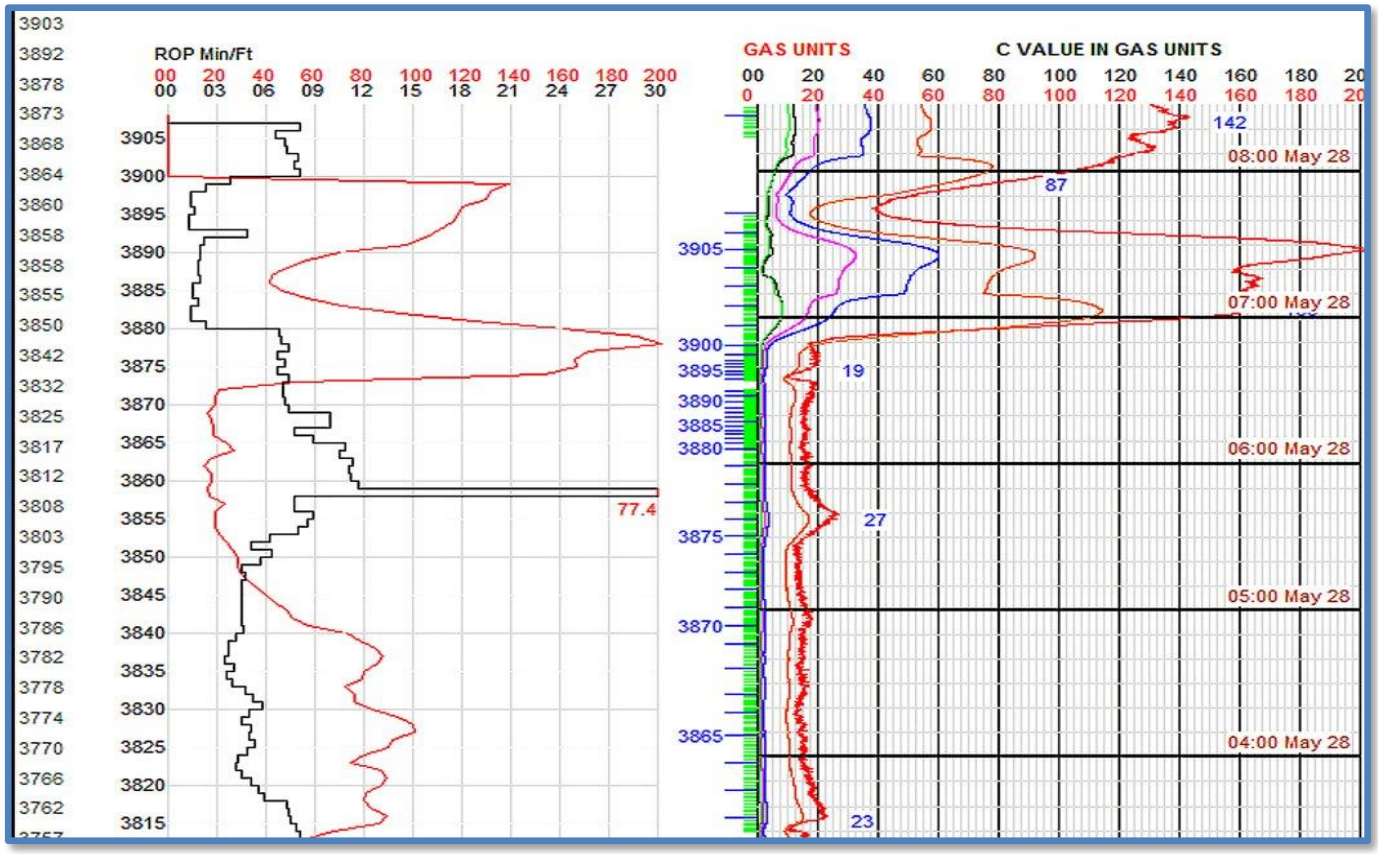
iBall Instruments
Gas Chart Software User Manual



For use with the iBall Instruments Real Time Gas Detection Equipment

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1.1 TABLE OF CONTENTS

2 INTRODUCTION

The iBall Instruments Gas Charting software enables the user to chart gas levels and other drilling data in real-time with high resolution and flexibility using the iBall Instruments Bloodhound system.

The Gas Charting software gathers information from the Bloodhound system, stores it in a Microsoft database, and displays gas levels, rate-of-penetration (ROP), and other data from the drilling operation. In addition, it can generate LAS and XLS text-based data files that can be utilized in logging software packages, such as those from Wellsight Systems. This functionality enables the user to produce well logs for their client or employer.

iBall Instruments distributes this software (and future upgrades) free of charge to all rental customers of the Bloodhound. Software can be downloaded from the iBall Instruments website at www.iballinst.com

2.1 HOW TO USE THIS MANUAL

This document is organized in a logical and hopefully meaningful fashion, first by section, then sub-sections. Each section covers a major section of the Gas Chart Software, or some meaningful function/aspect of using the software to monitor your gas output with the Bloodhound gas detector.

You will notice that there are occasional icons with short descriptions which appear on the left-hand side of the pages in this document. Each icon has a different meaning, with the text supporting what is attempting to be conveyed. Below is a table of these icons and their meanings:

Table: Left-Margin Icons and their Meanings

Icon	Meaning
	**NOTE**: This is the most commonly-seen icon, and denotes some special piece of information that supplements the topic being covered.
	**TIP**: This denotes a special “hint or tip” that might be helpful in certain situations.
	**LINK**: This points out a helpful hyperlink which might be valuable for acquiring more information on the topic.
	**CAUTION**: This is used to point out any “gotchas” that might potentially be avoided in the current context.
	**TRY ME**: This denotes an experiment to try that might help in understanding the mechanism being described.
	**ADVICE**: This denotes expert advice that iBall personnel have discovered through years of operation and refinement of the Bloodhound system which would otherwise be learned via a hardship experience.

2.2 OVERVIEW

NOTE: A complete list of acronyms and their definitions can be found in Appendix A of this manual.

At first glance the software graphics appear to emulate a typical continuous chart recorder. However, the software package is a powerful and accurate application capable of generating highly accurate charts, LAS files and XLS files with details essential to the production of accurate mud logs.

The waterfall chart design was selected as it is the most familiar to the greatest number of mud loggers and geologists. The iBall Gas Chart software waterfall chart by default displays the newest data at the bottom of the chart and as time goes on the data move upward. (If desired, the user may choose to have newest data presented at the top of the page.)

The iBall Instruments Gas Chart software user interface consists of three Control Boxes and a few logical hot keys that control every function. Once the user masters the few buttons on the three Control Boxes and memorizes the “hot keys,” they are in complete control of the program.

A great deal of time has been spent working with today's mud loggers and geologists at various well sites to make this program as intuitive as possible. iBall Instruments is always looking for suggestions to improve the software and associated hardware devices. As suggestions are received from our users, improvements and refinements are integrated into the application and updates are made available at no cost to our customers.

3 GAS CHART SOFTWARE – QUICK START QUIDE

iBall Instruments Gas Charting software enables the gas levels and other drilling data in real-time with high resolution and flexibility using the iBall Instruments Bloodhound system.

This section provides step-by-step instructions on how to install, setup, and use the iBall Instruments Gas Chart software.

The software gathers information from the Bloodhound gas detection device and stores it in a database. The software also displays gas levels, rate-of-penetration (ROP), and other data from the drilling operation. In addition, it can generate and export LAS and XLS text-based data files that can be imported and used in logging software packages. This functionality enables the user to produce well logs for their client or employer.

ADVICE: Learning basic network terminology such as LAN/WAN, Topology, combined with an understanding of network IP addressing and firewall operation is a benefit in advance rig-ups, and troubleshooting.

NOTE: Most firewalls are open to the Bloodhound and this is not a problem. If you have further questions about this, please contact technical support for additional documentation at support@iballinst.com.

3.1 SYSTEM REQUIREMENTS/PREREQUISITES

To install iBall Instruments Gas Charting software on your computer you will need to meet the following requirements:

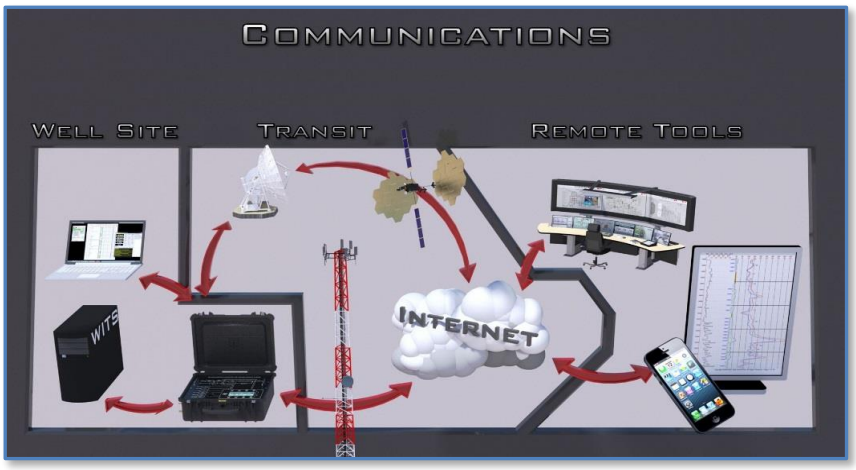
OPERATING SYSTEM: Microsoft Windows XP or later, 32-bit or 64-bit operating system, patched to most recent level using Microsoft Service Packs/Update function.

BROWSER: Microsoft Internet Explorer 6.0 SP1 or later.

LOCAL CONNECTION OPTIONS (EITHER/OR):
USB: One available USB port, and one USB Printer Cable (USB Type A to USB Type B).
SERIAL: One available 9-Pin Serial Port, and one 9-Pin Serial Cable, Male-to-Female.

FOR NETWORK CONNECTION OPTIONS:
LAN: One Available Ethernet Port, and appropriate cabling to reach a network-address-issuing device (or router).
WAN/INTERNET: In addition to the LAN requirements above, this also requires a functional Internet connection with a firewall that allows the Bloodhound to communicate.

If you are unable to use a computer installed with Gas Chart directly connected to a Bloodhound (RUNNING LOCALLY see diagram below) as an alternative you can utilize iBall Instruments Remote Logging Webserver application (www.iBallremote.com) to collect drilling data from the onsite Bloodhound connected to the Internet, that will be sent to the iBall Data Center (RUNNING REMOTELY see diagram below). Remote data collection will have slightly less functionality when using our Webserver application.



3.2 APPLICATION DEFAULTS

NOTE: Past Gas chart versions have created the DB_CUE default data directory in the root of the C: drive. That is no longer needed. It has been moved into the iBall directory folder structure.

The iBall Gas Charting software installation will create the required default directory structure as listed below:

Program Directory = located in C:\Program Files\iBall
Working Directory = C:\Program Files\iBall\DB_CUE

The program directory stores all necessary application files and the working directory stores all data collected and exported. Proper Directory/Folder/File permissions are required for both default directory locations to ensure accurate application operations. We recommend to always create and save all data to the Working Directory.

CAUTION: When viewing or editing the database using newer versions of Microsoft Access, it is important to save it under the JET 4,0 database structure, otherwise the database will no longer be compatible with t he Gas Chart software program.

When installing Gas Chart for the first time, the installation package will install and open a demo database. The data collected is stored in a Microsoft database structure using the Microsoft 4.0 JET database engine format. All databases generated by this application end with a file extension of *.MDB, and are created without encryption, and use no proprietary data formats. Therefore, the user is able to examine, use, and modify the data with simple Microsoft tools such as Microsoft Access.

3.3 INSTALLING GAS CHART SOFTWARE

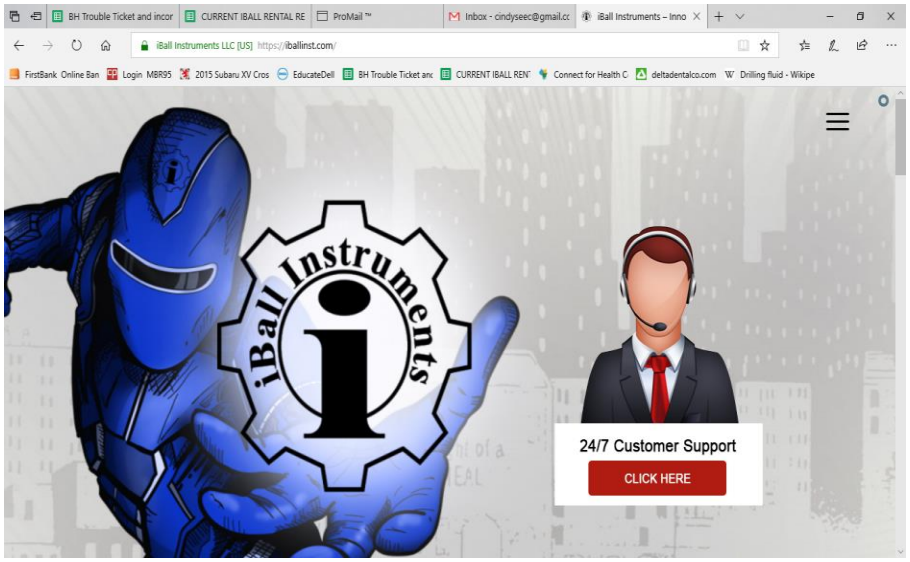
Your Bloodhound device will not ship with the media for the Gas Charting software or device drivers. In order to download the latest release, you will need to visit the iBall Instruments company website (www.iballinst.com) to download up to date software installations.

TIP: iBall recommends storing ALL databases and LAS/XLS export files in the default C:/Program Files/iBall/DB_CUE directory and to create a desktop shortcut to that folder.

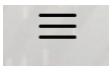
Steps to Install:

Open your Internet Browser and in the address bar TYPE in http://www.iballinst.com and press enter to reach the following iBall Instruments company web page:

NOTE: It is good practice to check the iBall Instruments website before each well to be sure you have the latest release on your computer. Many issues can be avoided by doing so (see Section below - Upgrading Gas Chart - if you need to upgrade to the latest version).

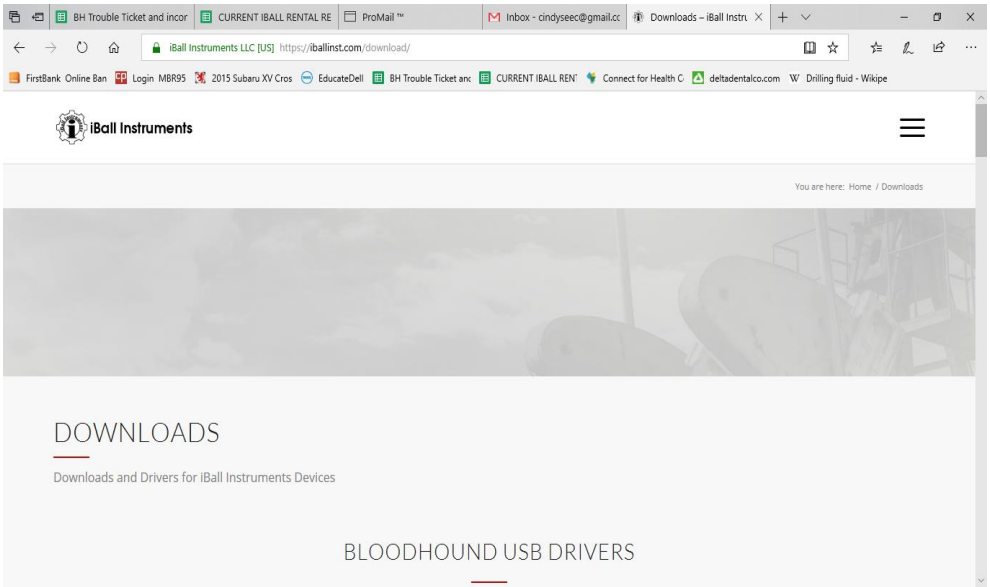


At the top of the Browser page you will see a List icon on the top right. CLICK to provide a list of Website options. Select DOWNLOADS from the list



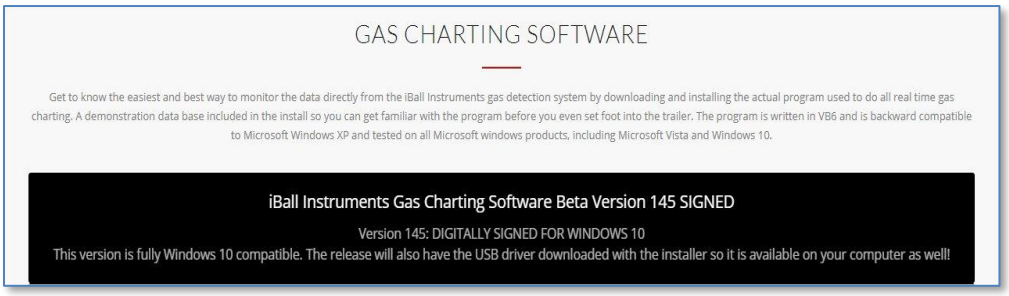
You will now be presented with the following web page:

LINK: For a list of all available downloads including Gas Chart, other software, drivers, and updated manuals go to: https://iballinst.com/download/



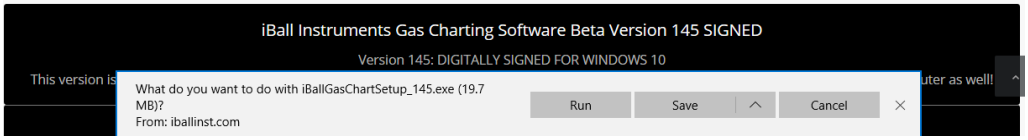
When you scroll down on the Downloads webpage you will see several options to download.

Scroll down to the section “Gas Charting Software” and CLICK the hyperlink for the latest iBall Instruments Gas Charting - Software Download Version XXX (as circled in picture below). Where XXX is will be the latest version. This is subject to change at anytime:



This will start the Download process from the iBall Webserver to your local computer. Depending on your Operating System version you should see a pop-up at the bottom of your Browser window showing you that the download process has started and asking if you would like to Run or Save the download to your computer (as pictured below):

NOTE: It is recommended that you Save the download, so the file will be available if problems with the install occur, or if you need it at a later point for other reasons.

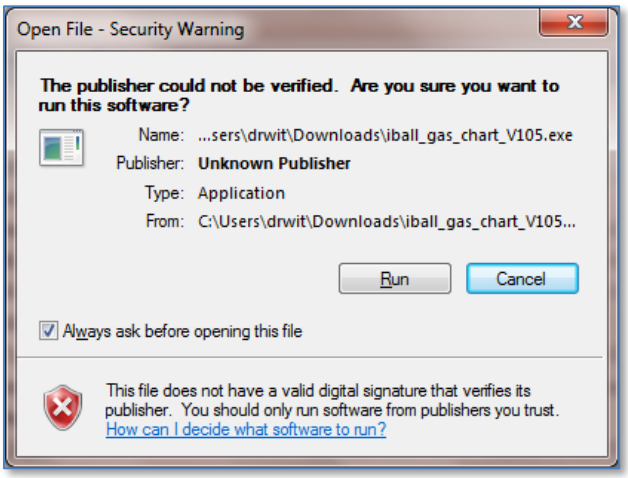


CLICK Save to start the download. You should be able to view the download progress, and it should also show you the download location (make a note of the location).

When download is complete, locate the Download directory (Downloads folder is usually the default directory or the directory noted above)

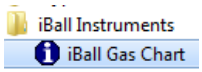
Once you are in the download directory you are ready to run the installation. DOUBLE-CLICK the executable file named iBall_gas_chart_Vxxx.exe (where xxx will be the latest software release number). A program installer window will open as pictured below:

NOTE: All prior versions of Gas Chart have NOT included the USB driver installation. If you need to download and install just the USB driver by itself see USB driver install section below.

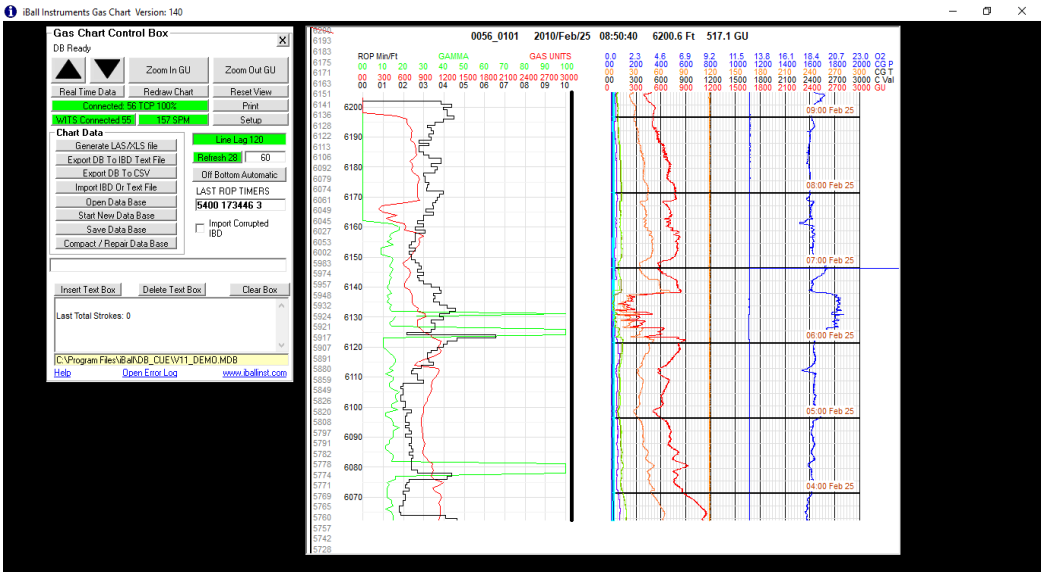


CLICK Run. The program will start installing, copying, updating, and configuring all required files to your computer. Once complete the program should have been successfully installed.

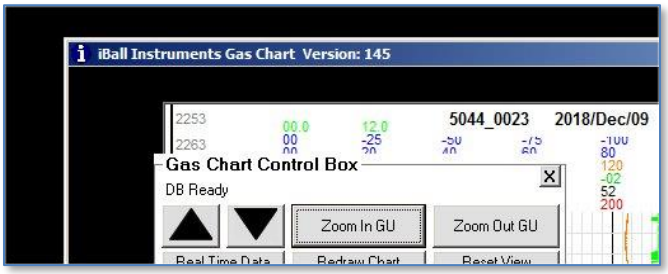
You will now have a new Gas Chart program on your All Programs List and a new Gas Chart program icon on your Desktop that will look like this:



DOUBLE-CLICK the desktop icon to launch the Gas Chart software and wait for it to load. Gas Chart will launch with a black background and begin gathering the ROP data and refreshing the database. After waiting for this process to complete, you will be presented with Gas Chart's main screen (see figure below).



After Gas Chart loads, verify that it is indeed the version you just installed by looking in the upper-left-hand corner of the application, on the title bar. You will see the text "iBall Instruments Gas Chart Version XXX" where "XXX" is the version of the software you are running (see figure below for an example).



NOTE: The size of the database in Gas Chart will directly relate to the amount of time it takes to gather ROP and load the database. A larger database will take longer than a smaller one.

At first launch the Gas Chart software loads a simulated database that is available to demonstrate the operation of the software. After that point you will be presented with the main Gas Chart screen, like the image above. To verify this, note the name of the database (located in the yellow data field at the bottom of the "Gas Chart Control Box" ends in "V11_DEMO.MDB". This is a real data set from a past well and displays an example of the overall charting function of the program. This is not a live/running database but is static and will not change over time. When Gas Chart is connected to a Bloodhound in the field, and you start a new database that is specific to your well, the chart will be continually advancing in two-minute intervals.

At this point your PC is installed with the Gas charting software **and ready to collect data from the Bloodhound device once the Bloodhound is successfully connected to your local PC**. Connection requirements are discussed in the next section.

3.4 CONNECTIONS

The Gas Chart software has full functionality when the computer it is running on is directly connected to a Bloodhound by way of 4 options:

1. Serial (9 Pin)
2. USB cable connection
3. Local-Area-Network (LAN)/Ethernet connection
4. Wide-Area-Network (WAN)/Internet

NOTE: WITS Connection (this connection option is discussed below but is only needed when connecting to a WITS provider).

Each connection option is configured on the Bloodhound tab in Setup and is described individually as follows:

3.4.1 9-PIN SERIAL (DB9) CONNECTION (OPTION 1)

This connection option involves connecting a 9-pin serial Male-To-Female cable between your PC and the Bloodhound's Serial Port, which is the bottom of the two 9-pin ports on the Bloodhound. This method does not require drivers other than those native to the hardware serial port on your computer. A 9-pin Mail-to-Female Serial cable is pictured below for reference:

3.4.2 USB CABLE CONNECTION (OPTION 2)

The USB cable connection is the **most common** connection method. To locally connect the PC running Gas Chart to the Bloodhound you will the USB-A to USB-B (printer) cable that is shipped with each unit and can be found in the black pouch when you open the Bloodhound case (pictured below):

The Gas Chart installation package includes the USB driver required to communicate with the Bloodhound when using the USB cable connection (as described below). Installing the Gas chart program **will NOT run the installation for the USB driver**, you will need to run that separately if you plan to use that connection method.

To install the USB driver, you need to do the following steps:

Unplug the USB cable from your PCs USB port (USB/A).

Open Windows File Explorer and go to C:\Program Files\iBall\USB_DRIVER directory to find the executable that you will need to install.

You have 2 options; 1) 32-bit driver install or 2) 64-bit driver install. Most Operating Systems will need the 64-bit driver. You can verify your OS specs by looking at System Properties. If you are unsure you can try to run either option and you will get a prompt telling you it is incompatible. If that happens go back and run the alternative driver install executable.

Double click the installer file (i.e. CP210xVCPInstaller_x64 for 64-bit OS or CP210xVCPInstaller_x86 for 32-bit OS). This will start the installation. Accept all defaults to complete.

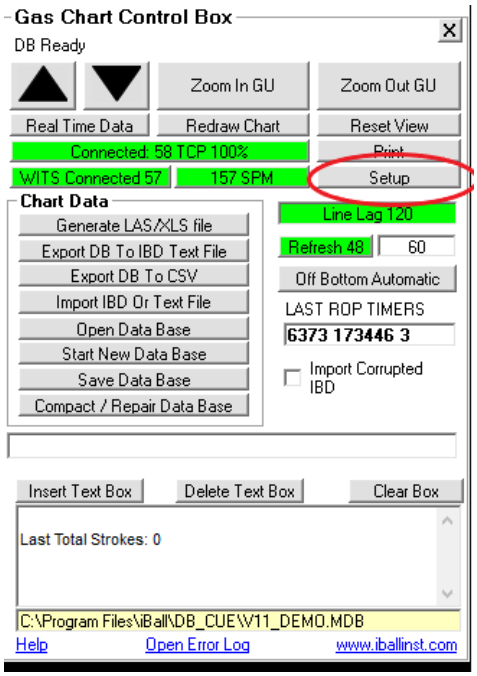
Once the Gas Chart software installation and the USB Driver installation are complete, you will need to plug in the USB cable to the Bloodhounds USB/B port and then to your computer's USB/A port. Your computers operating system will complete the Device Driver installation and port assignment.

When the Operating System has completed its final step in installing the USB driver you need to verify that Gas Chart is looking for your desired connection method.

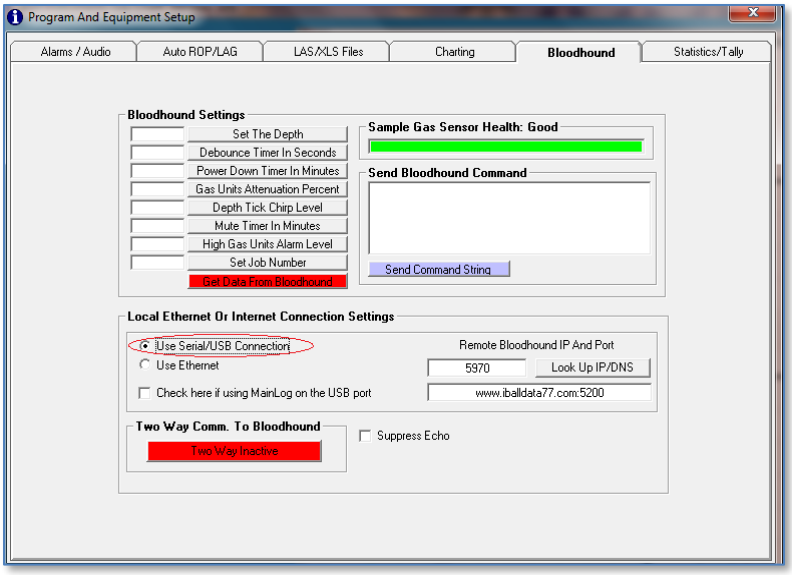
The following steps are the same for both Serial 9 Pin (Option1) and USB (Option 2). To verify your preferred connection method in Gas Chart, complete the following steps:

Open Gas Chart. Wait for database ROP gathering to complete.

Click the Setup button from the Gas Chart Control Box (as pictured below):



Click to select the Bloodhound tab and make sure the Use Serial/USB Connection radio button option is selected (pictured below):



Click the Red X to close the Setup window. Verify in the Control Box that the Bloodhound is Green and connected. If yes, you are done!

3.4.3 LAN/ETHERNET CONNECTION (OPTION 3):

TIP: Please refer to the Bloodhound User Manual for more information on the hardware configuration required for Internet connectivity for each Bloodhound model.

The Ethernet connection is available to those logging operations that have a Local Area Network configured on location (Rig Network) that can be utilized for Internet connectivity. The Ethernet connection steps below apply to all Bloodhound models.

To locally connect the PC running Gas Chart to the Bloodhound using the Bloodhound's Ethernet port, you will first need an Ethernet CAT5 cable. **This type of cable is not provided with the Bloodhound rental**. The Ethernet cable can be any length and will have an RG45 connector on each end (as pictured below):

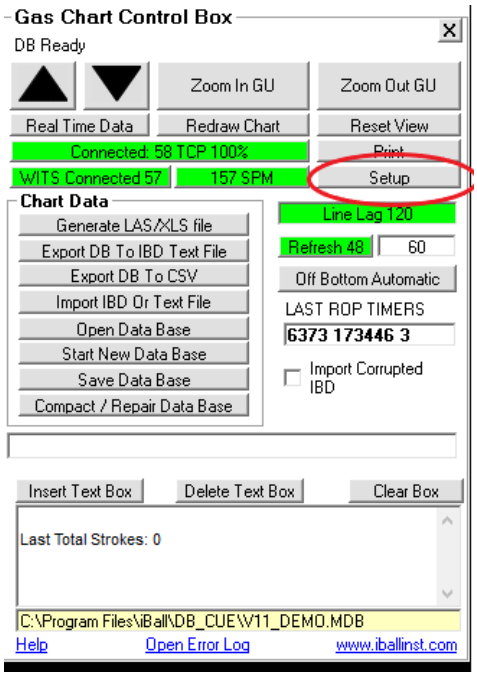
When you have plugged in the Ethernet cable from the side of the Bloodhound to an available LAN network port (either a Rig Router/Modem or network provided Switch) you will need to do the following steps to verify Gas chart is looking for your desired connection method.

NOTE: It might be necessary to turn the Bloodhounds internal modem/router off to avoid an IP assignment conflict. For assistance please contact Technical Support.

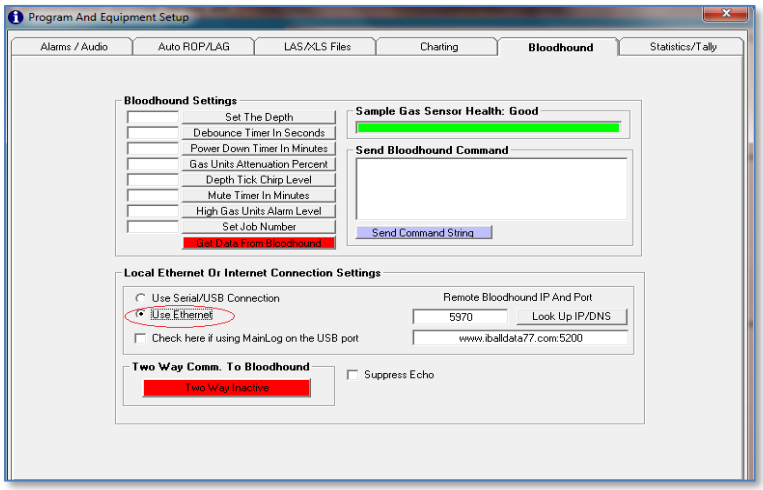
Wait for a few seconds for the Bloodhound to find an available IP and connect to the LAN. Once the Bloodhound is connected it will display an IP Address from the LAN on the Bloodhounds faceplate display. Wait for the data at the bottom of the display to scroll around and write down the IP Address and port information exactly as shown (ex. 192.168.1.10:23 / or 10.16.1.2:23 / or 172.123.13.1:23 or something similar).

Open Gas Chart. Wait for database ROP gathering to complete.

Click the Setup button from the Gas Chart Control Box (as pictured below):



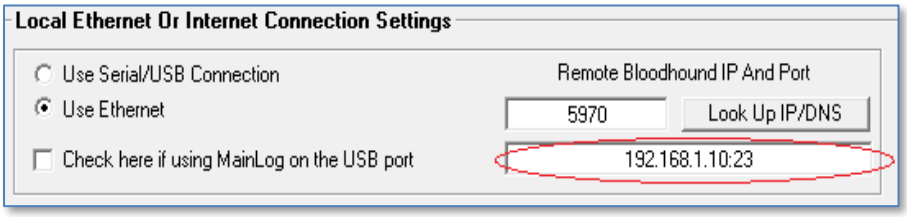
Click to select the Bloodhound tab and make sure the Use Ethernet Connection radio button option is selected (as pictured below):



In the Edit box to the right of the Use Ethernet radio option you just selected, you need to type in the LAN IP Address and Port you collected in Step # 2 above. Delete the DNS Name and Port currently in that Edit Box (i.e. www.iballdata77.com:5300) and then type in your LAN IP/Port.

NOTE: For the LAN connection option, ignore the smaller Edit box to the Left of the button labelled, "Look Up IP/DNS".

EXAMPLE: Using one of the sample IP Addresses from Step # 2 your screen should look like the picture below:



Click the Red X to close the Setup window. Verify in the Control Box that the Bloodhound is Green and connected. If yes, you are done!

3.4.4 WAN/INTERNET CONNECTION (OPTION 4):

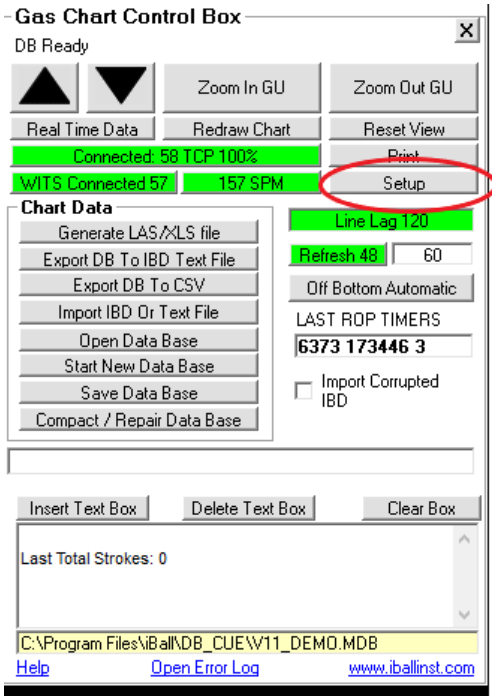
TIP: Please refer to the Bloodhound User Manual for more information on the hardware configuration required (Registers) for Internet connectivity for each Bloodhound model.

This Ethernet connection is a connection option if you cannot connect the Bloodhound and the PC using the USB cable AND you do not have a LAN to connect to. This method will only work if the internal Modem in the Bloodhound is powered on, has an active SIM card installed, and is connected to the Internet.

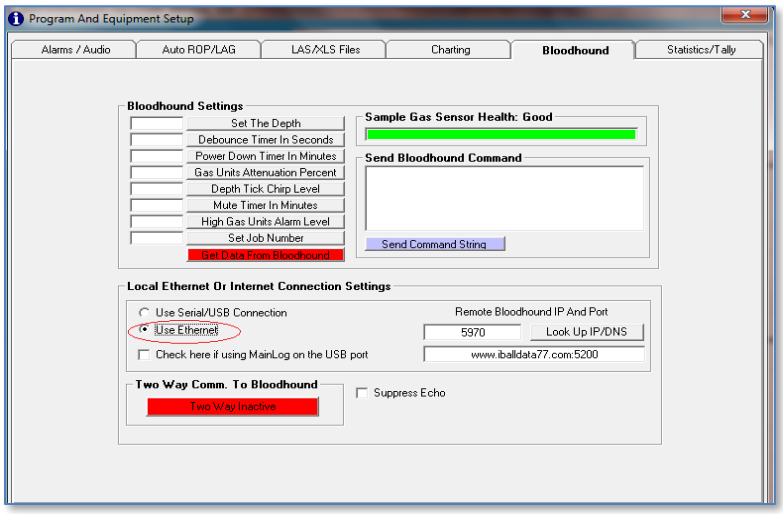
In this scenario you will not need an Ethernet cable. You will want to be sure the Bloodhound is connected to the Internet via the Bloodhounds internal modem (using the antenna) and broadcasting its data. Follow the steps below to verify Gas chart is looking to this desired connection.

After completing the steps to get the Bloodhound connected to the Internet using the internal modem (see NOTE above), open Gas Chart. Wait for database ROP gathering to complete

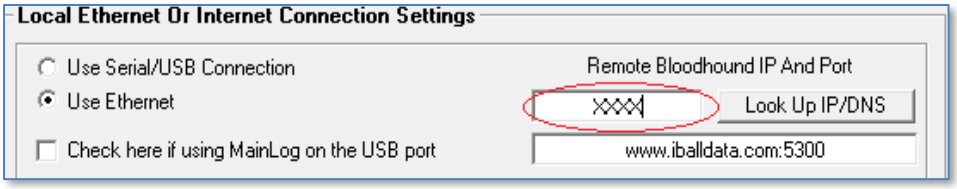
Click the Setup button from the Gas Chart Control Box (as pictured below):



Click to select the Bloodhound tab and make sure the Use Ethernet Connection radio button option is selected (as pictured below):



In the Edit box to the right of the Use Ethernet radio option you just selected, you will ONLY be concerned with the smaller Edit box to the Left of the <u>Look Up IP/DNS</u> button. Remove the unit number that is in that box and type in the Unit number of the Bloodhound you are using. Where XXXX is in the picture below is where you will type in your BH Unit number:



Once your Bloodhound unit number is entered, CLICK the Look Up IP/DNS button to the right of that Edit box.

Click the Red X to close the Setup window. Verify in the Control Box that the Bloodhound is Green and connected. If yes, you are done!

3.4.5 WITS CONNECTION

NOTE: Gas Chart does not require any software configuration for a WITS connection. If the Bloodhound and the EDR are communicating, and the computer running Gas Chart is successfully connected to the Bloodhound, WITS will show connected in the application.

The Bloodhound is designed to automatically establish communications to an Electronic Drilling Recorder (EDR) to collect and monitor WITS data that is available during the drilling process. In the collection process the Bloodhound builds a WITS packet that will be sent to the host server. There is no external hardware required to make this connection. The Bloodhound has incorporated connection interfaces to communicate (please refer to the Bloodhound User's Manual for detail on each interface).

If your operations require Gas Chart to receive input from a WITS workstation, you will need to be sure of the following for the Gas Chart software to collect the WITS data.

Ensure that the Bloodhound and the WITS workstation are physically connected to each other via the RS232 WITS connection interface or the RS422 connection interface. The Bloodhound's connections are described in detail in the Bloodhound Users Manual. The RS232 interface is most commonly requiring a Null Modem Serial Cable (DB9 Female to Female) as pictured below:

Setup the WITS Out configuration on the Electronic Drilling Recorder (EDR) for all the data types you need and be sure to save the configuration.

Launch the Gas Chart software and confirm in the Gas Chart control box that the WITS Connection button shows Green and Connected. This button acts as a toggle for the WITS connection depending on its connection state.

Normal EDR to Bloodhound connectivity is direct using the Null Modem Cable setup as described above. If the Bloodhound needs to be physically located in a place that is not close to the computer running a local copy of Gas Chart, such as in the logging shack, or wirelessly by the extractor, then Gas Chart can accept WITS data directly from the WITS computer through a serial port or USB to serial adapter on the computer running the Gas Chart software by itself. More detail on this with wireless setup is described later in this manual (Control Box Buttons).

3.4.6 UPGRADING AND REINSTALLING GAS CHART

iBall Instruments is dedicated to keeping our products enhanced to better accommodate the needs of our customers. Field operations are constantly demanding program additions, deletions, and modifications which we respond to as needed. We are also enhancing our products as our customers bring valuable and practical program “wish-list” items to our attention. Be sure to check our website regularly for the latest Gas Chart revisions to stay up to date.

WARNING: If the customer uninstalls Version 140 or greater it will also delete the storage folder (DB_CUE) under it and the data bases he has collected. It would be best to always load the new versions over the old. There is no warning when this happens, and the installer does not give that option.

You have 2 options to upgrade or reinstall your current version:

REPLACE - Install a new version over the top of an old version.
CLEAN - Install a new version after removing an old version.

Option 1 (REPLACE) will copy over all program files with the latest versions within the same directory structure **(SEE NOTE)**. This is quick and usually a viable option for most. Option 2 (CLEAN) is often required for those PCs that present system issues. Option 2 (CLEAN) requires a few more steps but is recommended if you have been having system problems.

The steps for both options are as follows:

REPLACE (Option 1)

The steps below will replace or upgrade your current version of Gas Chart on your local PC.

Close the current version of Gas Chart.

Download the latest software version of Gas Chart from the iBall website (Refer to steps in Installing Gas Chart Software section above).

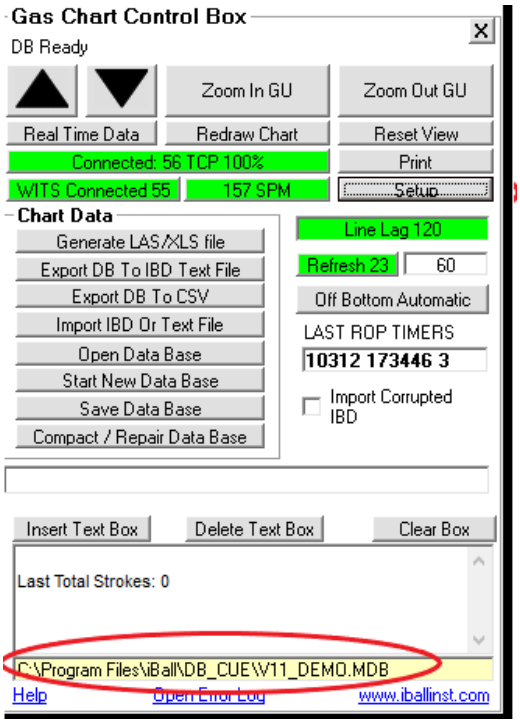
Run the updated executable that you just downloaded. The executable file is named **iBall_Gas_Chart_Vxxx.exe** (where xxx will be the latest software release number you just downloaded).

DOUBLE-CLICK to launch the Gas Chart software.

Verify that the program is displaying the latest version. You can verify the version number in the top left corner of the application window, or in the Notes section of the Control Box. If it matches the version you just downloaded, the upgrade was successful.

NOTE: Older versions of Gas Chart created the Data directory in the root of the C: drive. When you install v145 and up, the new Data (DB_CUE) directory is in C:\Program Files\iBall\DB_CUE. Be sure to move all data to new Data directory and delete old.

Verify that your database reopened in the updated version but referring to the path and file name at the bottom of the Control Box (as circled in the picture below). See NOTE if upgrading to a version that moved the working directory (DB_CUE) to the new location. You may need to move your data before being able to open your current database.



Verify that Bloodhound and WITS (if applicable) are connected.

Congratulations! You have successfully repaired your Gas Chart installation and verified current database and connections.

CLEAN (Option 2)

To upgrade using the CLEAN option you will be removing the iBall Instruments Gas Chart software program from your computer, rebooting you computer, then downloading and installing the latest version to complete the upgrade.

The steps for this option are as follows:

Close the current version of Gas Chart.

Go to your Programs utility for your Operating System version and select Add/Remove Programs, or Programs and Features (each OS may present the utility differently).

Find the iBall Instruments Gas Chart program in the program list and CLICK to select it.

At the top of the program list CLICK the Uninstall/Change button to start the removal process.

Reboot the computer. Be sure to close all open applications and save all files BEFORE allowing the reboot.

Download the latest software version of Gas Chart from the iBall website.

NOTE: Older versions of Gas Chart created the Data directory in the root of the C: drive. When you install v145 and up, the new Data (DB_CUE) directory is located in C:\Program Files\iBall\DB_CUE. Be sure to move all data to new Data directory and delete old.

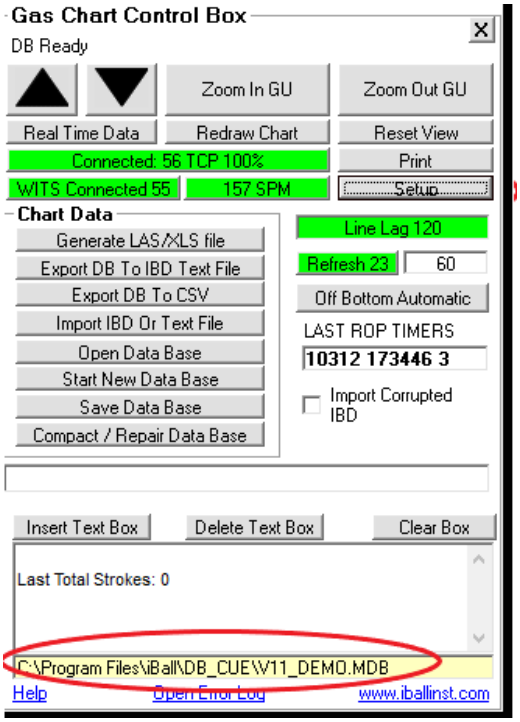
After rebooting you may have a new data directory (C:\DB_CUE) location depending on what version you were on prior to upgrade (**SEE NOTE**). If so, be sure to move all data from old to new location and then delete old Gas chart Data directory to avoid confusion.

Run the updated executable that you just downloaded. The executable file is named **iBall_gas_chart_Vxxx.exe** (where xxx will be the latest software release number you just downloaded, BE SURE IT IS THE LATEST).

DOUBLE-CLICK to launch the Gas Chart software.

Verify that the program is displaying the latest version. You can verify the version number in the top left corner of the application window, or in the Notes section of the Control Box. If it matches the version you just downloaded, the upgrade was successful.

Verify that your database reopened in the updated version but referring to the path and file name at the bottom of the Control Box (as circled in the picture below):



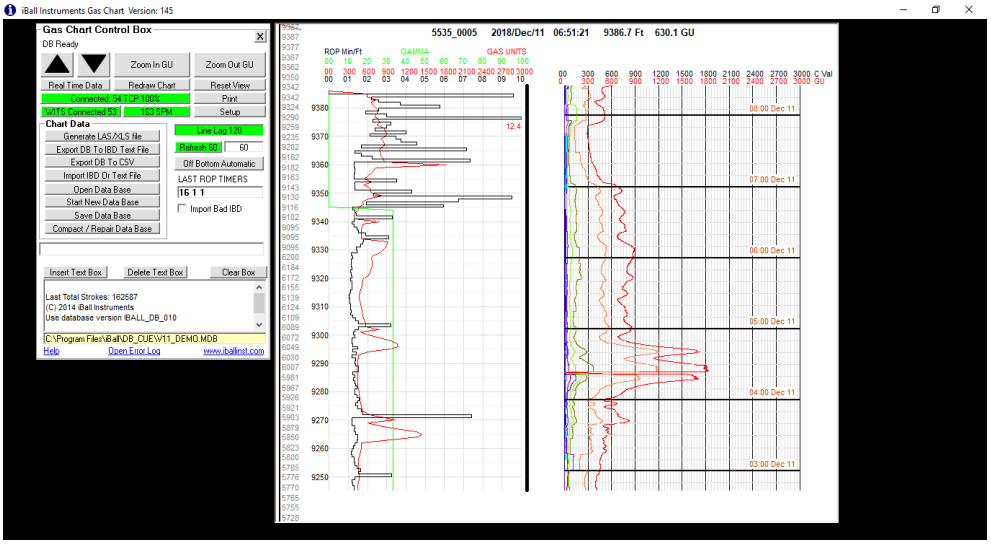
Verify that Bloodhound and WITS (if applicable) are connected.

Congratulations! You have successfully removed and reinstalled Gas Chart and verified current database and connections.

4 GAS CHART MAIN SCREEN

When the Gas Chart program is started, it first makes several database checks to ensure that the database is in the correct structure and has all the correct points. During this database check, a window will open to display the status of the database check and alert the user if there are any problems. After these database checks are completed, the program will generate the Data Logger Main Screen and draw a uniform grid.

The Main Screen is a white box that will automatically resize to the top and bottom of the monitor screen size. A minimum screen resolution of 1024 x 768 is suggested when using this program. A lower resolution is usable but not recommended. Once the loading process completes, you will be presented with the main screen to Gas Chart within the application window. It should look like this:



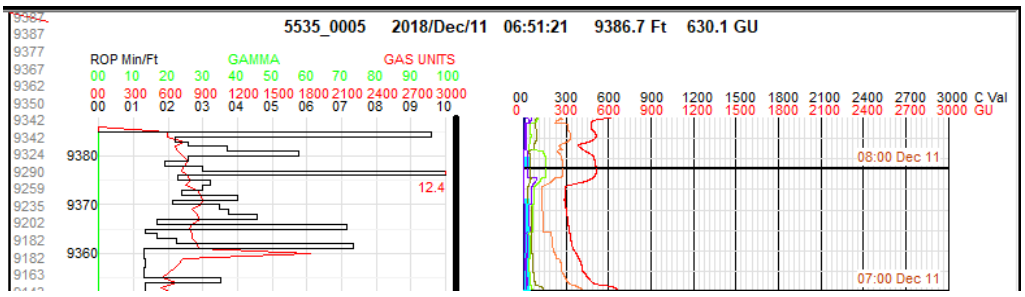
The Main Screen is a large chart divided in half by a thick black line at the center of the page. To the left and right of this line are two entirely different charts that are drawn in two different ways. The chart on the left is drawn by depth and will advance only when depth is being recorded. The chart on the right is drawn by time and will advance whether depth is advancing or not.

ON THE LEFT: By default, the left-hand chart displays the rate of penetration (ROP) as a black "stepped" line, as well as the total gas as a red line.

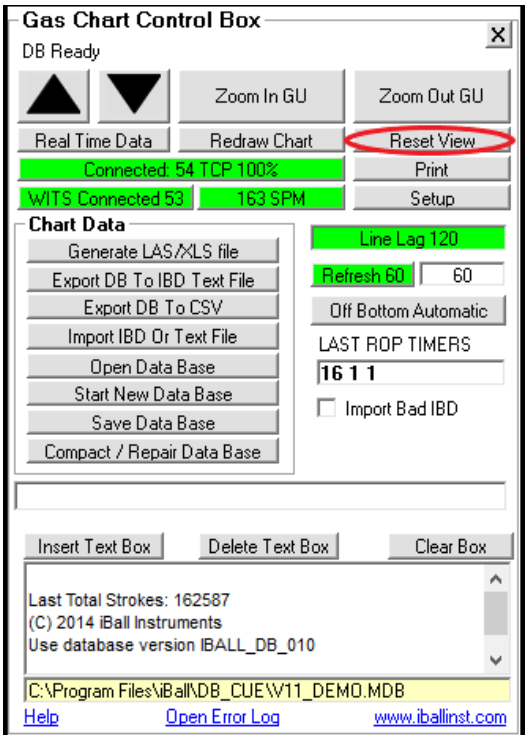
ON THE RIGHT: The right-hand chart displays gas units over time as well as a variety of other optional items.

You can think of the left-hand chart as being by footage while the right hand chart is by time. The two charts will have equal horizontal scales for similar items that are plotted on both, such as gas units on the right and lagged gas units on the left.

NOTE: Options for charting are defined in "Program and Equipment Setup" within the "Setup" screen. This is covered later in the document.



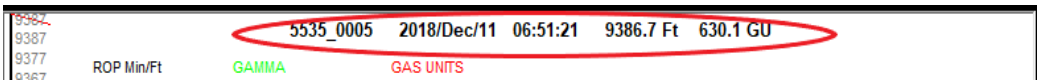
Although new data comes into the software's database every 6 seconds, the Main Screen is not automatically updated that frequently. This reduces the problem of the charts shifting while the user is trying to do something, such as make a depth correction. To manually refresh the charts with the most recently received data, the user may click on the Reset View button in the Chart Control Box (shown below):



4.1 STATUS LINE

NOTE: The data displayed on the Status Line is not the "current" real-time data, but rather is a snapshot in time of the data that arrived at the time denoted by the position of the cursor/arrow.

Whenever you move or place your cursor in the chart with the mouse (the arrow), you will see an update to Gas Chart's Status Line. This is a bold, black text line at the very top of the actual chart which has a white background (see image below).



This line continually updates as you move around on the chart. The data is displayed for the cursor's location" in the historical time/depth on the chart.

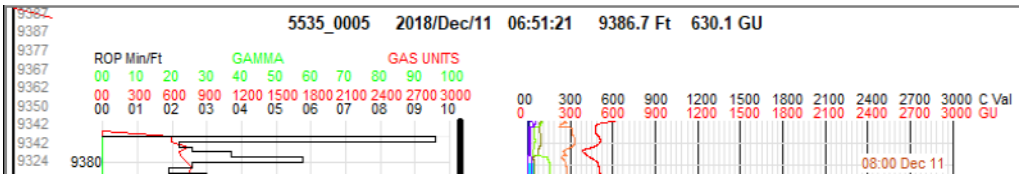
This line displays the following:

- Bloodhound Number.
- Bloodhound Job Number.
- Date/Time at cursor's location.
- Depth at cursor's location.
- Gas Units at cursor's location.

4.2 LEGEND

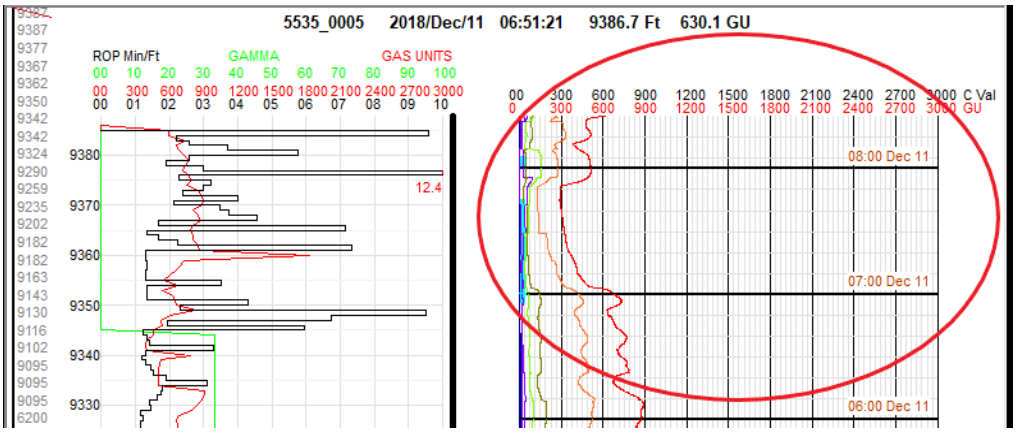
Below the Status Line and above the actual chart is the legend. The legend denotes the scale and color of the charted item, except in cases where doing so

is not feasible (such as multi-colored items). This legend will change depending on which charting items you have selected in “Program and Equipment Setup” (covered later in this manual). Below is an example of the legend that was captured from the demo database with which Gas Chart initially loads:



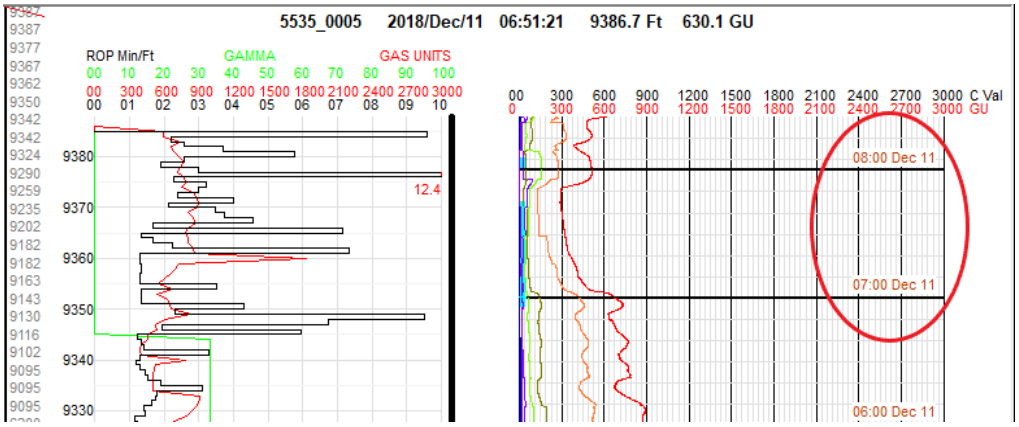
4.3 GAS OVER TIME CHART

The right-hand side of the Main Screen is the Gas Units Chart over Time. This graph is charting gas units, and potentially other data, by time, minute by minute. The horizontal scales for the plotted data items are shown at the top of the Gas Units Chart.



4.3.1 GAS CHART TIME AND DATE

In off-yellow, on the right-hand side of the chart, every hour there is a time and date displayed. This is the time and date that is transmitted by the Bloodhound instrument. (Be aware that, when running remotely, the Bloodhound could be in a different time zone.) The time and date continue to be charted as long as there is an input to the Gas Chart software, either locally from the Bloodhound, or from the Bloodhound remotely through the Data Center.

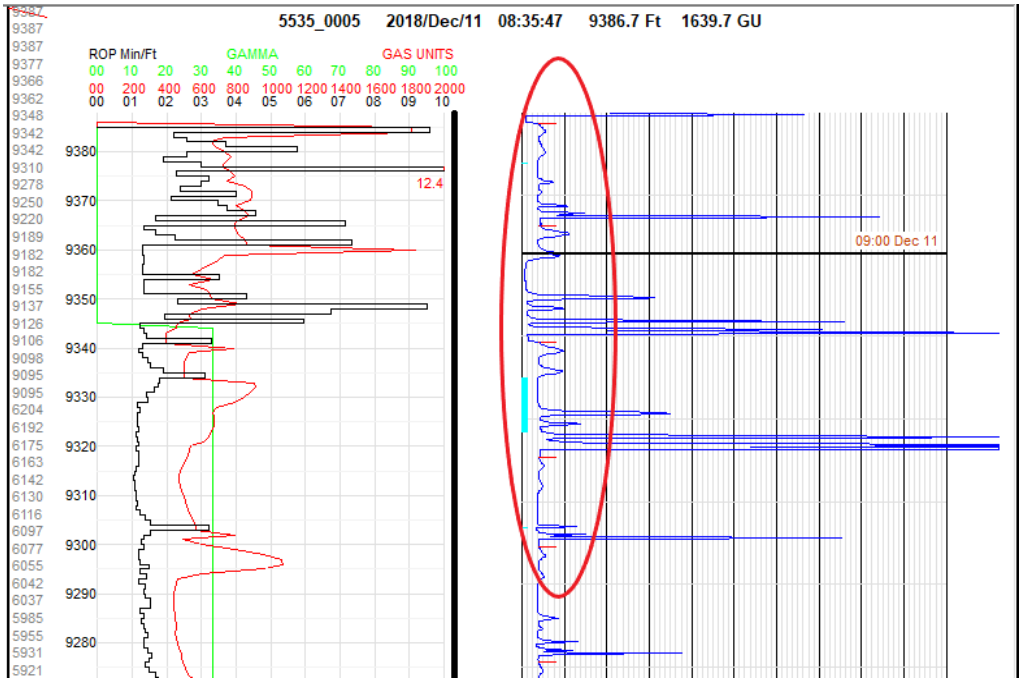


4.3.2 GAS UNITS LINE

The red graph line on the Right side of the chart represents the gas units that have been detected over time. The red gas units scale at the top of the chart can be changed as explained below. As the gas unit data flows into the Gas Chart program from the Bloodhound gas detection equipment, the user does not have to be concerned about off scale readings. If the gas units go off scale, no data are lost. If the gas units are off the current scale, the user can adjust the scale to view the gas by making a simple entry in the Chart Control Box.

4.3.3 CHROMATOGRAPH LINE

The dark blue line displays the raw chromatograph output. If the iBall Instruments equipment is furnished with the built-in chromatograph, and if the user selects the chromatograph viewing function in the Chart Control Box, the user will see the output of the chromatograph on the left hand side of the gas chart (right chart in main screen) in miniature form. (If your iBall Instruments equipment is not equipped with chromatograph hardware, then a flat blue line will appear in that area.) Each time a gas sample is injected into the chromatograph, a small red tick line will intersect the blue line. If the user chooses to zoom into the Gas Units Chart, the separations will become more noticeable. The user is also provided with the ability to select a portion of the chromatograph output and have the computer display the chromatograph data in larger format. This feature is explained below.

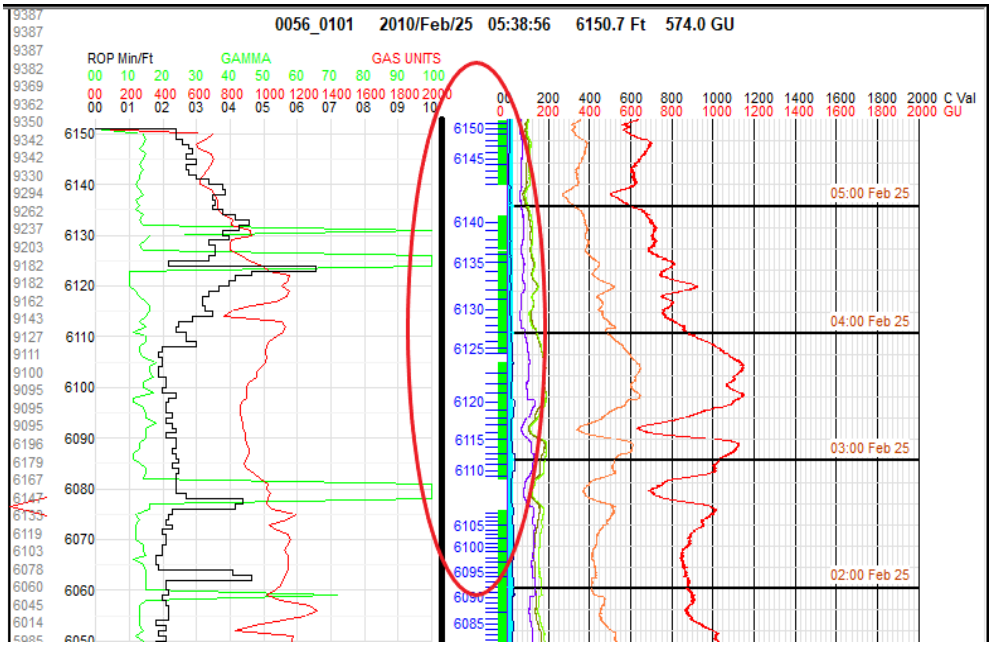


4.3.4 HYDROGEN SULFIDE (H_2S) LINE

The orange colored line represents the hydrogen sulfide detection in parts per million (PPM). When enabled for viewing (Register setting), there will be an orange colored line drawn to indicate the presence of H_2S. The scale for the H_2S detector is from 0 to 500 PPM of H_2S. If your iBall Instruments gas detection system does not have the H_2S detector installed, there will be a flat line shown on the display. This scale is not adjustable.

4.3.5 BLUE DEPTH TICK MARKS

If "Edited Geolograph" is selected in the Chart Control Box, blue tick marks will appear with the depth denoted beside them at five-foot intervals on the left-hand side of the gas chart (right side of the main screen). All Bloodhound Gas Detection systems are equipped to detect foot/meter changes, either through connection to a Geolograph depth switch, or from a WITS (Wellsite Information Transfer Specification) interface. If the drilling rate is rapid, these foot or meter ticks will run together and appear as a blue streak. The zoom function in the Chart Control Box provides the user the ability to view the ticks in detail. If the Bloodhound connected to a WITS interface, green tick marks will be displayed to indicate tenths of a foot.



4.3.6 RED DEPTH TICK MARKS

If “Raw Geolograph” is selected in the Chart Control Box, red depth tick marks will appear. These are called raw tick marks because these are the original (unedited) depth marks. Viewing these unedited marks allows the user to note the differences between tick marks that have been edited and the originals.

4.4 DEPTH/ROP CHART

The left-hand side of the Main Screen is the rate of penetration (ROP) Chart. The ROP Check Box must be checked in the Chart Control Box for the ROP Chart to appear (see Chart Items). The ROP is plotted by depth, foot by foot.

4.4.1 ROP LINE

When the ROP Check Box is checked in the Setup/Charting tab (Depth Based charting items) from the Chart Control Box, a black ROP line is plotted in minutes per foot, with the depths shown to the left. The horizontal ROP scale can be adjusted on the same tab in Setup as described later.

4.4.2 AUTO ROP LINE

When the Auto ROP Check Box is checked in the Chart Control Box, the plotted ROP line is dark red, and is corrected for the slow feet caused by making connections.

4.4.3 LAG GAS UNITS LINE

When the Lag Gas Check Box is checked in the Chart Control Box, the lagged gas units are plotted in red foot by foot on the ROP chart. The lag is calculated based on the settings in the "Chart Control Box / Setup Box / Lag Tab," described in a following section. When lagged gas units are plotted on the ROP Chart, they have the same horizontal scale as gas units plotted on the Gas Units Chart. If the lagged gas units are off the current scale, the user can adjust the gas units scale in the Chart Control Box.

4.4.4 LAG GAMMA LINE

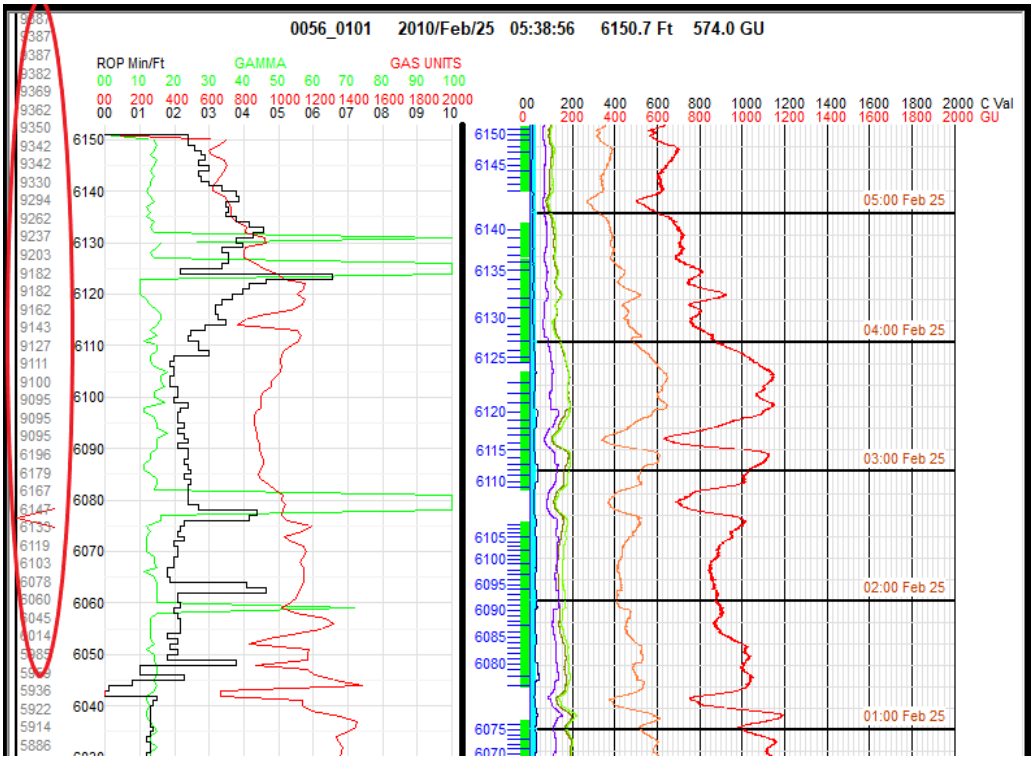
When the Lag Gamma Check Box is checked in the Chart Control Box, and the Bloodhound is connected to the WITS system and lagged gamma data is being entered into the WITS system by Measurement While Drilling (MWD) or directional personnel, the lagged gamma data are plotted on the ROP Chart as a green line.

4.5 NAVIGATION – VERTICAL CHART SCROLLING

There will be times when you need to move around in the Gas Chart database to review historical data. Fine and large vertical movements are possible within the Gas Chart software Main Screen.

4.5.1 LARGE MOVEMENTS

On the very far left-hand side of the Main Screen there is a jump bar. This is a vertical line with depth numbers next to it that goes from the top to the bottom of the chart. This represents <u>all</u> the data in the database. To make a large movement in the database you need to place the cursor near the vertical line at the desired depth so that a double-ended arrow appears and left-click (see picture below circled in red on far left of main screen). This will take the user to that approximate point in the database and display the data. After clicking, a red carrot **(>)** indicator on the jump line will show what part of the database is currently displayed. This view will only remain until the next time the chart is refreshed, either manually or automatically.

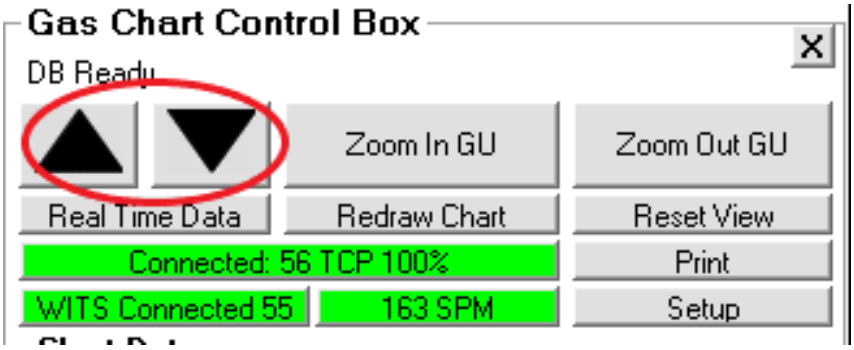


4.5.2 *FINE MOVEMENTS*

Fine movements in the database are accomplished by holding down a shift key and then holding down the left mouse button and moving the mouse up and down. This operation will move “ghost” gas units up and down that show where the Gas Units Graph will move to when the mouse button is released. The user is thus able to make fine movements.

4.5.3 *CONTROL BOX ARROWS*

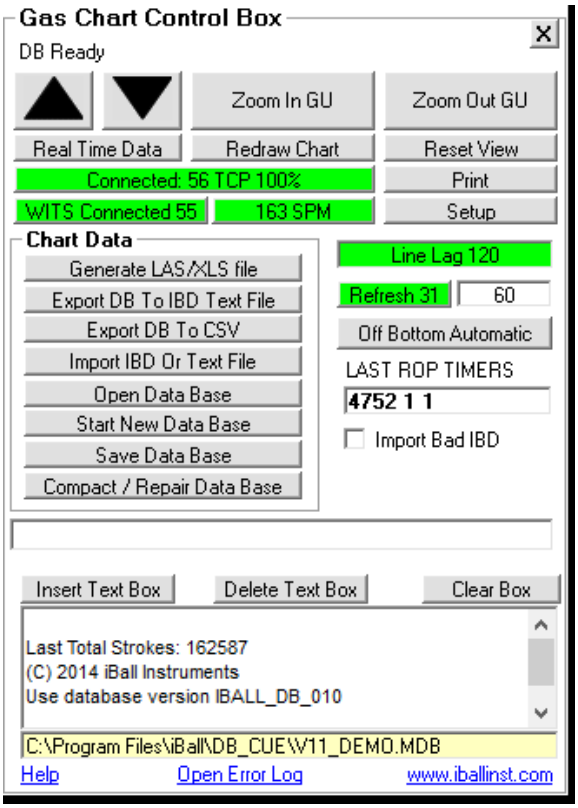
In addition, there are up and down arrow buttons (black triangles) in the Chart Control Box that permit the user to jump up or down a page at a time:



5 GAS CHART CONTROL BOX

The Gas Chart Control Box is the main control point of the program (as shown below). It allows the user to control what is seen on the Gas Units Chart and ROP Chart, select the input of data to the program, generate output from the program, verify connections, control view, control scale, and insert and delete text within the chart.

TRY ME: To disable the Main Screen automatic refresh cycle, click on the green "Refresh" button. This button will turn red with the wording "Refresh Off". This function is useful for disabling screen updates while working on an up-hole footage renumbering issue. To resume the Refresh cycle, click the "Refresh Off" button and it will turn green).



NOTE: If the "Connected" button does not show green, then Gas Chart is either not connected to the Bloodhound or has not been connected long enough for the light to turn (up to one minute).

To bring the Chart Control Box up for use, the user must RIGHT CLICK anywhere on the Gas Chart Main Screen. To remove the Chart Control Box the user must LEFT CLICK on the Main Screen or click on the small x in the upper right-hand corner of the Chart Control Box.

5.1 CONTROL BOX BUTTONS

The main control buttons in the Control Box are described below:

 - **Page Up and Page Down Buttons**.

In the upper left-hand corner of the Chart Control Box, there are two arrow buttons that enable the user to go up or down a page on the Main Screen.

Zoom In GU - **Zoom In GU** will allow the user to see more detail on the Gas Units Chart and will change the scale from 1” per hour to 2” per hour. Pressing this button again will double the scale to 4” per hour and so forth.

Zoom Out GU - **Zoom Out GU** will allow more gas chart data onto the screen at one time. Reverse effect as described above.

Real Time Data - **Real Time Data** button opens a new window that allows the user to see the real-time data that is being received from the Bloodhound gas detection system. This is an excellent method to verify that the Bloodhound instrument is running and communicating. This is explained in further detail in the following section.

Redraw Chart - **Redraw Chart** button does NOT bring the most recent data into view. It simply refreshes the chart that is currently being viewed. For example, if the user clicks or un-clicks the “Raw Chromatograph” chart item, this button then must be pressed to view the changes that the user has made.

Reset View - **Reset View** will instantly set the view to the newest data and set the Gas Units Chart to 1” per hour. This is handy if you get lost in the database or zoom in or out too much and want a speedy way to get back to a known position.

Connected: 59 TCP 100% - Bloodhound Connected/Disconnected button. Normally this button is green. The number in the window is the Main Screen automatic refresh (update) cycle in seconds. The default is 120 seconds (2 minutes). To change the refresh rate, place the mouse cursor in the window and enter the desired refresh rate, then hit the Redraw Chart button. The Number on the green Refresh button counts down the seconds until the next refresh. The number in the Refresh Text Box above the Gas Units box is a client entered second count-down timer that defaults to what is entered in the box whenever a new packet of Bloodhound information is received. If the Refresh button above the text box is red then it will count down and retry to connect to the Bloodhound every 120 seconds (the default setting, or whatever is entered in the text box below the Refresh button). If the user clicks on this button, the button will turn gray and the software will not attempt to connect to the Bloodhound (and will disconnect if connected). If the button is gray, clicking on it again will turn it red or green and the software will attempt to connect to the Bloodhound.

Print – Print button will allow the user to print the current visible (screen shot) Main Screen with status line to a printer that is connected to the computer. Before pressing the Print button, the scale of the print can be set using the ROP Inches Per 100 ft box.

NOTE: There are two sources for WITS input to Gas Chart;

(1) is from the Bloodhound equipment accepting the WITS data

(2) is when WITS data is directly connected to the computer that Gas Chart is Connected to

WITS Connected 13 – WITS Connected button will turn this button green if the Bloodhound has detected WITS input. The number in the button is a 30 to 60 second count down timer that resets whenever a new packet of WITS information is received. This button will turn red if no WITS input is found.

IF YOU HAVE WITS CONNECTED LOCALLY AT THE GAS CHART COMPUTER AND NOT CONNECTED TO THE BLOODHOUND THEN:

If you click on the button, it will open the SERIAL WITS control box (shown below).

Normally the Bloodhound will be connected to the WITS source of data and Gas Chart will accept the data directly from the connection to the Bloodhound only. If the Bloodhound is located away from the Gas Chart Computer, such as in the logging shack, or wirelessly by the extractor, then Gas Chart can accept WITS data directly from the WITS computer through a serial port or a USB to Serial port adapter as shown in the following wireless diagram.

By checking and turning on the “Use Local WITS Through Serial Port Instead Of Bloodhound” checkbox the Gas Chart computer will automatically (1) search for a local serial port, then; (2) check the serial port for WITS data, and when it finds it will; (3) connect to the serial port and start utilizing the streaming WITS input for Gas Chart operations.

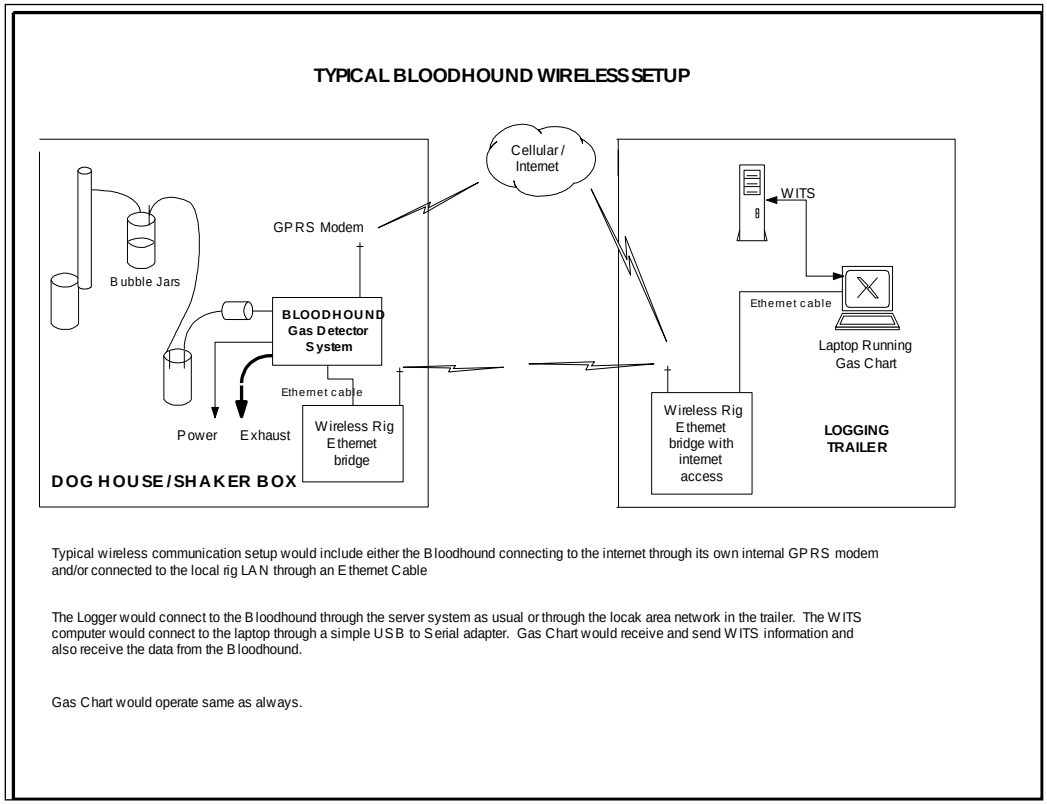
NOTE: Baud Rate is the speed at with serial data is sent or received over a given physical port on the computer.

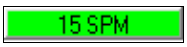
If the “Keep Wits Connected Aggressively” check box is turned on (on by default) if the WITS connection becomes bad or fails to flow data, the Gas Chart program will search again all serial ports on the computer for another WITS stream.

If for some reason the WITS computer supplying the WITS information is at a different baud rate other than the normal speed of 9600, then the serial communication speed can be adjusted here.

The Green left side of the box is the WITS data coming in from the Electronic Data Recorder (EDR), and the Right Yellow side is the data that the Gas Chart computer is sending back to the EDR. What Gas Chart sends is generally only lag depth and measured gasses. What the EDR sends is configured at the EDR or WITS computer.

If there is WITS information coming through the Bloodhound and through the Gas Chart computer serial port, then the “Use Local WITS Through Serial Port Instead Of Bloodhound” checkbox will determine when one Gas Chart will use.





– **SPM** button shows the number of total pump strokes per minute coming in from WITS. When WITS pump stroke data is not being received, the button turns gray and reads No Pump Data. When logging without WITS input (e.g. with a Geolograph setup), clicking the button toggles between “Pumps On” and Pumps Off”.

Setup – **Setup** button will allow the user to set the Gas Chart software preferences and is explained in detail later in this document.

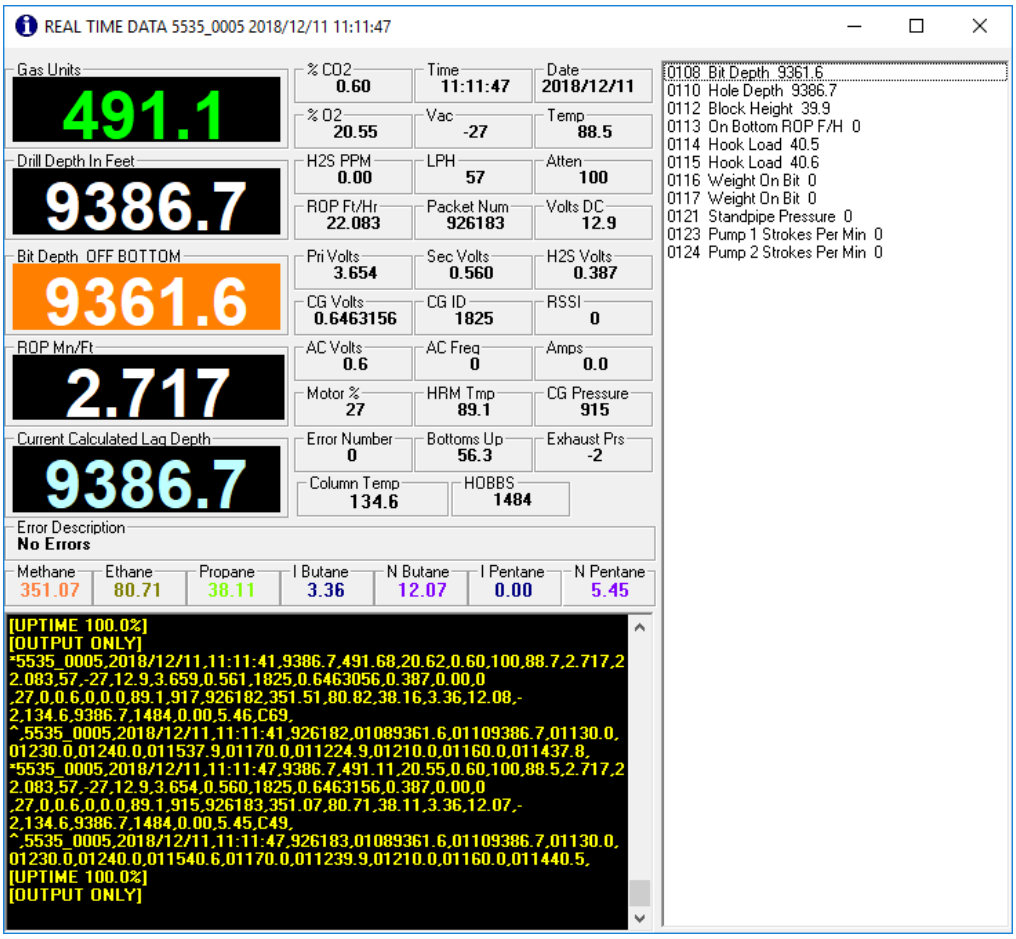
NOTE: The user does not have to know which serial port the Bloodhound is connected to. Gas Chart will search the ports and attempt to connect, and then will identify whether the port has a Bloodhound connected and select it automatically.

6 REAL-TIME DATA

The Real Time Data window provides important parameters from the connected Bloodhound. The RTD window will provide the Bloodhound Serial Number, the Job Number, and the date and time of the most recent data packet received in the header (top left of pop up window, as pictured below). Important parameters are shown in large boxes at the upper left to include Gas Units, Hole Depth, Bit Depth, ROP in Min/Ft and the Current Calculated Lag Depth.

If the Gas Chart software is running locally, the Lag Depth shown is that calculated within the Gas Chart software, based on the settings in the "Chart Control Box / Setup Box / Lag Tab," described in a following section. If the Gas Chart software is running remotely, the Lag Depth shown is that being calculated by Gas Chart software running on the wellsite and transmitted through the Bloodhound to the WITS system.

TIP: In the top-center section of the Real-Time Data screen is a table denoting several Bloodhound "critical stats". These are highly useful in diagnosing issues such as problems with the rig-up and mud, and are key indicators that can be used to discuss issues with on-site well operations staff.



All the Bloodhound parameters to the left of the large boxes mentioned above are described below.

6.1 PARAMETER DESCRIPTIONS

% CO2 0.00 – Current % CO_2	Time 17:32:10 - Time of last data packet from the Bloodhound.	Date 2015/11/10 - Date of last data packet from the Bloodhound.
% O2 5.28 - Current % O2 dependent on altitude, usually about 21% when drawing air. Used in Total Gas calculation – VERY important!	Vac -92 - Current Vac on sample line suction in millimeters mercury (mmHG), (absolute)	Temp 92.3 - Circuit board temperature, °F
H2S PPM 0.00 - H2S sensor reading in parts per million. This number will always be higher than a detector waved over the mud pit because the extractor (agitator) lowers the surface tension inside the body of the device, extracting more gas than turbulent flow alone.	LPH 61 - Sample flow in litres per hour (LPH). Part of feedback loop calibrated at 60 LPH. When LPH drops below the set flow, the motor speed increases; when it is above the set flow the motor speed decreases. The Bloodhound can function fine with a set motor speed (i.e. bypassing a bad flow meter).	Atten 100 - Attenuation setting. 100% (default) means 100 units in = 100 units detected. 50% is 100 units in = 50 units detected. Anything other than 100% alters the highest saturated gas number. Example: 30% will read 3,000 units MAXIMUM.
ROP Ft/Hr 3.752 - Rate of Penetration in Feet per Hour.	Packet Num 3570451 - Packet Number (most recent).	Volts DC 12.9 - Volts DC meter for internal voltage.
Pri Volts 2.586 – Primary gas sensor voltage	Sec Volts 0.380 – Secondary gas sensor voltage	H2S Volts 0.389 – H_2S sensor voltage
CG Volts 0.6601650 – Chromatograph sensor voltage	CG ID 528 – Most recent chromatograph run sequential ID number	RSSI 0 – Received Signal Strength Indication from the modem.

NOTE: RSSI only indicates signal strength in "cell bandwidth", not specifically by provider. This means the RSSI showing of 70% may be for a carrier other than the one for the Bloodhound.

AC Volts 113.1 – Incoming AC voltage	AC Freq 60 – Incoming AC frequency, Hz	Amps 0.0 – Amperage going out the 12-volt connector (Cavitator). Register 37 set to alarm at 5 amps, shut off at 6 amps.
Motor % 28 - Percent duty of the sample pump motor	HRM Tmp 93.2 – Temperature at the gas detector, °F	CG Pressure 1127 – Chromatograph pressure in mmHg (absolute), will alarm at 700 mm Hg
Error Number 0 - Any alarm from the Bloodhound will have an associated Error Number that will be displayed here. A table of alarm codes is available in the Bloodhound user manual or can be deciphered by contacting iBall Technical Support.	Bottoms Up 107.3 - Estimate Time (in minutes) for bottoms-up to occur. This is the amount of time it takes the mud at the bit to reach the surface.	Exhaust Prs -3 – In the Bloodhound Standard, this is the back-pressure in the exhaust line from the Bloodhound, mmHG (absolute). In the Bloodhound Enhanced, this is a reference point to barometric pressure (an arbitrary scale – not mmHg).
Column Temp 128.6 - Chromatograph column temperature from the CG Temp sensor is displayed here.	HOBBS 3615 – Number of hours the Bloodhound has been running. This meter can be reset by Tech Support to complete current well but only a few hundred hours can be granted while in the field. 1st alarm is at 4000 hrs and shuts off pumps at 5000 hrs. Gives no error number or description.	

NOTE: Whenever more than one alarm condition is currently being met, the Error Description on this page will show "UNKNOWN". In those cases, the multiple Error Numbers will be displayed in the "Error Number" field on this page, separated by commas.

Directly under these parameters there is a text box that will display an error description (if available) that will correspond to the Error Number parameter above (as pictured below).

Error Description
No Errors

Directly under the Error Description text box are the levels of the gas components, methane (C1) through normal Pentane (n-C5), detected during the most recent chromatograph cycle.

Methane	Ethane	Propane	I Butane	N Butane	I Pentane	N Pentane
256.59	56.76	17.24	0.00	0.00	0.00	0.00

The bottom left of the RTD window is a communications window that displays in real time the data packets being received from the Bloodhound or the Data Center (as pictured below). The sequence of data items contained in these comma-separated text data packets is described in further detail Bloodhound User Manual.

```
,0.00,-3,128.6,17891.0,3615,0.00,0.00,C200,
^,5095_1511,2015/11/10,17:30:21,3570433,010811257.7,011017891.0,01230
.0,01240.0,011541.5,01170.0,01190.0,01200.0,0112162.7,01210.0,01160.0,0
1180.0,01250.0,011441.2,0129232.0,01283.0,0126763.0,01273.9,01372820.0
,
[UPTIME 100.0%]
[OUTPUT ONLY]
*5095_1511,2015/11/10,17:30:27,17891.0,367.86,5.17,0.00,100,93.6,15.991,
3.752,61,-92,12.9,2.831,0.420,528,0.6600550,0.391,0.00,0
,28,0,108.4,60,0.0,93.2,1127,3570434,285.16,63.09,19.16,0.00,0.00,-
3,129.4,17891.0,3615,0.00,0.00,C200,
^,5095_1511,2015/11/10,17:30:27,3570434,010811257.7,011017891.0,01230
.0,01240.0,011541.6,01170.0,01190.0,01200.0,0112162.7,01210.0,01160.0,0
1180.0,01250.0,011441.8,0129231.0,01283.0,0126764.0,01274.3,01372820.0
,
*5095_1511,2015/11/10,17:30:33,17891.0,365.73,5.17,0.00,100,93.2,15.991,
3.752,61,-91,12.9,2.813,0.417,528,0.6600350,0.391,0.00,0
```

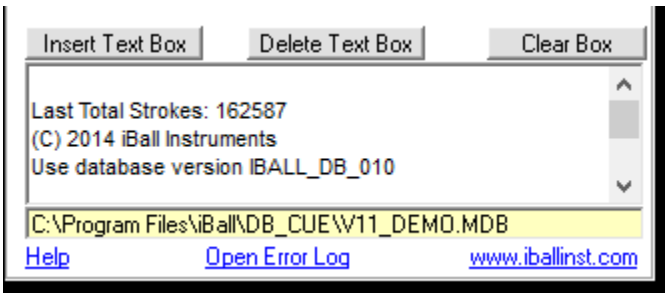
The far right of the RTD window will display, if any, the data coming into the Bloodhound from the WITS interface connection (as pictured below).

```
0108  Bit Depth  11314.5
0110  Hole Depth  17891
0112  Block Height  107.4
0114  Hook Load  167.8
0115  Hook Load  167.8
0116  Weight On Bit  0
0117  Weight On Bit  0
0118  Rotary Torque  0
0119  Rotary Torque  0
0120  Rotary RPM  0
0121  Standpipe Pressure  0
0123  Pump 1 Strokes Per Min  0
0124  Pump 2 Strokes Per Min  0
0125  Pump 3 Strokes Per Min  0
0126  Total Mud Volume  764
0127  PVT Total Mud Gain/Loss  4.7
0128  Flow  0
0129  Unknown  14
0137  Total Strokes Sum  2820
```


6.2 ANNOUNCEMENT WINDOW

NOTE: The "Rule of Thumb" regarding messages in the Announcement Window is that if the program appears to be behaving normally (updating, keeping up, etc.), and the data exported to the log is of good quality, then messages and error codes here are generally "handled conditions" within the program which are stated merely for informational purposes.

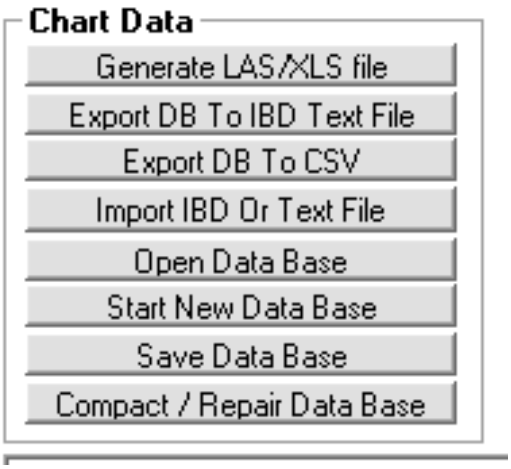
At the bottom of the Control Box, just above the program and database directory path is the Announcement Window (as picture below). Text and color will appear in this window to announce both Gas Chart-generated conditions and Bloodhound alarms. A list of Bloodhound conditions that can be reported is provided in Appendix A. Typical Bloodhound conditions that will be reported are "High Gas Units," "Low Sample Flow," and "Blocked Sample Line."



This window is used to Insert Text onto your Chart is desired. See section 3.6 Text Controls below for more detail.

6.3 CHART DATA BOX

The Chart Data Box (as pictured below) allows the user to Import, export and otherwise control data flow and storage locations.



NOTE: iBall suggests using an entirely different file name each and every time you export data so that if you need to go back and reference a prior export, it is still available.

Generate LAS/XLS file - The Log ASCII Standard (LAS) file generator permits the user to generate a file that is compatible with most mud logging software packages. When hitting this button, the user will be asked to supply a file name that will be saved to the C:\DB_CUE directory. At the same time an XLS file is generated and placed in the same folder (default is to generate both but can be configured to do one or the other). The difference between the two is that the LAS file will not duplicate feet depth and will place a –999.99 on missing feet. The XLS file will display duplicate feet and will not show missing feet. All data is time and date stamped.

Export DB To IBD Text File - The data that comes into the Gas Chart program is in packet form. Within Gas Chart, the packet is taken apart and stored in a Microsoft Database File or ".MDB". This button will take the data that has been stored in an MDB file and save it into a comma-delimited text file. Text-based data files are a convenient export file type because they can more easily transposed into various file formats.

Export DB To CSV - This button will take the data that is stored in the database (MDB file format) and save it into a comma separated value format. This format stores data in plain text. Each record of data consists of one or more fields of data that will be separated by commas. The use of the comma as a field separator is the source of the name for this file format.

Import IBD Or Text File - This button will take a text-based file and import it into the current database. The Bloodhound system stores all the data on the USB key and internal SD card in this text-based file format. This function is useful for filling in any holes that exist in the Gas Chart program database, but not in the text-based file contained on the USB key. Taking the USB key from the Bloodhound system and inserting it into the computer will enable the user to pull from the USB key any data that may be missing from the Gas Chart program database.

Open Data Base - All data that is viewed in the Gas Chart program comes from a Microsoft Database or MDB file. To select a file to open, the Open Data Base button is clicked and the directory and file name is selected from the default data directory (C:\Program Files\iBall\DB_CUE). The program then opens the file and displays the contents. However, if the Bloodhound is connected (green), new data will be written to the database. So, if you want to just look at a database and not put new data into it from the running equipment, you will have to turn off the green Bloodhound Connected button.

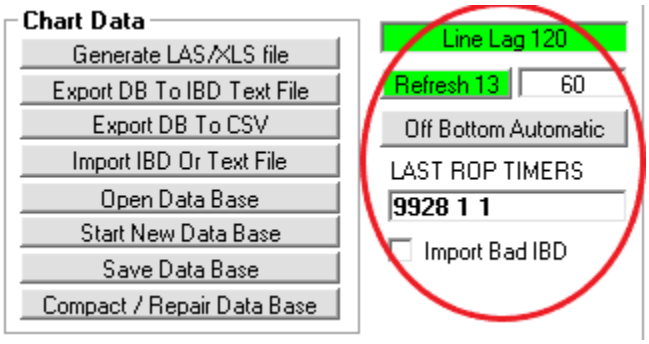
NOTE: Saving a database to a unique name does not affect the current database or its contents. It just copies the current database to another location for safe-keeping.

Start New Data Base - This button starts a fresh empty database. This is used when starting a new well. The user will be prompted for a file name to organize the data to be saved. When Start New Data Base is selected, a blank white chart will be displayed on the computer, because this is an empty database, and there is not yet anything to plot.

Save Data Base - Data is constantly being written to the named database when data is being collected. This button allows for the user to make a copy of the current open database to another location or another drive.

Compact / Repair Data Base - This is a database utility. This will check the database for errors or other problems and will then re-index the database if it needs it. It will also add any fields that are missing and remove any duplicate entries. This utility is automatically run every time the Gas Chart program starts.

Items to the right of the Chart Data Box (as pictured below) are useful parameters that can easily be viewed from the Control Box.



Line Lag is the time set on the Auto ROP/LAG tab, in the box below Surface/Line Lag.

Refresh is two parts: The Green box is the countdown timer for the chart refresh in seconds, based on the number in the white box next to it.

The Off Bottom Automatic button can toggle Forced **OFF** Bottom when using a Geolograph switch or Forced **ON** Bottom. Both Forced buttons will flash between yellow and orange to get your attention so that they are not left on as you drill.

The LAST ROP TIMERS list the last foot that the drill made in seconds (keeps three before over-writing with new footage).

Import Bad IBD is used to recover data from the Bloodhounds USB drive that has errors.

6.4 TEXT CONTROLS

The text input area and associated buttons permit the user to insert and remove text boxes within the database, and to make notes on the Gas Units Chart itself.

Clear Box - First press **Clear Box** and then enter desired text in the Text Input Window located below the three buttons.

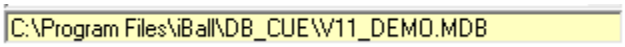
Insert Text Box - **Insert Text box** will "stick" the input text to the cursor. The user then places the cursor over the area where he or she wishes to insert the text, and then clicks the left mouse button to "stick" the text onto the Gas Units Chart.

To move text already on the Gas Units Chart, left click on the text, move it to the desired location, and left click again to drop it at the new location.

Delete Text Box - To delete a text entry from the chart, left click on the text, and then click on **Delete Text Box**.

6.5 FILE NAME WINDOW

Directly below the Text Input Window is a yellow-tinted window that displays the Program File and data path with the name of the current Gas Chart database (V11_DEMO.MDB as pictured below). Our recommendation is to create and save all databases and LAS/XLS files in this default data directory (C:\Program Files\iBall\DB_CUE) as mentioned in the Getting Started section for best operating results.



6.6 HYPER LINKS

At the bottom of the Gas Chart Control Box are three hyperlinks.

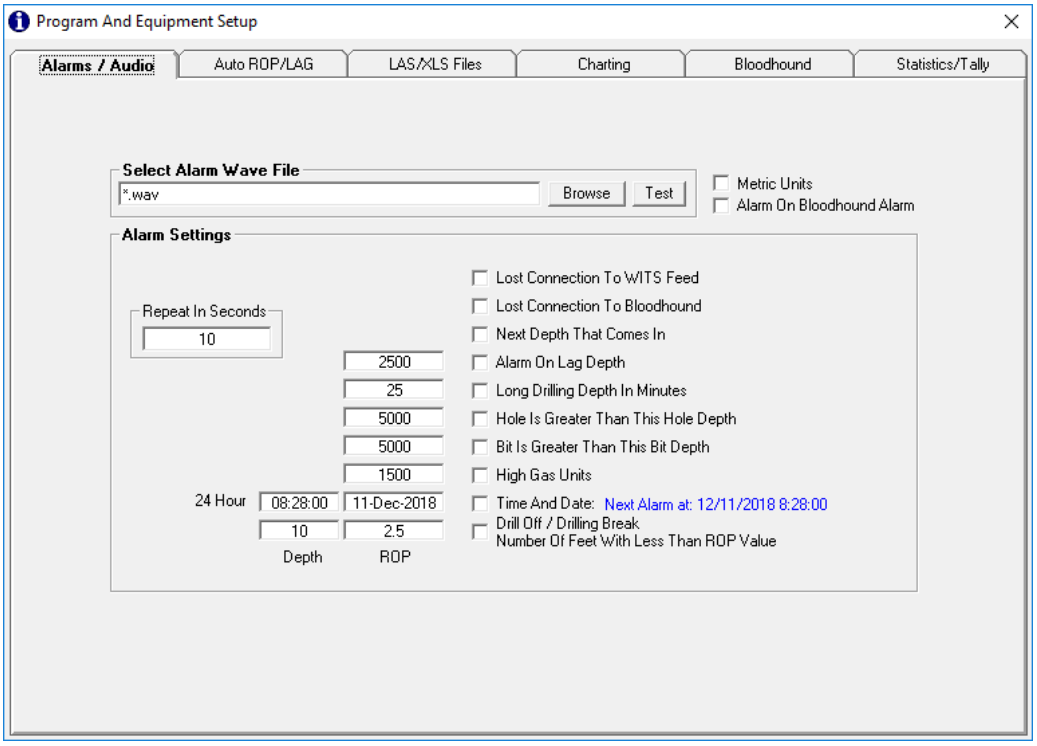
Clicking on the "**Help**" link will open this Manual. You do not need to be connected to the Internet to see this help.

The "**Open Error Log**" link opens a log of alarm messages that have been received from the Bloodhound, and error messages that have been generated by the Gas Chart software. Scroll to the bottom of the window to view the most recent alarms and error messages.

If an internet connection is active, the "**www.iballinst.com**" button allows the user to go to the iBall Instruments home page where information and downloads are available if Internet connectivity is available.

7 SETUP

On the Gas Chart Control Box, the Setup button opens the Program and Equipment Setup Screen (as pictured below). This screen allows the user to set program options. The screen is composed of six (6) tabs which we will cover from left to right respectively. The tabs of interest include: Auto ROP/LAG, LAS/XLS Files, Charting, and Bloodhound. The two end tabs are not critical but do include features such as auto alarms within the program, and rudimentary data tallying. Each Tab is described below in order from left to right as shown below in picture.



7.1 ALARMS/AUDIO

NOTE: For audio alarms to function, the computer must have a properly-configured sound card and speakers.

The first tab displayed (Alarms/Audio) allows the user to set several Gas Chart-generated alarms to notify the user of certain events. First, the user must select a sound file to play when the alarm is triggered.

You may select or add a sound that will be the "alarm" whenever one of the conditions defined on this page is met. The program comes with three (3) sounds that the user can select from, or the user can supply one. If you choose to use your own sound file, the sound file must be a WAV file, and located somewhere on the computer where it can be easily located. After selecting a WAV file, hitting the Test button will play the file through the PC sound card (to the computer speakers or head phones) for testing and volume adjustment.

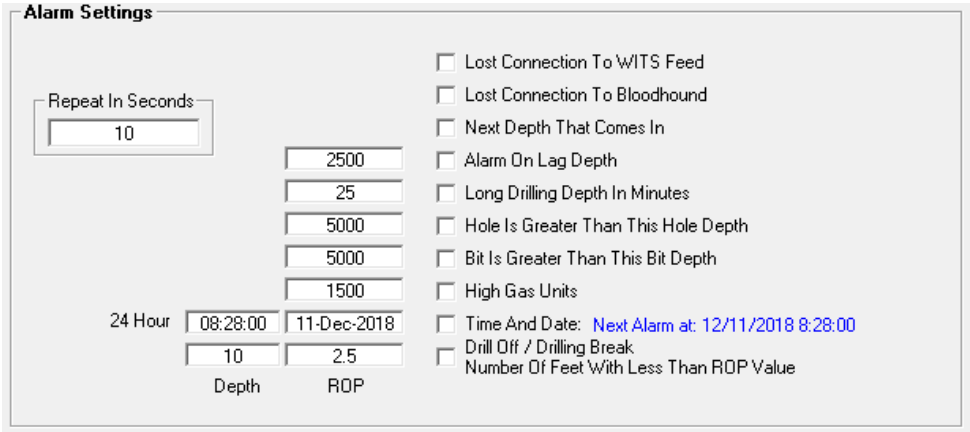
The next selection is to check the Metric Units option if the user desires to set the Gas Chart alarms using metric units.

NOTE: When running remotely, the "Alarm on Lag Depth" function uses the lag depth calculated within the Gas Chart software and not the lag depth calculated by the Gas Chart running at the Bloodhound's location. Likewise, the "Time and Date" alarm will trigger when that time and date are reached on the computer running the Gas Chart software rather than that of the computer running next to the Bloodhound.

The third setting is the Alarm On Bloodhound Alarm option. When this box is checked, ANY alarms that sound on the Bloodhound instrument will cause the Gas Chart alarm to sound. Text and color will appear in the Announcement Window located on the Gas Chart Control Box below the Scale Setting Area to announce both Gas Chart-generated alarms and Bloodhound conditions. A list of Bloodhound conditions that can be reported is provided in Appendix A. Typical Bloodhound conditions that will be reported are "High Gas Units," "Low Sample Flow," and "Blocked Sample Line."

When the Gas Chart alarm is in triggered, the Repeat In Seconds 10 box will cause the sound to repeat every so many seconds. The default is 10 seconds.

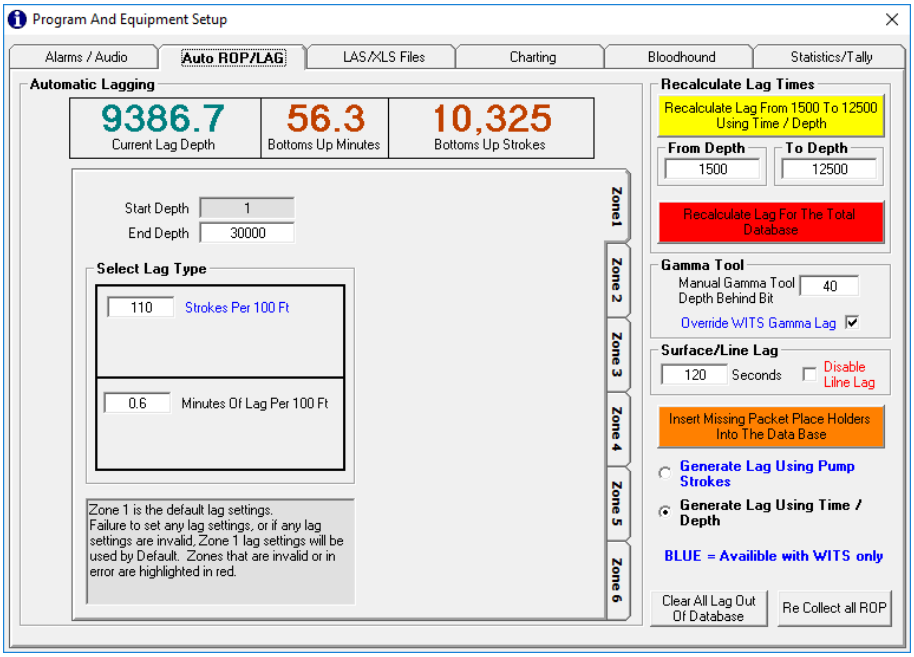
To set a specific Gas Chart-generated alarm, check the appropriate alarm selection box (or boxes) and fill in the desired values in the windows. This is a two-step process. First, you must activate the specific alarm by checking the appropriate box on the right and then you must fill in the parameters (if applicable) for the specific alarm to the left of the check box…



7.2 AUTO ROP/LAG

NOTE: You can calculate LAG using either WITS Pump Strokes or using Time over Depth, which is generally used when WITS is unavailable or not providing the correct parameters to lag, such as when using a Geolograph.

This Tab is for setting up the Auto ROP and Gas Units Lag, Gamma Tool and Surface/Line Lag. For the Gas Units Lag, the user can select between generating the lag using pump strokes (if WITS is active) or from time and depth, otherwise Time/Depth is the only option.



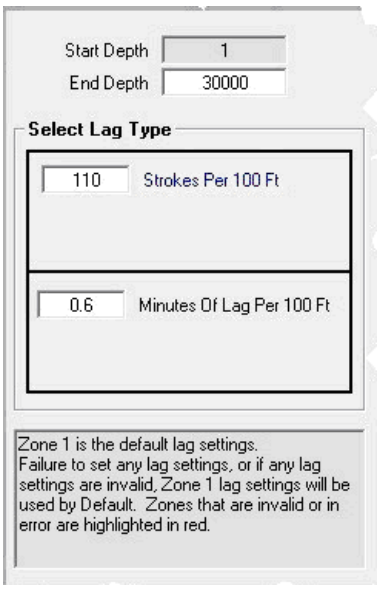
NOTE: The "Generate Lag Using Pump Strokes" method requires that the Bloodhound is connected to a WITS interface and that the provider is sending SPM by pump on the ANSII Standard WITS channels for SPM (0123, 0124, 0125).

First, select the type of lag you are using by selecting either, Generate Lag using Pump Strokes or Generate Lag Using Time / Depth in the bottom-right corner of this page (See NOTE).

7.2.1 GENERATE LAG USING PUMP STROKES METHOD:

NOTE: If WITS Pump Channels are not present, or the channel is sending a negative number, this will be interpreted by Gas Chart as "zero SPM".

To use the pump strokes method, the user clicks the round radio option next to Generate Lag Using Pump Strokes and enters the strokes per 100 feet of hole in the corresponding box in the center of the screen (see figure below). (To calculate the strokes per 100 feet of hole, divide the bottom-up strokes by the hole depth, then multiply by 100. For instance, if the hole is 5,000 feet deep with 2,800 bottom-up strokes, (2,800 ÷ 5,000) x 100 = 56 strokes per 100 feet.)



The setting will be saved upon closing the Setup window. Information can often be obtained from the Mud Engineer or Mud Report. For example, for a 7 7/8-inch diameter hole containing 4 ½-inch drill pipe, the annular volume of 1,000 feet of hole is about 41 barrels (bbls). For a pump with a capacity of 0.0725 bbls per stroke, it would take about 56 strokes to circulate 100 feet of hole. For a hole 5,000 feet deep, it would take about 2,800 strokes (5 x 560) to achieve bottoms-up.

7.2.2 GENERATE LAG USING TIME/DEPTH METHOD:

To use the time/depth method, the user clicks the round button next to "Generate Lag Using Time /Depth," and enters the known minutes of lag time at a known depth. For example, for a 7 7/8-inch diameter hole containing 4 ½-inch drill pipe, the approximate annular volume at a depth of 5,000 feet is about 203

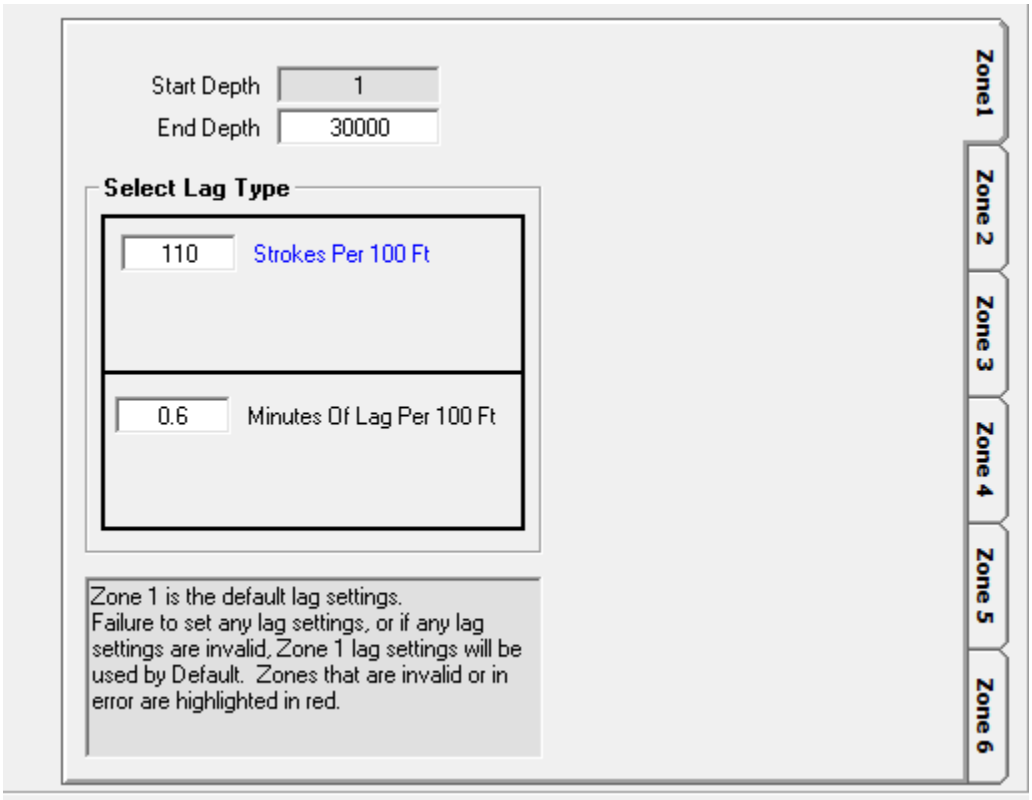
bbls. For a pump with a capacity of 0.0725 bbls per stroke running at 60 strokes per minute, it would take about 47 minutes to circulate bottoms-up. Minutes of lag can also be determined by a bottoms-up test using carbide or other material, or by converting the number of strokes needed to minutes (2,800 strokes ÷ 60 strokes per minute = 47 minutes). The Bottoms Up Minutes window will give the current lag minutes for the current depth.

With either method, the user will have to periodically adjust the settings to best match drilling breaks to gas increases. This is due to the many real-world factors that affect lag, including changes in hole washout and pump efficiencies, among others.

7.2.3 ZONES

To the right of the center panel where strokes and/or time per 100-feet of lag are entered, you will notice a vertical set of tabs containing zones. Zones indicate potential changes in diameter of the hole over depth. Below are some notes on this feature.

CAUTION: Calculate all of your lag into Zone 1 and avoid using other zones. Zone 1 is the only functional zone currently. Zones beyond the first one is a beta test feature.

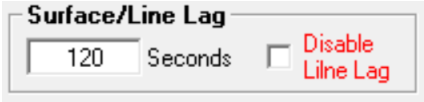


7.2.4 GAMMA TOOL

Need info…

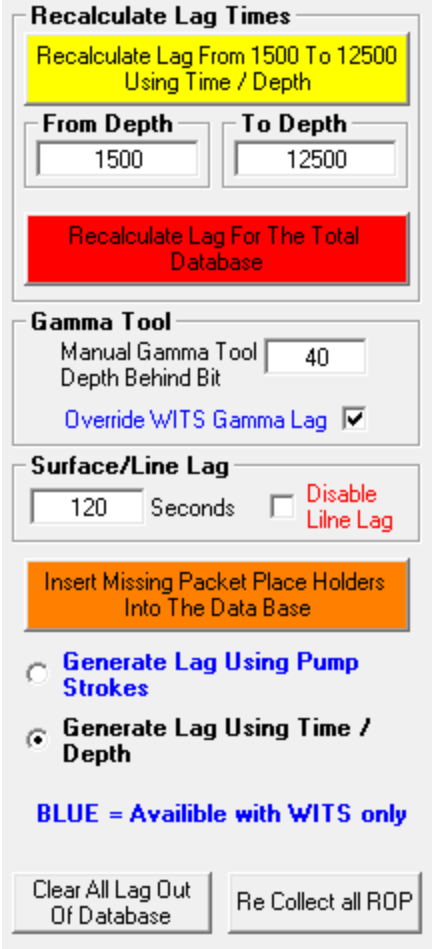
7.2.5 SURFACE/LINE LAG

Need info…



7.2.6 RECALCULATE LAG TIMES

If the user wants to recalculate the lag time for any depth or range of depths, the right-hand side of the tab will allow the user to adjust the lag times for the whole database or just a section of it based on feet. If the user wishes to recalculate the lag for the whole database, select the type of lag calculations, adjust the lag variables, and then hit the red button. The program will recalculate the lag based on the settings that the user provides. If the user wishes to recalculate the lag for a range of feet, then the user should enter the starting and ending feet that will be recalculated, and then hit the yellow button to just recalculate the lag within the range selected. If footage is missing from the database because of driller recalculation or other problems, the orange button "**Insert Missing Packet Place Holders Into The Data Base**" should be pressed to try correcting the errors.

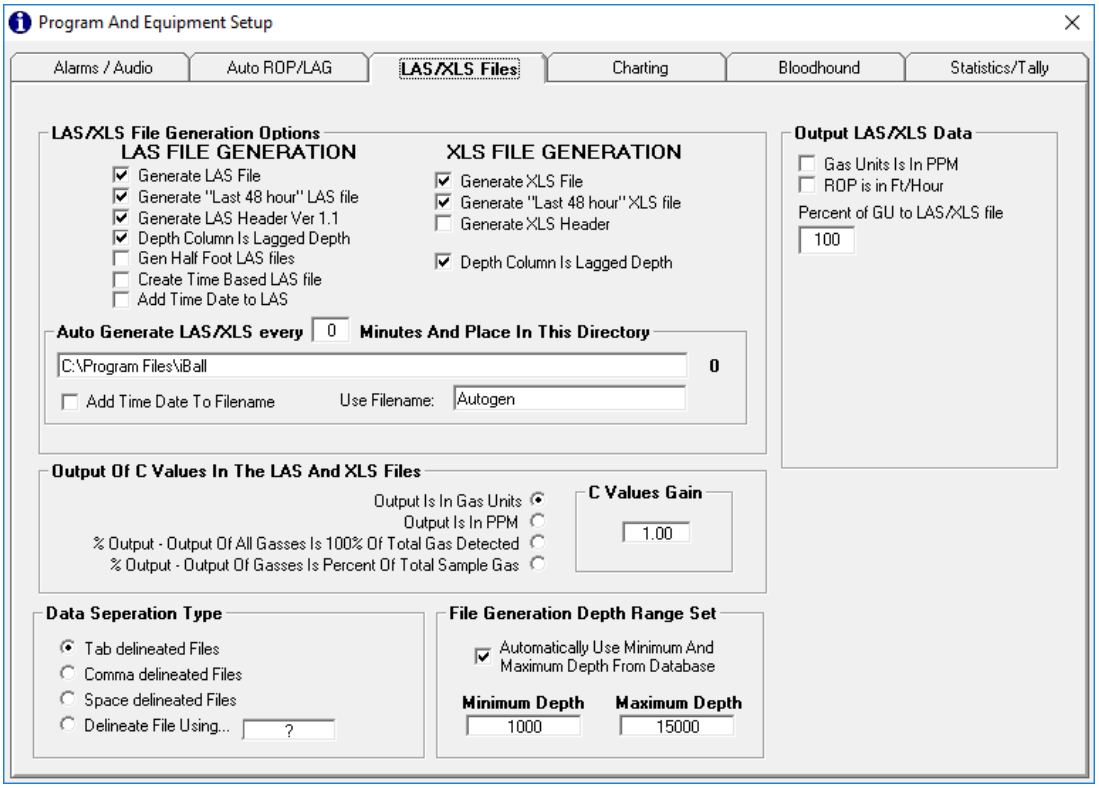


Clear All Lag Out Of Database

Re Collect all ROP

7.3 LAS/XLS FILES

This Tab is for the LAS/XLS file generation. The user can choose to generate an LAS file, an XLS file, or both. The program default is to generate both.



NOTE: Changes to the output of your files will only impact the files themselves and have no bearing on the visual presentation of the data whether in Gas Chart, or on the iBallRemote.com web page.

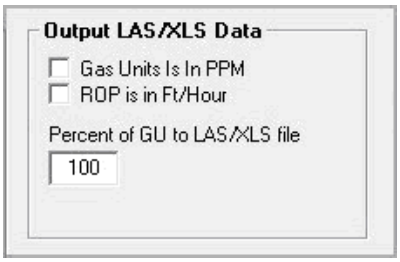
LAS File Generation options include a few more export options in comparison to the XLS File Generations options. The additional LAS export options are based on customer requests and various log application requirements. By application default the options checked on are to generate a file containing all the data (Generate LAS File), the last 48 hours of data (Generate "Last 48 Hour" LAS), the type of LAS file header to include (Generate LAS Header Ver 1.1), and whether the depth column is lagged depth (Depth Column Is Lagged Depth). The user can toggle these options on or off as desired.

The additional LAS File Generation options can be checked on and implemented into your export files as needed. You can export data into a LAS file using Half Foot Increments, Create a time based LAS file, and add a Data/Time column in the export file.

XLS File Generation options include generating a file containing all the data (Generate XLS File), the last 48 hours of data (Generate "Last 48 Hour" XLS), to generate a header (Generate XLS Header), and whether the depth column is lagged depth (Depth Column Is Lagged Depth). All XLS export options are selected by application default EXCEPT Generate XLS Header information.

7.3.1 OUTPUT OPTIONS

In the upper-right of this screen are settings for output of "Total Gas", "ROP", and "Percent of GU to LAS/XLS file" numbers in their file. (See picture below).



Gas Units Is In PPM Checking this box will generate the Total Gas column in your LAS/XLS file in Parts Per Million (PPM) rather than the default which is Gas Units, or the actual number displayed on the Bloodhound's LCD as Total Gas. PPM is one-thousand times the value of Gas Units.

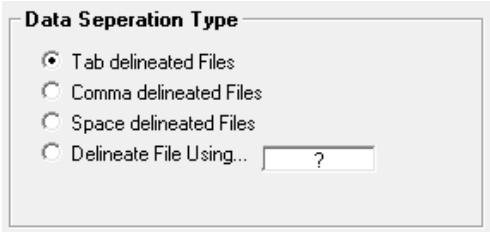
ROP is in Ft/Hour Checking this box will change the ROP column on your LAS/XLS file to Feet per Hour rather than the default which is Minutes Per Foot.

CAUTION: When dealing with percent output modifiers, it is best to leave the default of 100. Other numbers will produce unpredictable results in your log.

Percent of GU to LAS/XLS file
100 This option is a number between 0 and 200 and acts as a multiplier from zero to a factor of 200 for the value that is ultimately written to the LAS/XLS file. For example, if you are displaying 500 gas units for a specific foot within Gas Chart, and this field contains a value of 50, the actual value in the LAS file will be 250 gas units, or fifty percent of the value recorded for that foot.

7.3.2 DATA SEPARATION TYPES

Defaulted to Tab (which is the standard for LAS files), this denotes what kind of ASCII character will be used in the LAS/XLS output to separate the values into columns (see picture below). In specific cases, a <TAB> may be insufficient and the option to select alternative values may be required, however the default is best in most cases.

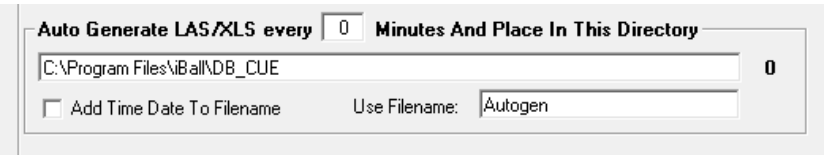


7.3.3 AUTO GENERATION

One nice feature of Gas Chart is the ability to automatically generate LAS/XLS files at specific intervals (see picture below). To enable this, one would enter a value other than zero (0) in the field reads "Auto Generate LAS/XLS EVERY 0 Minutes And Place In This Directory", enter the number of minutes *between* each export. Generally, ten (10) to thirty (30) is a good number and cannot be lower then 10. You have the option to Add Time/Date to Filename and you can Change the default filename from Autogen to something else if you require.

TIP: When using a strip-logging package with Lithology, auto-generation is particularly useful if the package can automatically import files at specified intervals. Stagger your export and import by even intervals for the best results.

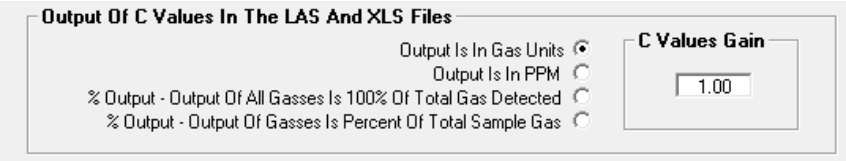
The directory path is important for the file to generate properly. Be sure to add the default data directory to the path (DB_CUE).



NOTE: Auto-generation is not required for MainLog unless you wish to import H2S into that program.

7.3.4 C-VALUE OUTPUT TYPE AND GAIN

The next section is used to modify the C-Value output in your LAS/XLS files (see picture below). On the left are four choices for output which include Gas Units (the default), Parts-Per-Million (PPM), Percent Totalling 100% of Gas Detected, and Percent Totalling Percent of Sample Gas.



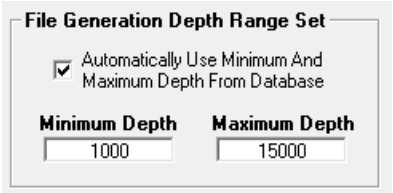
NOTE: On rare occasions, WITS systems use odd factors to import gas, so the Total Gas Percent (see "OUTPUT OPTIONS" above) might be something out of the ordinary like 50 percent. In this case, one might need to set the C-Value Gain to 2.00 in order to double the C-Values on output so that they still add up to 100%.

On the right is the C Values Gain (default 1.00). The C Value Gain is a factor applied to the C Value upon export to XLS/LAS only and does not impact data output to WITS, iBallRemote.com, or the Gas Chart software's chart or real-time data. This is used when one wants a different percent of C Value Totalled Percent versus that of Total Gas.

7.3.5 DEPTH RANGE

We also can specify a range to export (see picture below). By default, the box labelled "**Automatically Use Minimum And Maximum Depth From Database**" is checked, which means that the entire data set from the shallowest footage in the current file/database to the deepest footage in the current file/database will be packed up in an LAS/XLS file when generating. This is usually the best option, but there may be some cases in which this might need to be changed.

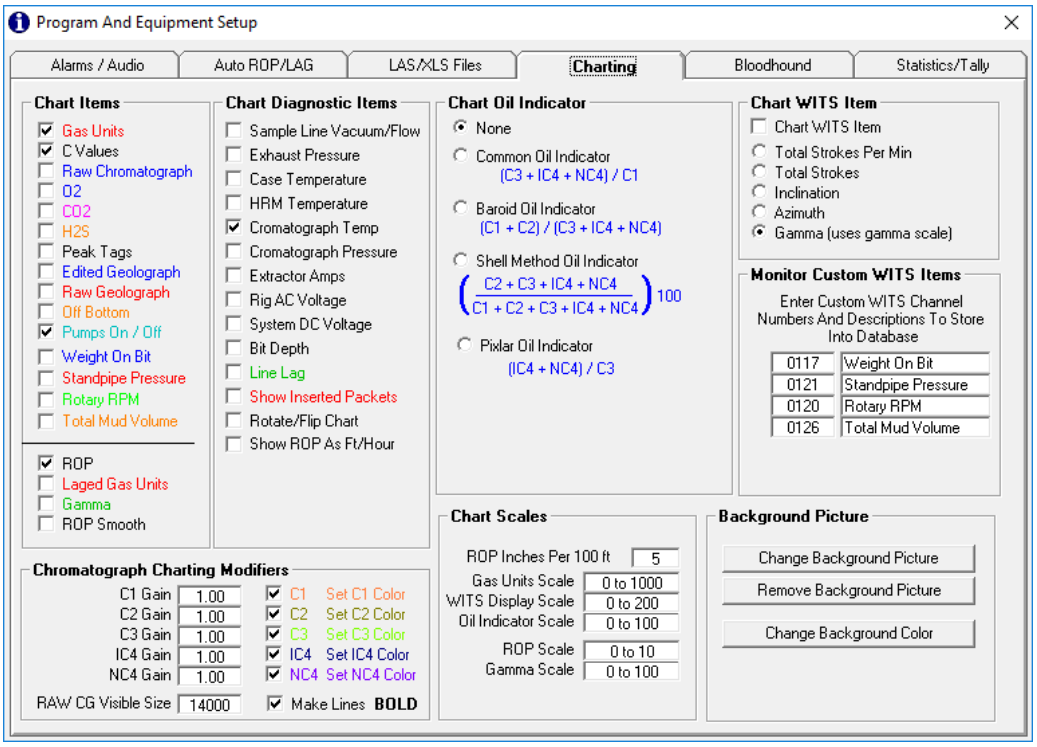
TIP: When using a specific depth range, it's good practice to write down prior settings and then to remember to set back to the prior settings after your export. Not doing so could have a confusing result wherein either your log stops generating new footage or stops at a certain footage in the future.



7.4 CHARTING

The Charting tab (see picture below) is one of the most versatile and useful mechanisms within Gas Chart. Mastering this tab will allow for quick analysis of the bases in a well, drilling activity, problems with mud, presence of petroleum, and problems with rig-up, equipment, and configuration of the Bloodhound.

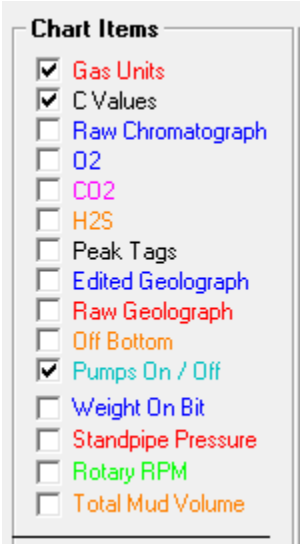
NOTE: Changes made on this page are not reflected until the next time the actual chart is re-drawn by the program. This can happen in one of two ways: 1) It happens automatically roughly every two minutes, and 2) the user can force it to redraw after exiting this setup screen by pressing on the Re-Draw Chart button from the Gas Chart Control Box.



7.4.1 CHART ITEMS – TIME-BASED (RIGHT-SIDE)

NOTE: When looking at the actual chart on the main page of Gas Chart, there are two separate charts represented. There is a thick, black vertical line in the middle of the page that separates the two charts. On the left side is the depth-based chart, which generally displays gas and ROP over the depth in regular increments.

The upper left section of the Charting Tab contains selections for what gases and other critical logging values to draw on the chart on the right side, or time-based section of Gas Chart (see picture below). These range from Gas Units to Total Mud Volume.



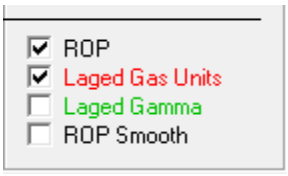
The table below identifies and describes each of these optional items to chart, respectively:

ITEM	DESCRIPTION
☑ Gas Units	Total Gas over time in the form of a red line, as displayed on the Bloodhound's LCD. This value will show situations such as trip gas, connection gas, and circulation gas, where that might not be so apparent over depth.
☐ C Values	Like the Gas Units above, this will create a series of individually-colored component-gas curves over time that follow each of the C1 through C5 gases accordingly.
☐ Raw Chromatograph	This will take the Chromatograph Curve over time and will like all the corresponding peaks on their side, over and over again as they pertain to each individual run through the Bloodhound's on-board Chromatograph.
☑ O2	Charts Oxygen over time on the right-hand chart as a blue line.
☑ CO2	Carbon Dioxide over time on the right-hand side of the chart.

☐ H2S	Hydrogen Sulfide over time, as an orange line, on the right-hand chart.
☐ Peak Tags	Any detected peak total gas will be labelled with a number denoting the Gas Units detected at the time.
☐ Edited Geolograph	Edits over time of the Geolograph.
☐ Raw Geolograph	Un-edited Geolograph Input
☐ Off Bottom	Shows an orange band on the left side of the right chart over time that the bit was detected as off bottom (a.k.a., Bit Depth" < "Hole Depth).
☐ Pumps On / Off	Shows a cyan band on the left side of the right chart over time that denotes times when pumps were off (a.k.a. The sum of data coming from WITS channels 0123, 0124, and 0125 <= zero).
☐ Weight On Bit	Direct translation from the Weight on Bit value coming from WITS.
☐ Standpipe Pressure	Direct translation from the Standpipe Pressure value coming from WITS.
☐ Rotary RPM	Direct translation from the Rotary RPM value coming from WITS.
☐ Total Mud Volume	Direct translation from the Total Mud Volume value coming from WITS.

7.4.2 CHART ITEMS – DEPTH-BASED

In the bottom part of the box containing the time-based Chart Items (see CHART ITEMS (TIME-BASED)" above), there is a divider line below which are four values that are optionally charted on the left-hand side of the main chart, or the "depth-based chart" (see figure below). These range from "ROP" to "ROP Smooth".



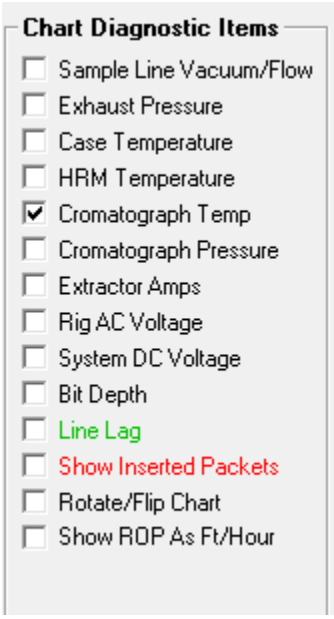
The table below identifies and describes each of these optional items to chart, respectively:

ITEM	DESCRIPTION
☑ ROP	Displayed as a black line, this is generally a stepped value over time denoting the ROP for a given foot or depth section of data.
☑ Laged Gas Units	This shows the gas-units as lagged and matched up to actual footage.

	NOTE: Since mud that is down-hole still contains lagged gas, by design, Gas Chart displays the most recent part of this curve as zero at the origin (left side) of the chart until the hole and surface line lag have elapsed.
☐ Laged Gamma	This is a direct translation of the "Lagged Gamma channel as sent to the Bloodhound via a WITS system.
☐ ROP Smooth	In cases where information packets may be dropped between the Bloodhound and Gas Chart this option will average the curve, forcing it to show more realistic character by making interpolations of missing data based on bracketing data.

7.4.3 CHART DIAGNOSTIC ITEMS

This set of optional charting items may be the single most powerful section of Gas Chart that one can master. Knowing this section and gaining an overall understanding of the interrelationships among the data herein is the equivalent of the ability to manually fly a plane on instrumentation only. It is the difference between novice and Guru. Essentially, charting these items will generate curves over time that can identify flaws in mud, drilling operations, rig-up, and the Bloodhound instrument itself.



The table below illustrates each of these items and what they chart as well as several contextual notes that can shorten the learning curve and help these items become more valuable in a well-logging operation:

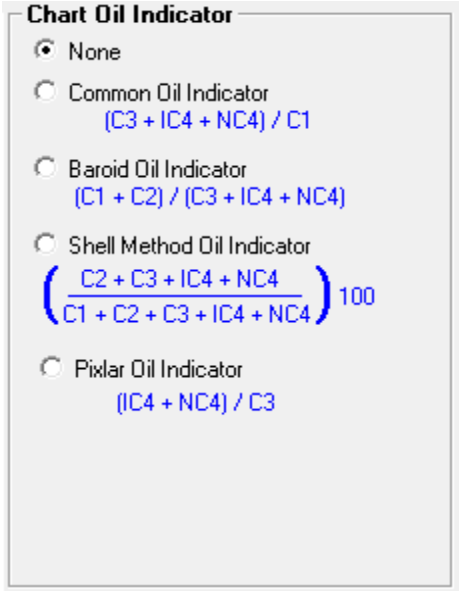
ITEM	DESCRIPTION
☐ Sample Line Vacuum/Flow	Shown over time, checking this item will display two different pieces of data at once: 1) The vacuum being drawn in the system between (presumably) the trap and the Bloodhound as a blue line, and 2) the flow-rate in litres-per-hour (LPH) as a green line. Whenever one suspects leaks, cuts, or partial blockages in a rig-up this is a very valuable item to chart. The relationship between these two is important when diagnosing apparatus-related issues. For example, knowing that if your vacuum line says it's blocked, but the flow rate is not showing zero could mean there is a required re-calibration of either the vacuum sensor or flow meter (both easy tasks). NOTE: Of the many, a few specific situations this can identify: 1) Cut in sample line, 2) partial leak in sample line, 3) partially-blocked sample line, 3) fully-blocked sample line, 4) mud-level changes.
☐ Exhaust Pressure	In Standard Bloodhounds this is indeed the outgoing exhaust pressure and can be used to diagnose (as an example) ice blocking the exhaust line. In Enhanced Bloodhounds (Bloodhounds whose serial number starts with a five), this is a barometric pressure reference point. In this case, it can be used (when zooming out on the chart with this item drawn) whether a weather system may have changed your peak-timing within the chromatograph.
☐ Case Temperature	This measures the temperature within the Bloodhound's actual large-black plastic case. It can be used to diagnose changes in temperature that may be translating to your total gas curve, or that may warrant changes to chromatograph peak timing.
☐ HRM Temperature	The HRM (Hotwire Replacement Module) is the red block inside the Bloodhound that contains the actual sensor array. This device's temperature should be managed to as flat a curve as possible to preserve reference points and keep the readings level. Charting this value along with the Case Temperature (above) can show rises and falls in the ambient (outdoor temperature) and how they impact the Bloodhound's readings. They can show poor

	HVAC control of the environmental temperature where the Bloodhound is stationed and can help in diagnosing problems with the identification of C-Values over time.
☐ Cromatograph Temp	This charts the temperature of the Chromatograph column itself. This should be flat. If there is a fluctuating curve you will need to call Tech Support for assistance.
☐ Cromatograph Pressure	This charts the pressure generated in the chromate via the chromatograph pump. If one receives a “Low Chromatograph Pressure” alarm, the first thing to do is to check this value, and over time. A *true* pump failure drops out completely, at shorter intervals with longer incidents over time. If this suddenly drops, it would be best to check internal connections to make sure no hoses came loose (very rare). If it’s just hovering, or falling and rising, checking the chromatograph runs (100 G.U. minimum to get a good result) combined with this value may yield that either a barometric pressure event, or a high-altitude could be the culprit, in which case a simple adjustment of the alarm threshold may be in order.
☐ Extractor Amps	This measures the amperage which is being drawn from the Bloodhound’s power supply via the 12-volt DC output on the side of the Bloodhound. When troubleshooting either an extractor or the power lines between the Bloodhound and the extractor, there are a few things this might denote. Amperage of zero might indicate a cut through the line as no amps would be drawn when the circuit is not complete. A high amperage might indicate a dead short in the power lines, a weak connection in the line (in which case it has to push harder), or a problem with the extractor motor itself (in which case one would cut about a 3’ line and bring the extractor motor to the trailer to test directly on the Bloodhound). NOTE: This only applies if you are using the external power port on the Bloodhound to power an extractor, or other device.
☐ Rig AC Voltage	This charts the voltage being supplied to the Bloodhound by the AC outlet into which it is

	plugged. This is useful in identifying problems with on-site generators, and/or wiring. In many cases, it helps when explaining that power outages were the cause of peripheral logging problems on-site since the Bloodhound will remain running during outages via its internal power source.
☐ System DC Voltage	This tracks the DC voltage provided to the circuits within the Bloodhound by its own power supply. This is useful in both demonstrating that the isolated power to the Bloodhound remains steady even when A/C power is poor (see above), and when diagnosing any internal electrical problems on the Bloodhound, although extremely rare.
☐ Bit Depth	This tracks the bit-depth over time, as provided by WITS.
☐ Line Lag	This will track the line lag over time.
☐ Show Inserted Packets	This shows any packets inserted over time.
☐ Rotate/Flip Chart	This is provided to allow for either a paper chart style of logging (more common several years ago) where the newest data comes in at the "top" of the chart. Checking this item (the default) is a more contemporary approach since it follows the bit down into the hole by showing the newest data at the bottom while pushing the overall chart upward on the screen.
☐ Show ROP As Ft/Hour	This changes the chart method of ROP on the left chart, from the default of minutes-per-foot to feet-per-hour.

7.4.4 CHART OIL INDICATOR

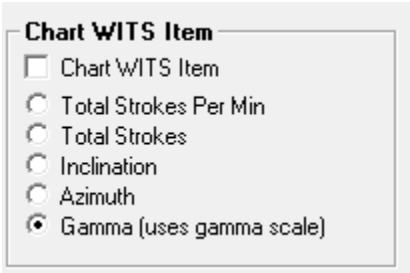
There are four known oil indicators, any of which are selectable (along with none) to allow Gas Chart to draw a line on the chart indicating the potential presence of petroleum. These formulas are spelled out neatly within Gas Chart and identified by brand so that selecting them is a breeze (see figure below).



7.4.5 CHART WITS ITEM

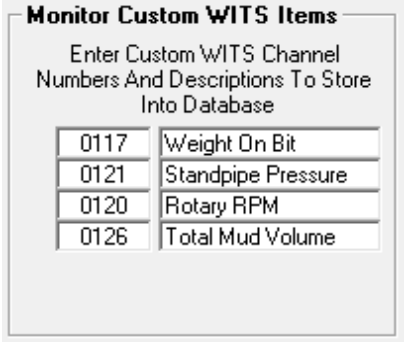
This section specifies any of one specific WITS items that can be arbitrarily charted in the time-based portion of the chart (see picture below). To enact this feature, select which WITS item you want to chart (Total Strokes Per Min, Total Strokes, Inclination, Azimuth, Gamma), and check the Chart WITS Item box at the top, then wait for the chart to re-draw.

NOTE: The WITS channel must be sent to the Bloodhound for this feature to function.



7.4.6 MONITOR CUSTOM WITS ITEMS

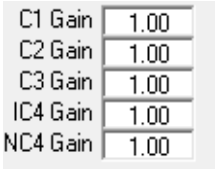
In this section, you can specify up to four items to chart directly from the WITS system which are not general present (see picture below). This is done by first entering the four-digit WITS channel that will be charted on the left, and adding a Label on the right, and can be any valid WITS channel.



7.4.7 CHROMATOGRAPH CHARTING MODIFIERS

This section allows one to change several of the factors upon which the chromatograph bars are based (see picture below).

- To display (or not display) each C-Value, one either check or un-checks the boxes to the left of the colored C-Value accordingly. For example, if one didn't want to display heavies, they would de-select IC4 and NC4 respectively, but would leave C1, C2 and C3 selected (as related to the picture below).



- Chromatograph values are by default setup to add up to one-hundred percent of the Total Gas number. The Gain value can be used to change this by the factor represented in the box to the right of the corresponding C-Value. For example, if Total Gas were 800 units, and C1 was showing 700 units, but you had a value of 0.50 in the box to the right of C1 Gain, the actual displayed value on the chart would be 350 units.

- Current C-Value Colors are denoted by the color of the 

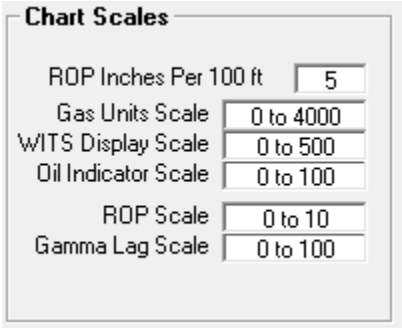
text toward the right of this box. By clicking on Set CX Color (where (x) is the corresponding number of the C-Value), a dialog is presented wherein the color of the clicked C-Value can be changed.

RAW CG Visible Size 83000 - This denotes the size (in millivolts) to which the value of Raw Chromatograph will be plotted when it's selected in the Chart Items section.

☑ Make Lines **BOLD** - This will draw the Raw Chromatograph lines in Bold colors.

7.4.8 CHART SCALES

The Chart Scales section allows for the adjustment of the scales used to draw some of the more important lines (see picture below).



ROP Inches Per 100 ft 5 :- Changes the vertical scale of the ROP graph (bottom right of the Main Screen), and may be used to control the scale of printed output.

Gas Units Scale 0 to 4000 - The iBall Instruments gas detection hardware and software cannot be pegged out - the gas detector can read 0% to 100% natural gas, and the software can display it in very innovative ways. To change the gas unit scale, the user just enters the scale desired to be viewed, e.g. 0 to 500, 0 to 10000.

WITS Display Scale 0 to 500 - This scale is for any WITS item that is to be viewed. Selecting the WITS item to display will be described in the section Chart Control Box / Setup Box / WITS tab. The items that can be displayed include total strokes per minute, total strokes, inclination, azimuth, and gamma.

NOTE: An Oil Indicator must be selected for the Oil Indicator Scale option to have any impact.

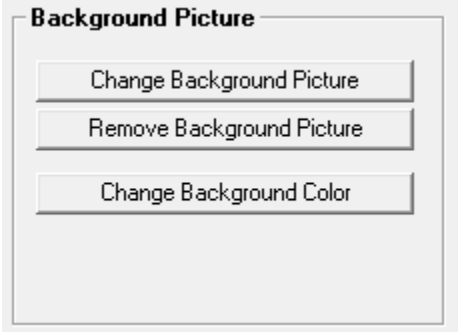
Oil Indicator Scale 0 to 100 - Allows for the change in scale of the Oil Indicator. This is adjustable to accommodate the various formulas that can be applied.

ROP Scale 0 to 10 - This scale permits the user to set the scale for viewing the rate of penetration. The ROP is in minutes per foot. To change the ROP scale, the user just enters the scale desired in minutes such as 0 to 10, 0 to 20.

Gamma Lag Scale | 0 to 100 - If the Bloodhound is connected to the WITS system, and the WITS system is sending lagged gamma information, this allows the user to view the collected lagged gamma data at a given scale.

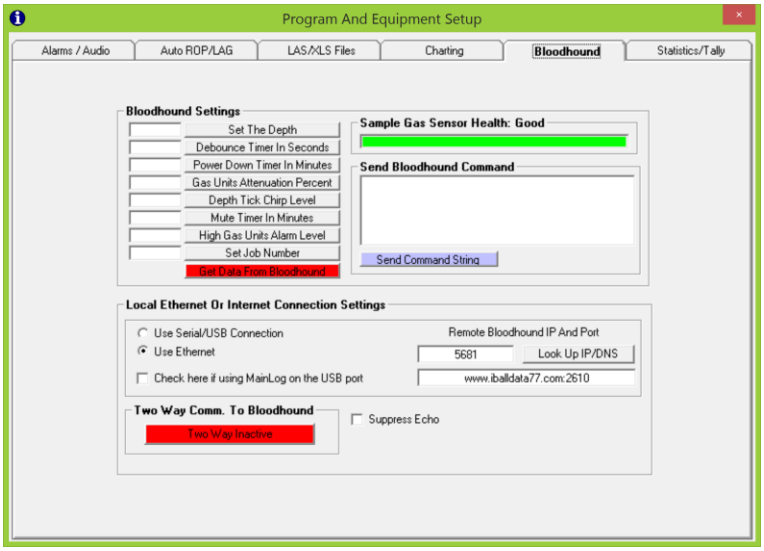
7.4.9 APPLICATION BACKGROUND

The Gas Chart main screen has a blank white background that can be modified. The background is behind the Control Box and the chart. Click Change Background Picture to select an image file to attach and display as application background (i.e. Company logo, Site picture, etc.) or click Change Background Color to select a color of choice.



7.5 BLOODHOUND

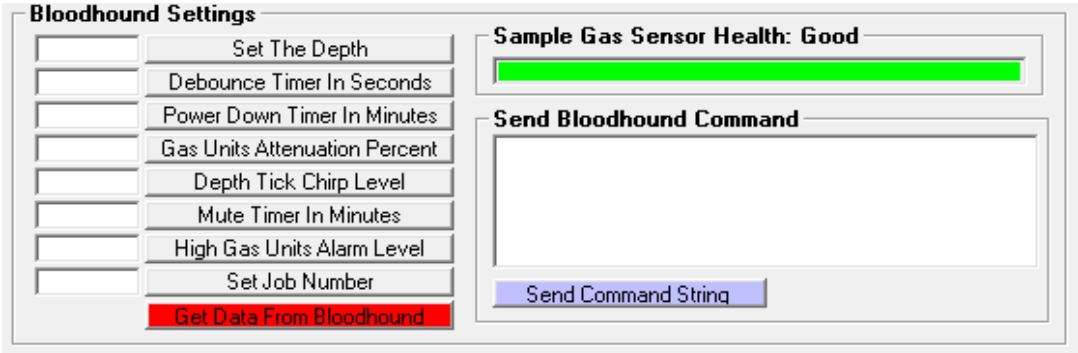
The Bloodhound Tab allows for Bloodhound settings and connections. When Gas Chart is connected to the Bloodhound either locally or remotely, this setup tab allows the user to send Bloodhound commands directly to the Bloodhound system.



7.5.1 BLOODHOUND SETTINGS

NOTE: Gas Chart must either be set to connect Locally (USB/Serial), or via Ethernet. With an Ethernet connection, the user must be logged in with "Two-Way Active" for changes on this page to impact the Bloodhound.

When running locally (Serial/USB), the left section of the Bloodhound Setup Tab allows the user to read and change certain Bloodhound Settings. Pressing [Get Data From Bloodhound] will query the Bloodhound and fill in the data in the windows above. The right section allows the user to see the health of the IR sensors within the Bloodhound. You are also able to enter command in the "Send Bloodhound Command" box (See Bloodhound User Manual for possible commands). More information on this in Section 7.5.3.



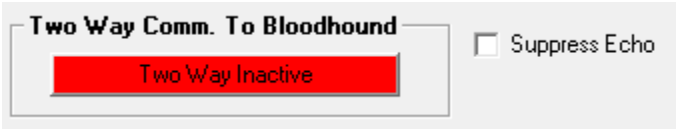
The following table illustrates what the potential settings are:

ITEM	DESCRIPTION
Set The Depth	Enter a specific depth (in feet) in the left panel and click on this button to send it to the Bloodhound. NOTE: Avoid up-hole depth changes or be aware that large up-hole changes may force the need for a new Job Number on the Bloodhound and a New Database in the Gas Chart software, as depth is the primary key for LAS files.
Debounce Timer In Seconds	When using a Geolograph to track depth, it is often important to adapt to changes in drill rates. Entering a time in seconds here will set the Bloodhound to not become eligible for a foot tick until the number of seconds entered has elapsed. EXAMPLE: If set to ten (the default), then when a close of the contacts on the Geolograph switch is detected, the bloodhound will not look for a subsequent closure until after ten seconds have elapsed.

Power Down Timer In Minutes	The Bloodhound will power down at this interval.
Gas Units Attenuation Percent	This will modify the percent of total gas read by the Bloodhound and display/send it to all subscribing applications. In short, this represents the percent of gas that the Bloodhound can display. EXAMPLE, if the Bloodhound is reading 1000 units, and it is desired that only 800 units show (for various reasons), then one would set this to 80 and submit it to the Bloodhound by pressing the button. NOTE: In this example the maximum the Bloodhound will ever display is 8000 units, because one has effectively moved the top-end of the scale in to 80% of the maximum.
Depth Tick Chirp Level	This will change the volume (rather the length) of the depth-tick in milliseconds so that whenever a foot is ticked off, this alarm will sound with it.
Mute Timer In Minutes	This will mute the Bloodhound's audible alarm for the number of minutes indicated here. NOTE: Sending 550 with this command will effectively mute the Bloodhound's alarm completely. NOTE: This has no impact on alarms in the Gas Chart software, which will continue as configured.
High Gas Units Alarm Level	This sets the threshold in units over which an alarm will sound alerting users nearby of a High Gas event. EXAMPLE: Setting this to 5000 will cause the Bloodhound to alarm audibly and show an error condition with lights that High Gas has been breached. NOTE: Setting this to zero will effectively disable this particular alarm.
Set Job Number	This will set the job number on the Bloodhound to the value entered here.

	NOTE: Best practice is to increment the job number by on whenever setting this rather than trying to mimic a site-number or similar. This number is arbitrary to the Bloodhound and its software and does not get propagated outside of those tools.
Get Data From Bloodhound	This will refresh all current data and populate it in the boxes on the left-hand side of this section. NOTE: If one wants a reference point when adjusting these, it is advised to hit this button first to see where things are set before making changes.

When connected remotely, you must connect using the "**Two Way Comm To Bloodhound**" button and wait up to 15 minutes until the server will allow you to send commands to the remote Bloodhound (with the proper login/password). All commands can be found in the Bloodhound user's manual.



7.5.2 SAMPLE GAS SENSOR HEALTH

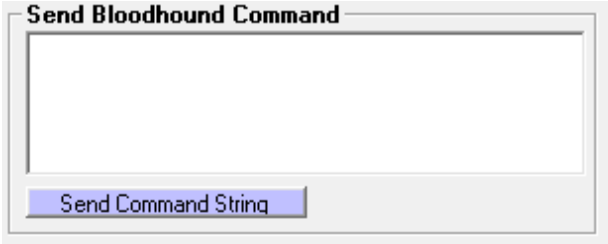
NOTE: If the Sample Gas Sensor field drops to the bottom of red and returns to green on occasion, this is normal for units with serial numbers starting with a five. That situation indicates that the SIM number is being propagated.

In the upper-right corner of this screen is a health bar, indicating the general health of the Bloodhound's sensor (see picture below). If this bar is continually (not occasionally) yellow or below, this is an indicator that either the Bloodhound is due for service, or a call to technical support is in order. The Sensor health will go from green, to yellow, and finally to red. When the bars turn to a mid yellow, it is time to replace the IR sensors.

7.5.3 SEND BLOODHOUND COMMAND

NOTE: Send Bloodhound Command is an advanced feature and CLI commands will not be specifically addressed here. They are defined in the Bloodhound hardware manual if you wish to explore this function in further detail.

This section is used to send custom command-line-interface (CLI) to the Bloodhound via the USB or Two-Way connection (see picture below). In order to send a command, one enters the specific command in the large while field and clicks on Send Command String. (See Note)

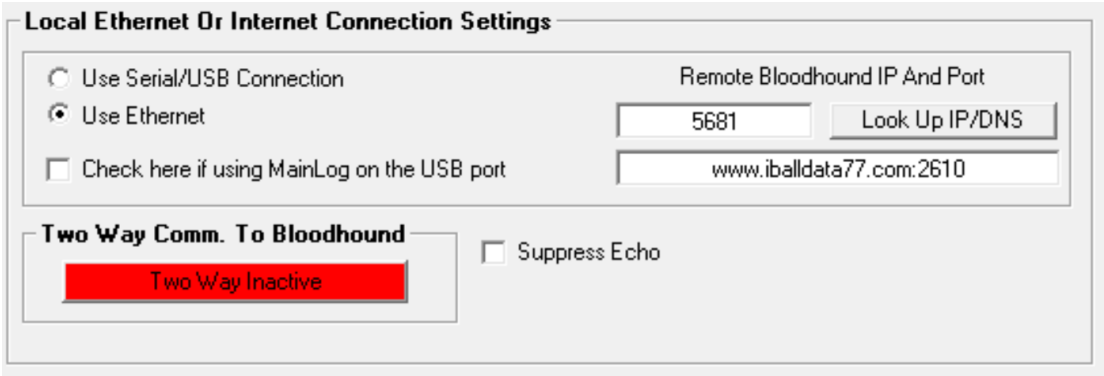


When using this CLI interface you will need to have the Bloodhound tab open in Setup as well as the Real Time Data window in order to send and view commands. When you type the command in this window you need to click the Send Command String after each command and view the results in the RTD window. You will see the command and its results in the raw data packet window of this utility.

7.5.4 LOCAL ETHERNET OR INTERNET CONNECTION SETTINGS

At the bottom of the Tab, the “Local Ethernet Or Internet Connection Settings” area allows the user to select connecting to the Bloodhound using a Local Ethernet Connection, a Remote Ethernet Connection, or Serial/USB connection.

When Gas Chart software is being used on a computer directly connected to the Bloodhound using the USB cable you want to be sure to select the Serial/USB option (connection default).



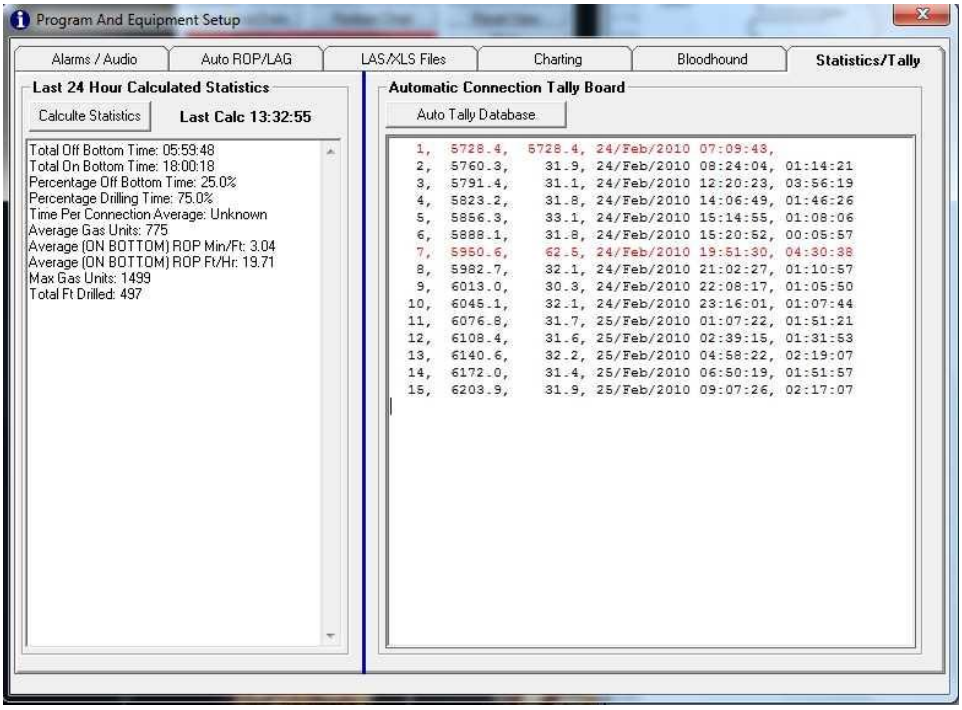
When Gas Chart software is being used at a location remote from the Bloodhound (running remotely), check the box next to “Use Ethernet” Instead of “Use Serial/USB Connection” and type in the 4-digit number of the Bloodhound and push the “Look UP IP/DNS” button, and the IP and Port will be displayed in

the box below. Click on the red “Get Data From Bloodhound” to ensure connection (See Getting Started section for detail).

If connected to the Bloodhound on a local Ethernet (through a router or computer that is running a DHCP service) check the same button as above and enter the local IP address displayed on the LCD panel of the Bloodhound (it will scroll past eventually) and use 23 as the port number: 192.168.1.7:23 (See Getting Started Section for detail).

7.6 STATISTICS/TALLY

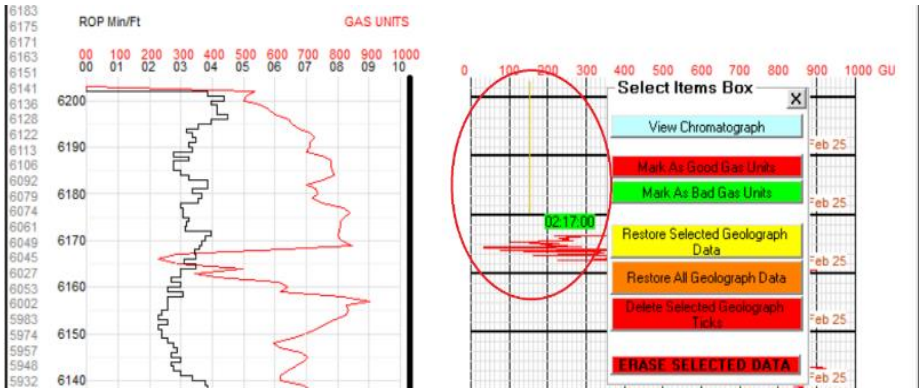
This tab allows the user to calculate the pipe tally, Total Off Bottom Time, Total On Bottom Time, Percentage Off Bottom Time, Percentage Drilling Time, Time Per Connection Average, Average Gas Units, Average On Bottom ROP Mn/Ft, Average On Bottom ROP Ft/Hr, Max Gas Units, and Total Ft Drilled from the data in the database by clicking Calculate Statistics and Auto Tally Database buttons.



8 SELECT ITEMS BOX

Double left-clicking on the right-hand side of the gas chart will bring up a select tool that changes color and is stuck to the tip of the cursor. Also, at the tip of the cursor is a green information box that displays the time in minutes. If the cursor goes to the left of the Geolograph tick marks, the green information box displays

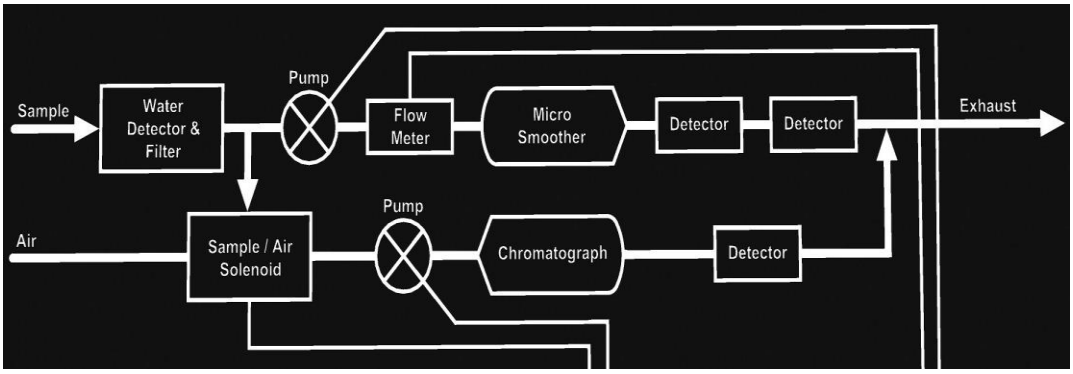
the depth. This is useful in selecting a range of feet or minutes of data. By double clicking on a second point as you drag down on the Gas Chart, you have just selected a range of data, and the Select Items Box will appear (as pictured below).



8.1 VIEW CHROMATOGRAPH

In all versions of the Bloodhound, the chromatography system is a second sub-system within the Bloodhound's core infra-red (IR) plumbing circuit. While the IR circuit continually runs and in real-time identifies the total hydrocarbon-based gas volume on a near real-time basis, the Chromatograph is a snapshot in time that is created with a short sample that is taken on the fly.

Below is a basic flowchart showing the two systems and how they connect.



The sampling mechanism is accomplished by a solenoid in the Bloodhound that opens for a few seconds to the main real-time gas line while a second pump which is dedicated to the chromatograph part of the system pulls in a sample. The solenoid then closes, and the IR/real-time portion of the system continues as normal. When the solenoid switches away from the sample line, it uses fresh air from the inside of the case as a medium to push the sample through the heated chromatograph column, which is a long tube that consists of a proprietary mixture of filtering particulates. As the sample is pushed through the column,

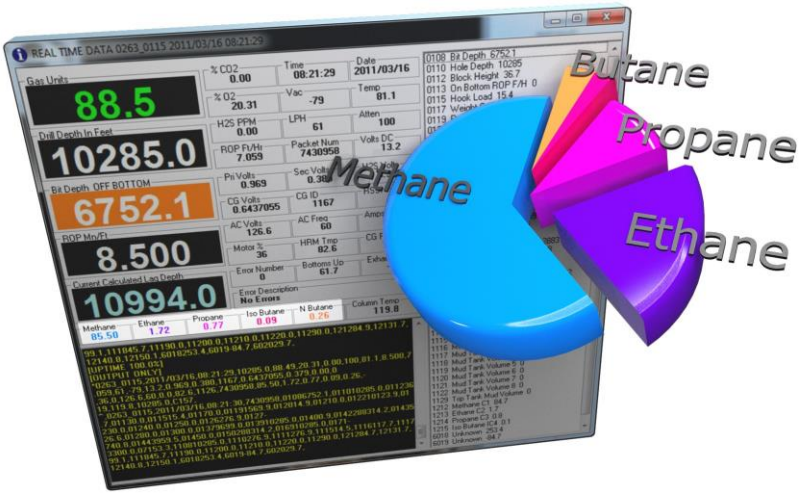
the hydrocarbons separate into their component gases in order of molecular weight from lightest to heaviest (i.e., methane, ethane, propane, butane, etc.). The gases then escape the end of the column and are run through an entirely separate chamber in the Bloodhound's sensor block where a VQ sensor picks up the hydrocarbons. When the sensor is activated it sends an electrical signal to the Bloodhound's brain board, where it is interpreted as gas. This occurs over a period of a few minutes, and when a chromat sample run is completed, the whole process starts over again with the solenoid re-opening. This process results in a chromat sample run that takes several minutes to complete and produces a chart of the component gases as parabolas in sequential order from lowest to highest molecular weight.

Using this sampling mechanism, the Bloodhound will build a percentage-based model of the gas components. This model can be thought of simply as a pie chart that is used against whatever the current real-time total gas number is to break out the C-values (see image below).

Once the chromat run is completed and the model is complete as well, the Bloodhound applies to the real-time total gas numbers to approximate component gas volumes until the completion of the next chromat run.

NOTE: The Bloodhound can identify other gases farther down the chain; however, these will not be identified and factored into the overall model. By raising the column temperature and extending the run-time, you can see these non-bold peaks form in these situations. If this is a need, the recommended procedure is to get them to appear on the Gas Chart Chromat Run screens, estimate the volume/percentage under all the curves, and build a spreadsheet to derive partial gases from the whole using your own model. This is considered an advanced process and is not covered in detail in this manual.

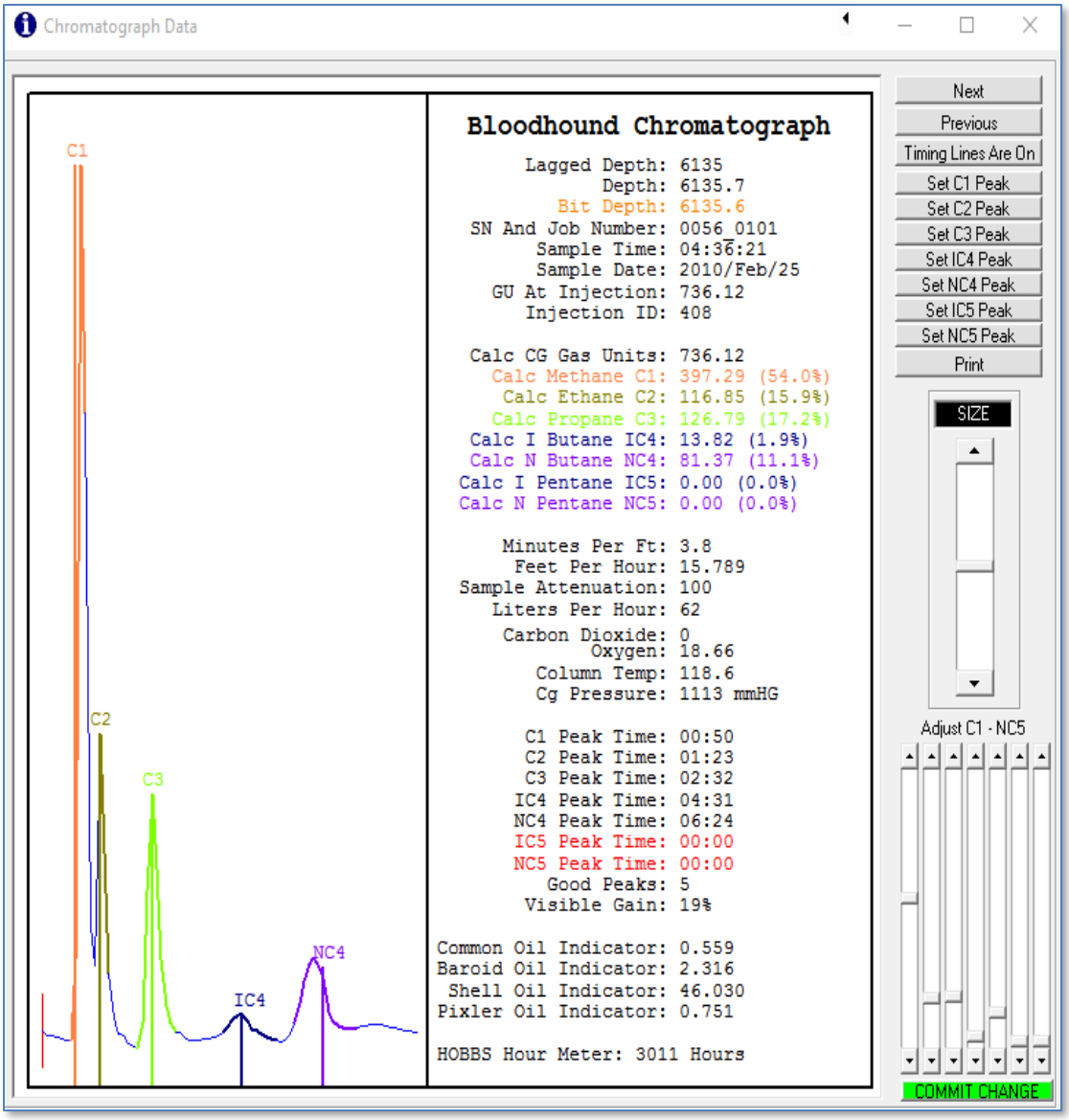
For example, if the current model says there is 75% C1, and 25% C2 (with no other component gases), and your current real-time reading on the Bloodhound shows 3000 units, then in the real-time data viewer screen you should see for C1 a total of 2250 units and for C2 a total of 750 units, and 0 units for the rest of the C Values (see image below for an example of a component gas breakout as shown about 2/3 of the way down on the real-time data screen).



Using Gas Chart and the Bloodhound, the Bloodhound can capture, measure, and break apart C1 through NC5.

When in the Select Items box (above), clicking the View Chromatograph button will raise the Chromatograph Data window (as pictured below).

ADVICE: Get familiar with this page. Bring it up frequently and examine multiple chromatographs by clicking on the "Previous" and "Next" buttons respectively. Over time, this data will build a context around the types of gases detected, the relationships between voltages and peaks, impacts of weather and altitude on gas measurement, and condensates in the mud. Understanding chromatograph charts and elution timing is a very useful and marketable skill.



This button allows the user to see a close-up view of the selected chromatograph output. Left clicking and holding on the chromatogram will allow the user to adjust the trace up and down on the display window. If the trace is too large or too small, the user can adjust the over all visual size in the Program and Equipment Setup Screen, under the Chromatograph Tab. When the user is satisfied with the display, a print can be made of the chromatogram.

The LEFT side of the Chromatograph Data window shows the chromatograph peaks, specifically the elution time. The peak search times (elution times) are shown as heavy-colored overlays on the chromatograph curve. Each time-window is centered on its associated vertical line, which is the "picked Peak" time in seconds before and after the line setting. This is a time window in which the Bloodhound will search for the "real" peak and establish a volume under the parabola (i.e. peak) that will be used to create a model of the gas mix. The width

of the time windows is controlled by Bloodhound C Value Standard Deviation Register 61 through 65 (see the Bloodhound manual for register list).

The data for the chromatogram is available on the RIGHT side of Chromatograph Data window. If a particular peak timing is off, or is incorrectly labelled, then all the user has to do is click on the corresponding Set C(x) peak button, place the cross hairs over the correct peak, and DOUBLE CLICK on the peak to set the new elution timing window for that component (please refer to the Bloodhound Knowledge Base website (www.bhkb.org) for the "How To" article on setting peaks).

8.1.1 PREVIOUS / NEXT BUTTONS

To see the previous separation or Injection, hit the Previous button. To see the next separation or Injection, hit the Next button.

8.1.2 TIMING LINES BUTTON

Timing Lines Are On - Using this button will toggle the peak vertical lines On and Off as needed the LEFT side of the Chromat window. This can be very helpful when setting your peak timing.

8.1.3 SET C VALUE PEAK BUTTONS

Set C1 Peak
Set C2 Peak
Set C3 Peak
Set IC4 Peak
Set NC4 Peak
Set IC5 Peak
Set NC5 Peak - Use these buttons to Set each C Value peak. Click the C Value button, then on the LEFT side of the Chromatograph windows DOUBLE-CLICK to set the timing vertical line and wait for the timing confirmation window to complete.

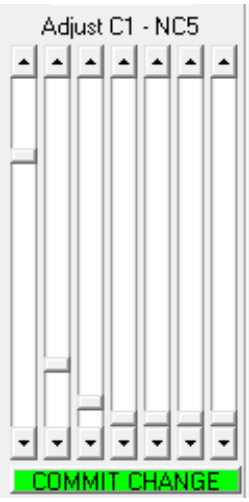
8.1.4 PRINT BUTTON

Print - Chromatogram print if there is an availble printer setup on the PC that Gas Chart is running on.

8.1.5 VISIBLE GAIN SLIDER

- This slider will adjust the Visible Gain on the peaks displayed on the LEFT side of the Chromatograph Data Windows.

8.1.6 ADJUST C VALUE % SLIDERS



- These sliders allow retroactive modifications to chromat runs. It does not change peak timing, rather it changes the percentage that was output for a particular injection (i.e. chromat run). This can only be done on one injection at a time.

8.2 DATABASE MARKING

- Select a questionable range of data as you would to view a chromatograph, and then click on Mark As Bad Gas Units to change that range of GU to green. To reverse the process, select the same area and click on Mark As Good Gas Units to change GU back to the original color.

8.3 GEOLOGRAPH SELECT DATA RESTORE

Restore Selected Geolograph Data - This button will restore any Geolograph data that has been previously deleted or changed in the range that was selected. To see the difference, select the Raw Geolograph check box in Setup on the Charting Tab and then CLICK Redraw Chart from the Control Box.

8.4 GEOLOGRAPH ALL DATA RESTORE

Restore All Geolograph Data - This button restores all the Geolograph data from the start of the database to the end. Any changes that have been made will be undone.

8.5 GEOLOGRAPH TICKS DELETE

Delete Selected Geolograph Ticks - This will remove the blue Geolograph tick marks from the database. To see the difference between the blue edited Geolograph tick marks and the Raw Geolograph tick marks, just check either the Raw or Edited tick marks box of the Gas Chart Control Box, Charting Tab.

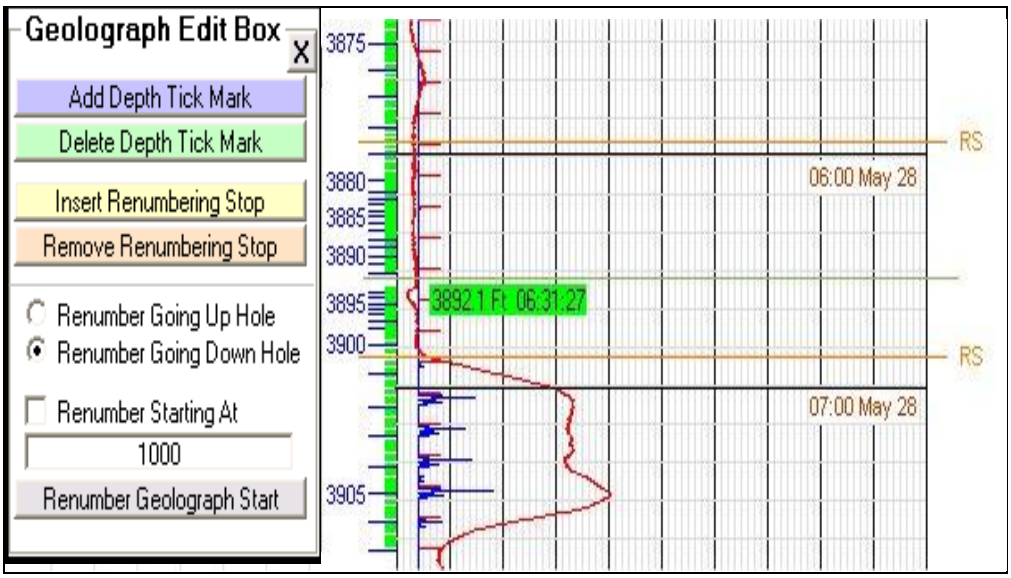
8.6 DATABASE DATA ERASE

ERASE SELECTED DATA - This button will erase all of the selected data from the database. The program will then perform a database check and then re-index the database.

9 GEOLOGRAPH EDIT BOX

The Gas Chart program can edit the Geolograph tick marks on a one-by-one basis. To change the edited Geolograph data the user must move the mouse over the Geolograph tick marks and hold down the right mouse button. When moving the cursor over the Geolograph tick marks, it will turn into a Double-Headed arrow or Up/Down arrow cursor (as pictured below):

This will bring up the Geolograph Edit Select Tool and the Geolograph Edit Box. The Select tool is a blinking horizontal line that will follow the mouse up and down while the right mouse button is held down. There is also a green data box that follows the line that indicates a depth and time that the mouse is pointing to in the database. While holding down the right mouse button and moving the mouse up and down, the user will be able to select a specific point in the database that the user will be able to edit.



9.1 ADD DEPTH TICK MARK

Add Depth Tick Mark - This will insert a non-numbered foot tick. This inserted foot tick is not numbered and will be red in color with a red NF (New Foot) next to it. These new foot ticks are intended to be renumbered by the user later.

9.2 DELETE DEPTH TICK MARK

Delete Depth Tick Mark - This will remove a single foot tick from the database. This foot tick can be a blue edited foot tick or a red NF foot tick. It will always remove the nearest foot tick to the horizontal selection tool.

9.3 INSERT RENUMBERING STOP

Insert Renumbering Stop - If the user just wants to renumber within a set of boundaries, then the user can enter into the database a single or multiple renumbering stop(s). Renumbering stops allow the user to control where the renumbering will take place. The insert renumbering stop button will allow the user to insert as many renumbering stops as needed to control the renumbering of the Geolograph.

9.4 REMOVE RENUMBERING STOP

Remove Renumbering Stop - This will remove the nearest renumbering stop to the horizontal select tool.

9.5 RENUMBER GOING UP HOLE

Renumber Going Up Hole - This button tells the charting program to renumber from the horizontal select tool moving up towards the top of the hole.

9.6 RENUMBER GOING DOWN HOLE

Renumber Going Down Hole - This button tells the charting program to renumber from the horizontal select tool moving down towards the bottom of the hole.

9.7 RENUMBER STARTING AT

Renumber Starting At
1000 - If the user wishes to change the renumbering numbers, then the user should enter the number that the renumbering will start at. This will start the renumbering at a new number and continue up or down until the end of the database or a renumbering stop is seen.

9.8 RENUMBER GEOLOGRAPH START

Renumber Geolograph Start - This button will tell the charting program to begin renumbering the database with the given parameters.

10 APPENDIX A – GLOSSARY OF TERMS

ASCII	American Standard Code for Information Interchange
Browser	A program used to view HTML documents (i.e. Internet Explorer, FireFox, Chrome)
CG	Chromatograph
CO_2	Carbon Dioxide
DB	Database
H^2S	Hydrogen Sulfide
I/O Port	Input/Output Ports
I/R	Infra Red
IDB	iBall Database file extension. This is the file extension of the raw data saved to the Bloodhounds USB jump drive.
LAN	Local Area Network. Local network connectivity design/layout
LAS	Logical ASCII Standard File protocol (File Extension compatible with EXCEL & Notepad)
LPH	Litres Per Hour
MDB	Microsoft Database (Used with Microsoft ACCESS and EXCEL). Gas Chart uses this file format for database display
mmHG	Millimetres of Mercury (unit of pressure defined as 1/760 of an atmosphere)
O_2	Oxygen
PC	Personal Computer
ROP	Rate of Penetration
TCP/IP	Transmission Control Protocol/Internet Protocol: a stack of protocols developed for the internet to get data from one network device to another.
TG	Total Gas
USB	Universal Serial Bus (USB) is a serial bus standard to interface devices
WAN	Wide Area Network
WITS	Wellsite Information Transfer Specification
XLS	Filename Extension (Microsoft Excel spreadsheet file)

11 APPENDIX B – ALARM CODES/DESCRIPTIONS

Condition	Alarm Number	Bloodhound Register Setting
Unknown Alarm	0	Hours meter
High Sample Line Pressure	1	
Blocked Sample Line	2	Reg 52: factory setting 200 (means –200 mmHg)
Detector Voltage High	3	No register setting - Automatic from HRM
Detector Voltage Low	4	No register setting - Automatic from HRM
High Flow Rate	5	Reg 50: factory setting 200 LPH
Low Flow Rate	6	Reg 51: factory setting 20 LPH
Low Power Voltage	7	Set at 11.1 VDC No register setting
High Amps going out to 12V Cavitator terminals (60 second average)	9	Reg 37: factory setting 5 Set to 0 to disable
High Temperature inside Case	10	Reg 46: factory setting 120 degrees F
Low Temperature inside Case	11	Reg 47: factory setting 35 degrees F
High Gas Units	12	Reg 53: factory setting 22 (means 2200 units) Set to 0 to disable
HRM Warming Up	13	
Unit In Shutdown Mode	14	No register settings
Geolograph Switch Noise	15	Reg 33: factory setting 180 spikes Set to 0 to disable
CG Low Pressure	16	Reg 54: factory setting 70 (means 700 mmHg) Set to 0 to disable
High H2S		Reg 56: factory setting 50 Can set from 0 to 200 Set to 0 to disable
Exhaust Blocked		Set to 50 mmHg - No register setting

