



Beacon Test Bench

Operator's Manual

STB100

Version 1.20

Information contained in this manual is subject to change without notice. Please consult the website at www.wst.ca for new Operator's Manual updates. Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means including but not limited to, electronic, mechanical, photocopying, recording, or otherwise, or for any purpose, without the written permission of WS Technologies Inc. (WST). WST may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from WST, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

The purchaser shall not in any event be entitled to, and WST shall not be liable for indirect, special, incidental or consequential damages of any nature including, without limitation, business interruption costs, loss of profit or revenue, loss of data, promotional or manufacturing expenses, overhead, injury to reputation or loss of customers, even if WST has been advised of the possibility of such damages. In any event, purchaser's recovery from WST for any claim shall not exceed purchaser's purchase price for the product giving rise to such claim irrespective of the nature of the claim, whether in contract, tort, warranty, or otherwise. WST shall not be liable for and purchaser shall indemnify, defend and hold WST, its agents, distributors, dealers, successors and assigns harmless from any and all claims, damages or losses, including injury or death, arising from or relating to the use or failure of the products.

**Copyright © WS Technologies Inc.
All rights reserved.**

**Printed in Canada
March 2019**

CONTENTS

INTRODUCTION	1
SUMMARY OF MODELS AND OPTIONS	1
UNPACKING	1
GETTING STARTED	2
Front Panel:	2
Rear Panel:	2
Installing the Application:	3
Launching the Application:	3
Application Screens:	4
Measurement Screen:	4
Setup Screen:	5
User IO Screen:	5
Device Status Panel:	6
Setup Screen Configuration:	6
User Data section:	6
Device Settings:	7
10MHz Reference Setting:	7
Input Mode Settings:	7
Direct Input mode:	7
Antenna mode:	7
Screen Box mode:	7
Files:	7
Software Updates and Upgrades:	8
Measurements:	8
Select Channels for Measurement:	8
Test Duration:	8
Cable Loss Factors:	8
Decode Location Format:	8
Location:	8
VIT Settings:	8
Limit Tester Configuration:	9
Selecting Parameters:	9
Setting Lower and Upper Limits:	9
Limits Files:	9
Miscellaneous Limits Conditions:	9
Stop Measurement When Fail	9
Fail if Location is Default	9
VHF Training Frequencies:	10
Measurement Screen Configuration:	11
Measure:	11
Screen View:	12
File:	13
Test Report:	13
VIT Configuration:	14
Zero Current Sensor:	14
VIT Measurements - General:	14
Voltage and Current Measurements:	15

Voltage:	15
Current – DC Overload Condition:	15
Temperature:	15
GPS Receiver:	15
MAKING MEASUREMENTS	16
Connecting the Beacon:	16
Direct Connection:	16
Antenna:	16
Screen Box Connection:	17
Single Mode Measurement:	17
Continuous Mode Measurement:	17
Leakage Measurement:	19
MEASUREMENT RESULTS	20
Results Screen:	20
TEST REPORTS AND DATA FILES	21
Generate and Print Test Report:	21
Data Files:	21
Measurement Data File Structure:	22
VIT Data File Structure:	23
Graphics Files:	23
USER IO SCREEN	24
Breakout Board and Cable:	24
SOFTWARE UPDATES	25
STB100 MODEL UPGRADING	25
FREQUENTLY ASKED QUESTIONS	26
SPECIFICATIONS	27
REGULATORY INFORMATION	29
DECLARATION OF CONFORMITY	30
WARRANTY INFORMATION	31
CALIBRATION	31
RETURNS	31
POWER CONVERSION CHART - dBm to Watts	32

WARNING!

DO NOT ACTIVATE ANY BEACON IN ITS NORMAL ACTIVATE MODE UNLESS THE BEACON IS IN A SCREEN BOX (TSE100B) OR A SCREEN ROOM. DOING SO COULD RESULT IN A FALSE DISTRESS ALERT.

WARNING!

WHEN USING DIRECT CONNECTION INPUT MODE DO NOT EXCEED A BURST POWER LEVEL OF 20 WATTS OR A CONTINUOUS POWER LEVEL OF 2 WATTS. DAMAGE WILL RESULT!

INTRODUCTION

Thank you for choosing the STB100 Beacon Test Bench. This Operator's Manual explains the operation of this equipment.

SUMMARY OF MODELS AND OPTIONS

STB100: This is the base model. It measures and decodes all Cospas-Sarsat EPIRBs, PLBs, and ELTs. It decodes the 406 MHz message, measures the 406 MHz transmitter, the 121.5 MHz transmitter, and the 243 MHz transmitter. It also measures voltage and current supplied to a beacon, along with the leakage current when a beacon is switched to standby mode. Accessory items include up to 2 temperature probes and a breakout board kit for measuring various USER I/O functions.

API Set option: The API Set option is available for those that wish to customize their software program.

UNPACKING

Please verify the contents of your package. It should contain:

- STB100 Beacon Test Bench
- Operator's Manual
- Certificate of Calibration with Calibration data
- Front Panel Antenna
- USB to PC interface cable
- GPS Magnet Mount Active Antenna
- AC power cable

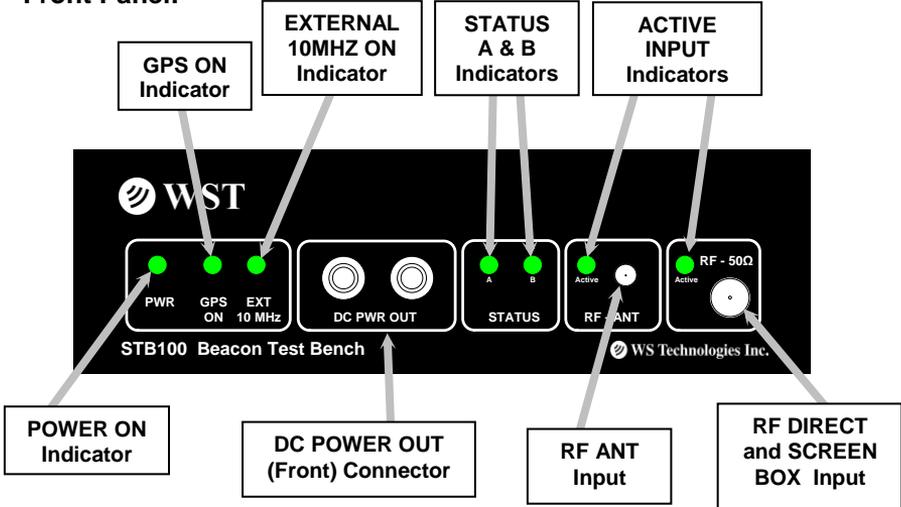
NOTICE!

Install the Beacon Test Bench software before connecting the device to the USB port.

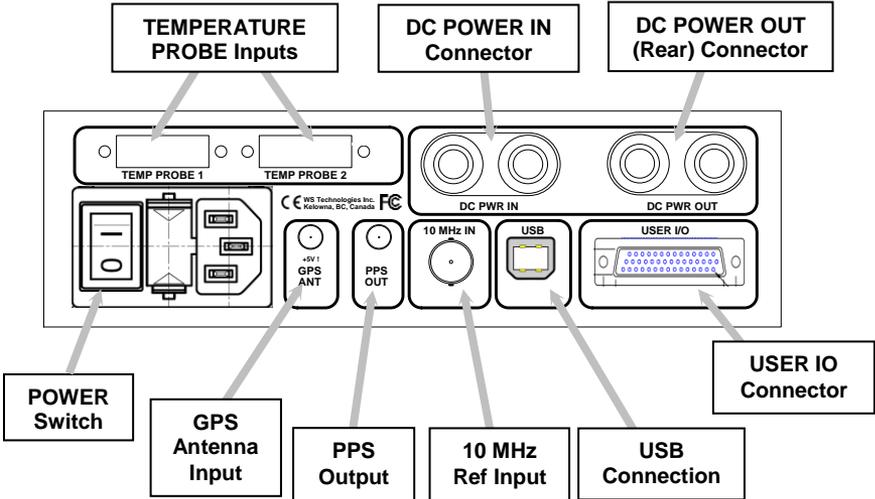
GETTING STARTED

Please read this Operator’s Manual to become familiar with the operation of the Beacon Test Bench.

Front Panel:



Rear Panel:

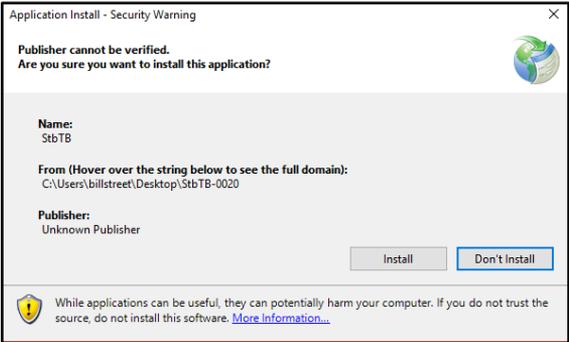


Installing the Application:

NOTICE!
Install the Beacon Test Bench software before connecting the device to the USB port.

The STB100 Application must be installed on your computer prior to connecting the device.

Go to www.wst.ca/stb100.html and install the latest version of the STB100 software. The following message will appear.



Click ***Install*** to install the application on the computer.

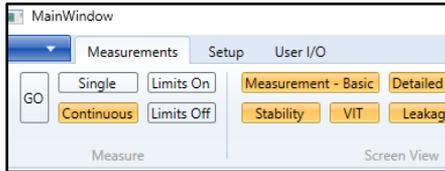
The STB100 icon will appear on your desktop.

Launching the Application:

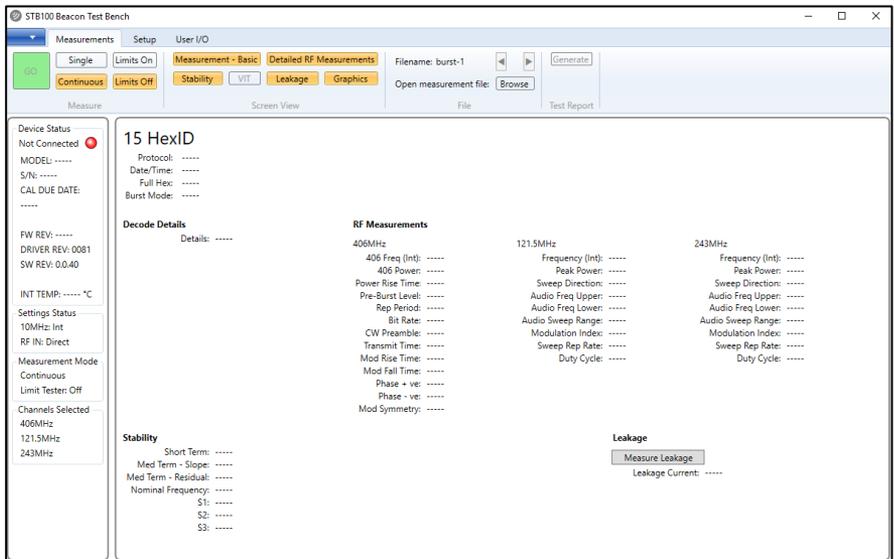
Click the desktop icon to launch the STB100 application. A splash screen will appear followed by the Measurement Screen.

Application Screens:

The application has three main screens, the **Measurement Screen**, the **Setup Screen**, and the **USER IO Screen**, each accessible from the tabs near the top of the screen.



Measurement Screen:



Setup Screen:

STB100 Beacon Test Bench

Measurements Setup User I/O

Setup Limits

VHF Training Frequencies

Screen

Device Status
Not Connected

MODEL: -----
S/N: -----
CAL DUE DATE: -----

FW REV: -----
DRIVER REV: 1.11
SW REV: 1.12

INT TEMP: ----- °C

Settings Status
10MHz: Int
RF IN: Direct

Measurement Mode
Continuous
Limit Tester: Off

Channels Selected
406MHz
121.5MHz
243MHz

User Data

Organization:
Technician:

Device Settings

10MHz: Internal
 External

RF IN Mode: Direct
 Antenna
 Screen Box

Files

Measurement Files Location:

Filename: Auto Increment Filename

Upgrades and Software Updates

Current Version: 1.12

Measurements

Select Channels for Measurement

406MHz
 121.5MHz
 243MHz

Test Duration

Test Duration in continuous mode: (1 to 43200 minutes)

Cable Loss Factors

406 MHz dB
 121.5 MHz dB
 243 MHz dB

Decode Location Format

dd.dddd°
 dd° mm.mm'
 dd° mm' ss"

Location

Location of STB100 installation. (Use decimal degrees)

Latitude:
Longitude:

VIT Settings

VIT functions on **VIT - real time:**

Ensure all loads are removed and then press the button to zero the current sensor

Voltage In: -----
Voltage Out: -----
Current: -----
Temperature 1: -----
Temperature 2: -----

User IO Screen:

STB100 Beacon Test Bench

Measurements Setup User I/O

Device Status
Not Connected

MODEL: -----
S/N: -----
CAL DUE DATE: -----

FW REV: -----
DRIVER REV: 0081
SW REV: 0.040

INT TEMP: ----- °C

Settings Status
10MHz: Int
RF IN: Direct

Measurement Mode
Continuous
Limit Tester: Off

Channels Selected
406MHz
121.5MHz
243MHz

Relay Controls

Relay 1
Relay 2

Auxiliary ADC

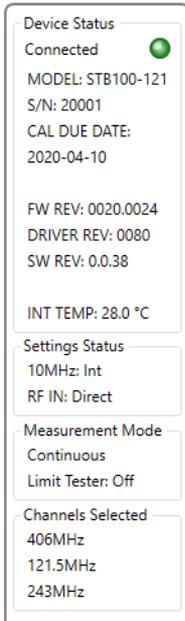
AuxADC 0 0.000 V
AuxADC 1 0.000 V
AuxADC 2 0.000 V
AuxADC 3 0.000 V
AuxADC 4 0.000 V
AuxADC 5 0.000 V
AuxADC 6 0.000 V
AuxADC 7 0.000 V

Auxiliary IO

	Output	Input	
AuxIO 0	<input type="button" value="Set"/> <input type="button" value="Clr"/>	<input type="button" value="Get"/>	Lo
AuxIO 1	<input type="button" value="Set"/> <input type="button" value="Clr"/>	<input type="button" value="Get"/>	Lo
AuxIO 2	<input type="button" value="Set"/> <input type="button" value="Clr"/>	<input type="button" value="Get"/>	Lo
AuxIO 3	<input type="button" value="Set"/> <input type="button" value="Clr"/>	<input type="button" value="Get"/>	Lo
AuxIO 4	<input type="button" value="Set"/> <input type="button" value="Clr"/>	<input type="button" value="Get"/>	Lo
AuxIO 5	<input type="button" value="Set"/> <input type="button" value="Clr"/>	<input type="button" value="Get"/>	Lo
AuxIO 6	<input type="button" value="Set"/> <input type="button" value="Clr"/>	<input type="button" value="Get"/>	Lo
AuxIO 7	<input type="button" value="Set"/> <input type="button" value="Clr"/>	<input type="button" value="Get"/>	Lo

Device Status Panel:

Each of the three screens has the Device Status panel on the left side which shows the user various device settings and status of various functions.



Setup Screen Configuration:

Go to the Setup Screen by clicking on the **Setup tab**, then click the **Setup** button on the left.

The **Setup Screen** has the following sections: User Data; Device Settings; Files; Upgrades and Software Updates; and Measurements.

User Data section:

Enter the name of the **Organization**. Enter the name of the **Technician** performing the tests. This data will appear in the saved data files and on the Test Reports.

Device Settings:

10MHz Reference Setting:

Select the desired **Internal** or **External** 10 MHz reference.
The external 10 MHz must have a stability better than 10E-10.

Input Mode Settings:

Select the desired RF Input mode: **Direct**, **Antenna**, or **Screen Box**

Direct Input mode:

Use this mode when connecting the output of the beacon directly using a 50Ω cable. This mode will result in a very accurate absolute measurement in dBm.

Antenna mode:

This mode receives signals via the antenna attached to the front of the STB100. Use this mode when the beacon is transmitting its signal through its antenna.

The resulting power measurement units are relative and are shown in %.

WARNING

**DO NOT ACTIVATE ANY BEACON IN ITS NORMAL
ACTIVATE MODE UNLESS THE BEACON IS IN A SCREEN
BOX (TSE100B) OR A SCREEN ROOM. DOING SO COULD
RESULT IN A FALSE DISTRESS ALERT.**

Screen Box mode:

Use this mode when the transmitting beacon is located in a Screen Box. The resulting power measurement units are relative and are shown in %.

Files:

Click **Browse** to enter the desired location where all measurement files will be located.

Enter the desired filename in the **Filename** box. When **Auto Increment Filename** is selected, the filename will be appended with a number. This number will automatically increment with each measurement.

Software Updates and Upgrades:

Click **Upgrades** to enter an upgrade code if you have purchased an upgrade.

Click **Check for Updates** to see if Software Updates are available.

Measurements:

The Measurements section of the Setup page has the following sections: Select Channels for Measurement; Test Duration; Cable Loss Factors; Decode Location Format; Location; and VIT Settings.

Select Channels for Measurement:

Select the channels you wish to receive.

Test Duration:

Select the duration of the test. Testing will continue for the specified duration when in Continuous mode.

Cable Loss Factors:

Enter the appropriate cable loss factors. These factors will be included in the power level measurements in Direct Input mode.

Decode Location Format:

Select the desired location format.

Location:

Enter the actual location of the STB100 in decimal degrees format. This information is used to provide a delta distance when location information is included in location protocol measurements.

VIT Settings:

If VIT (Voltage, Current, and Temperature) measurements are desired, then the **VIT Functions On** box must be selected.

Once turned On, the VIT information will continually update in real time directly on the Setup screen.

Limit Tester Configuration:

Go to the **Limits** screen by clicking on the **Setup tab**, then click the **Limits** button.

Note: Limits can be turned ON or OFF in the Measurement section on the ribbon on the main Measurement screen.

Selecting Parameters:

You can select which parameters you wish to include in the Limits. When a parameter is selected, that parameter will be compared to the Lower and Upper Limits and a Pass or Fail indication will result.

Setting Lower and Upper Limits:

The Upper and Lower Limits can be set if desired. Click in the cell you wish to change and enter the desired value. If you wish to restore the default values, click on the **Load Defaults** button in the **File** section of the ribbon on the **Setup** screen.

Limits Files:

You can save various Limits profiles by typing a Filename and clicking **Save**. To recall a Limits file, click **Browse** and select the desired File. The current measurement will always be compared to the Limits currently loaded.

Miscellaneous Limits Conditions:

Stop Measurement When Fail

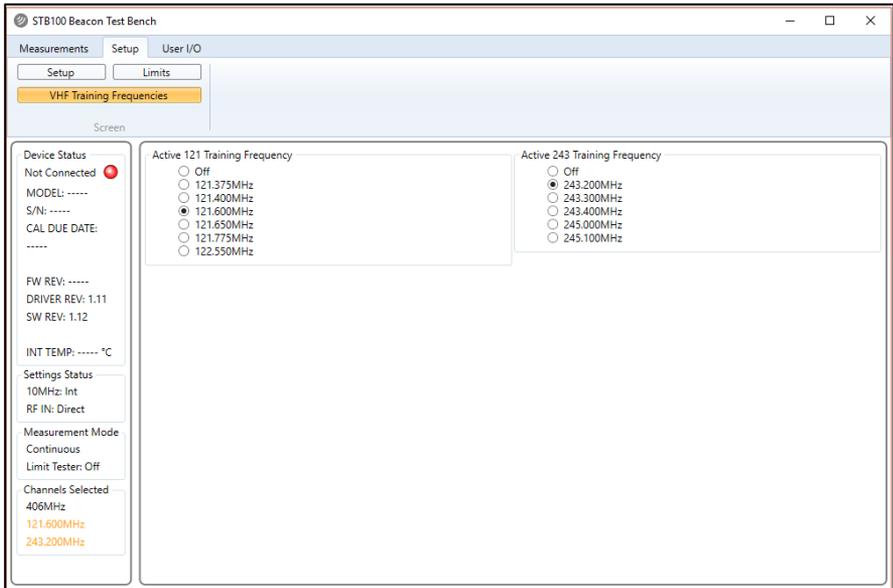
When this is selected, and you are in Continuous mode, the measurements will stop once a Fail is encountered.

Fail if Location is Default

If this is selected, a Fail will result if the decoded location is the default condition (**. **).

VHF Training Frequencies:

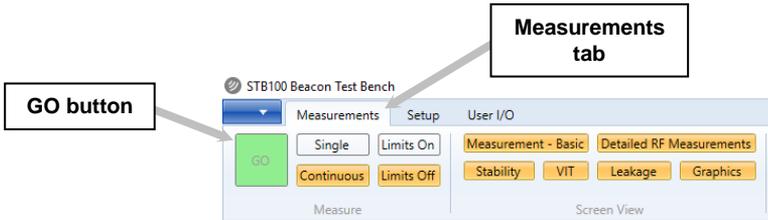
If the beacon you are testing has VHF training frequencies, you will need to activate and select the VHF Training Frequencies in order to measure. Go to the **VHF Training Frequencies** screen by clicking on the **Setup tab**, then click the **VHF Training Frequencies** button.



Measurement Screen Configuration:

The ribbon in the **Measurements** screen has the following sections: Measure; Screen View; Files; and Test Report.

Measure:



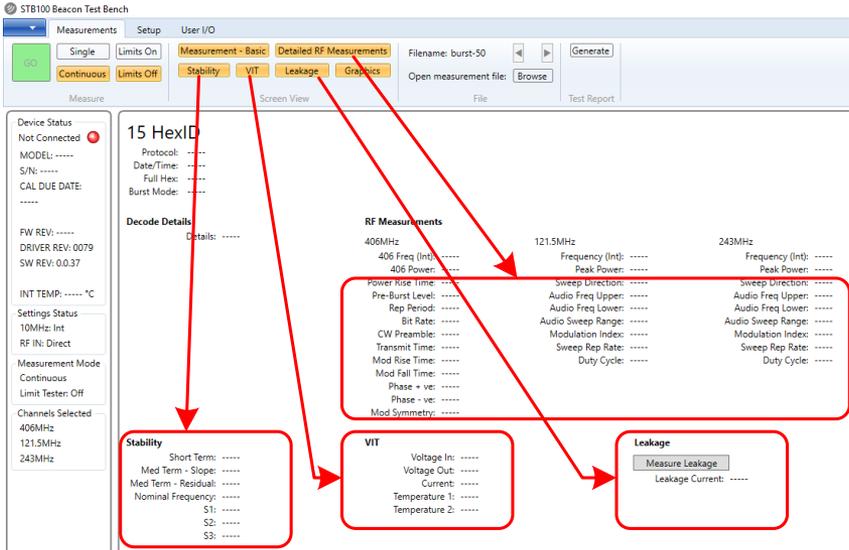
The **GO** button will start the test. The test will continue until the **STOP** button is pressed or the test duration is reached (set in Setup).

Single or **Continuous**. In Single mode, only one measurement is taken. In continuous mode, measurements will continue for the duration of the test (set in Setup).

Limits On or **Limits Off**. Select Limits On if you wish to compare the parameters selected in the **Setup** section to minimum and maximum values.

Screen View:

You can select which sections to view by toggling On/Off the buttons in the **Screen View** section of the ribbon. When Off, that section will be hidden.



Measurement – Basic includes the Beacon 15HexID and all decode details along with frequency and power of each selected channel.

Detailed RF Measurements include detailed measurements for each selected channel.

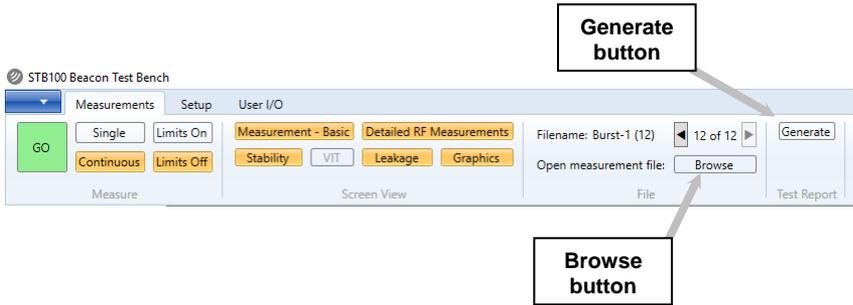
Stability includes 406 MHz stability measurements in accordance with Cospas-Sarsat T.001.

VIT includes voltage, current, and temperature measurements sampled every 250 ms. (Note: VIT must be selected in Setup.)

Leakage is a separate measurement to measure the leakage current of the beacon.

Graphics will display the 406 MHz spectral mask, the 406 MHz power during the burst and the 406 MHz phase modulation.

File:



When making measurements in Continuous mode, the filename will be appended with the measurement number in brackets. You can quickly view the previous measurements by pressing  or .

Clicking the **Browse** button will allow you to select a previously completed measurement.

Test Report:

Use the buttons in the Screen View ribbon to display only the sections you wish to print on the Test Report. Click **Generate** to create a Test Report. You must have a suitable PDF viewer installed on your PC in order to view and print the Test Report. The Test Report is also saved in the Measurement File location.

With the Limits ON, the Test Report will show the measured value, the lower limit, the upper limit, and a pass or fail indication for each parameter selected in the Limits section of the Setup screen.

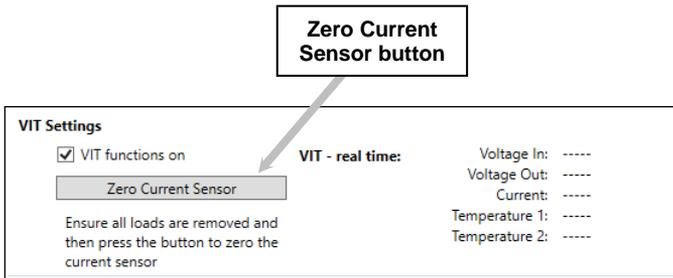
VIT Configuration:

On the Setup page, ensure that the VIT box is selected. Real-time VIT measurements will show on the right side of the VIT section.

Zero Current Sensor:

The current sensor is a very sensitive device and may be adversely affected by external magnetic fields. In order to make accurate current measurements the current sensor must be periodically zeroed. To zero the sensor do the following:

- Ensure all loads are disconnected
- Press the Zero Current Sensor button on the Setup page



VIT Measurements - General:

Voltage/Current/Temperature (VIT) measurements are done at various levels. When the VIT box is selected the following VIT measurement methods are available:

- Real-time measurements are viewed from the Setup screen when the VIT box is selected.
- VIT data is shown on the **Measurement** screen when an RF measurement is completed. This measurement corresponds to the voltage and current during the burst. This data is also recorded in the **filename-1VIT.txt** file.
- When all frequency channels are un-selected, the Measurement screen will display only VIT data once **GO** is clicked. The VIT data is sampled every 250 ms and continues until the user clicks **STOP** or the test duration is reached. The resulting data is saved in the **filename-1VIT.txt** file.

Voltage and Current Measurements:

Connect a power supply or battery to the **DC PWR IN** terminals on the rear of the STB100.

Connect the beacon to the **DC PWR OUT** terminals on either the front or rear of the STB100.

Voltage:

The voltage drop between the **DC PWR IN** and **DC PWR OUT** terminals is approximately 100mV/A. The V_{in} measurement represents the voltage at the DC PWR IN terminals while the V_{out} measurement represents the voltage at the DC PWR OUT terminals.

Current – DC Overload Condition:

If the current exceeds approximately 9 Amps, the unit will go into a DC Overload condition. Remove the overload condition and press **Reset** on the message box. You may need to cycle the power to the STB100 in order to reset.

Temperature:

Temperature probes are available as an optional accessory from WST. VIT measurements will include temperature measurements when the probes are plugged in.

GPS Receiver:

The STB100 is equipped with an internal GPS receiver. The GPS functions are available if you have the **API Set** option. Please refer to the API Listing document.

MAKING MEASUREMENTS

Once all of the items in the Setup section are completed, go to the Measurement screen by clicking on the Measurements tab.

Connecting the Beacon:

There are three methods of receiving a signal from a beacon – using the Direct Connection mode, the Antenna mode, or the Screen Box mode.

Direct Connection:

- select **Direct** in the **Device Settings** on the **Setup** page.
- attach a 50Ω cable between the Beacon and the **RF IN** connector located on the front of the STB100.

When a measurement is completed, the power level units will be shown in dBm. This measurement is very accurate. If **Cable Loss Factors** are entered on the **Setup** page, then these factors are included in the power level measurements.

WARNING!

WHEN USING DIRECT CONNECTION INPUT MODE DO NOT EXCEED A BURST POWER LEVEL OF 20 WATTS OR A CONTINUOUS POWER LEVEL OF 2 WATTS. DAMAGE WILL RESULT!

Antenna:

- select **Antenna** in the **Device Settings** on the **Setup** page.
- ensure the antenna is attached to the RF-ANT connector on the front of the STB100.

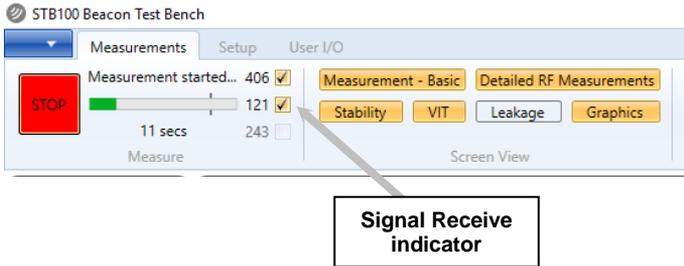
When a measurement is completed, the power level units will be shown in %, with 100% being displayed when the tester is very close to the antenna of the transmitting beacon.

Screen Box Connection:

- select **Screen Box** in the **Device Settings** on the **Setup** page.
- attach a 50Ω cable from the output of the TSE100B Screen Box to the **RF IN** connector located on the front of the STB100.

Single Mode Measurement:

Click **GO**. The ribbon will show the elapsed time and a Signal Receive indication for each channel. A check mark will appear in the appropriate indicator box once the signal is received.

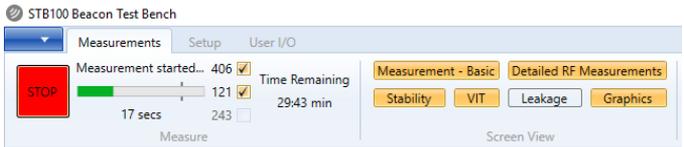


The 121 and 243 channels must be received before the 406 channel. The measurement is deemed to be completed once the 406 burst is received.

Once the measurement is completed, the result will be displayed on the **Measurement** screen.

Continuous Mode Measurement:

Click **GO**. The ribbon will show the elapsed time and the Time Remaining, and a Signal Receive indication for each channel. A check mark will appear in the appropriate indicator box once the signal is received.



The 121 and 243 channels must be received before the 406 channel. The measurement is deemed to be completed once the 406 burst is received.

Once the measurement is completed, the result will be displayed on the **Measurement** screen. Once two or more burst have been received, the measurement number (in brackets) is appended to the filename.



The user may scroll through previous measurements while waiting for the next burst.

The measurement will terminate once the user clicks **STOP** or the duration of the test has been reached.

Note: In Continuous mode, when using the Antenna mode, all beacons within range of the STB100 will be captured. The 15 Hex IDs may not necessarily be the same.

Leakage Measurement:

Once a measurement is complete the user may make a leakage measurement. This will measure the leakage current in the beacon when it is switched to auto or standby.

- Ensure the beacon is in its standby or auto mode
- Click the **Measure Leakage** button.

The screenshot shows the STB100 Beacon Test Bench software interface. At the top, there are tabs for 'Measurements', 'Setup', and 'User I/O'. Below these, there are buttons for 'STOP', 'Measurement started...', 'Time Remaining', and '11:52 min'. There are also buttons for 'Stability', 'VIT', 'Leakage', and 'Graphics'. A 'Generate' button is visible on the right. The main display area shows the following information:

Device Status: Connected
MCODEL: STB100-121
S/N: 20001
CAL DUE DATE: 2020-04-10
FW REV: 0020.0024
DRIVER REV: 0080
SW REV: 0.0.38
INT TEMP: 28.0 °C
Settings Status: 10MHz Int, RF IN: ScrBx
Measurement Mode: Continuous
Limit Tester: Off
Channels Selected: 406MHz, 121.5MHz, VIT

279B39427FBDFD
Protocol: Return Link-FLB Protocol
Date/Time: 04-Jul-2018 12:12:22 PM
Full Hex: FFF2F93CD9CA13FCC977F2C438849465827
Burst Mode: Normal mode (long)

Decode Details:
15 Hex Checksum: 2E1E9
Country Code: Canada (316)
C/S Number: 3458
Serial Number: 1279
RLM Request: Type-1
RLM Ack: None
Provider: GALILEO
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Latitude: 49.9222° N
Longitude: 119.3944° W
Δ Distance: 1205523 m

RF Measurements:
406MHz
406 Freq (Int): 406.027605 MHz
Pwr (ScrBx): 103.0 %
Power Rise Time: 0.00 ms
Pre-Burst Level: ----
Rep Period: 27.7 s
Bit Rate: 399.5 bps
CW Preamble: 160.3 ms
Transmit Time: 521.0 ms
Mod Rise Time: 257.4 μs
Mod Fall Time: 277.2 μs
Phase - ve: 1.08 rad
Phase - ve: -1.08 rad
Mod Symmetry: 0.80 %

121.5MHz
Frequency (Int): ----
Pk Pwr (ScrBx): ----
Sweep Direction: ----
Audio Freq Upper: ----
Audio Freq Lower: ----
Audio Sweep Range: ----
Modulation Index: ----
Sweep Rep Rate: ----
Duty Cycle: ----

Stability
Short Term: ----
Med Term - Slope: ----
Med Term - Residual: ----
Nominal Frequency: ----
S1: 406027605.260
S2: 406027605.388
S3: 406027605.149

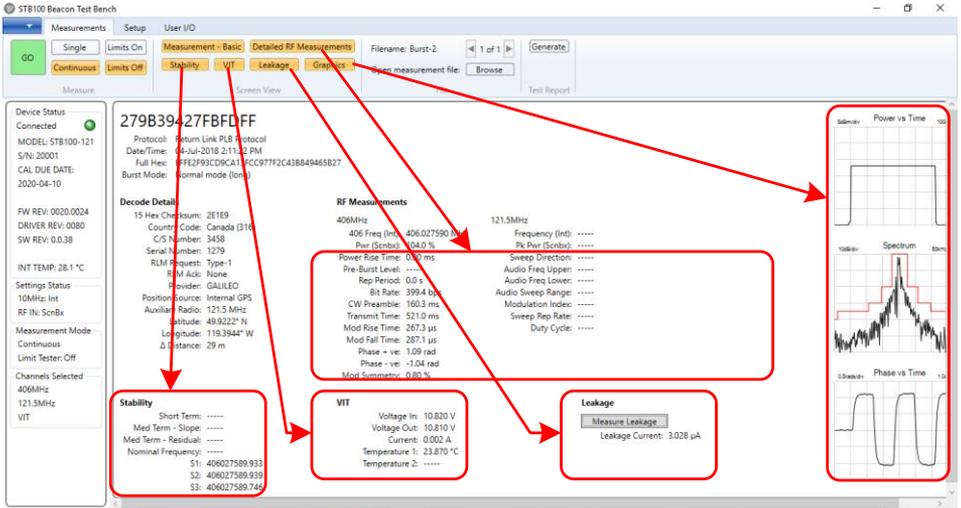
Leakage
Measure Leakage
Leakage Current: ----

**Measure
Leakage
button**

MEASUREMENT RESULTS

Results Screen:

Once the measurement is complete, the results show on the Measurement screen. The user can toggle various sections On and Off.



TEST REPORTS AND DATA FILES

Generate and Print Test Report:

Use the buttons in the **Screen View** ribbon to display only the sections you wish to print on the Test Report. Click **Generate** to create a test report. You must have a suitable PDF viewer installed on your PC in order to view and print the Test Report. The Test Report is also saved in the Measurement File location.

With the Limits ON, the Test Report will show the measured value, the lower limit, the upper limit, and a pass or fail indication for each parameter selected in the Limits section of the Setup screen.

Data Files:

Each measurement generates a folder containing the measurement data. The measurement data includes a data file containing all of the protocol data and RF measurement data, and a VIT data file containing the VIT data. Both files are in TXT format for easily importing into a spreadsheet and for data parsing.

Measurement results are stored on the PC in the directory location specified on the **Setup** screen. Each measurement will be saved in a folder with the same name as the measurement filename. For example, a measurement with the filename "Burst-1" is made on a beacon. When the measurement is completed, the following is created:

<Burst-1>		folder name
	<Graphics>	folder containing graphics
	Burst-1.txt	delimited data file
	Burst-1VIT.txt	delimited VIT dat file
	Burst-1.pdf	PDF Test Report

Measurement Data File Structure:

The Measurement Data file is a delimited text file (TXT format) suitable for importing into a spreadsheet or database.

The header section of the file contains the Filename;Unit Model Number & Serial Number;Cal Due Date;Tester Internal Temperature; Input Mode;Reference Mode;Cable Loss at 406;Cable Loss at 121;Cable Loss at 243;Receive Channels;FW/Driver Revisions;Organization;Tested By;Date/Time.

The body contains the Delta Time (s); Burst#;15 Hex ID;Full HEX;Latitude;Longitude;406 Freq (MHz);406 Power (%);406 Power Rise Time (ms);406 Pre-Burst Level (dBm);406 Rep Period (s);406 Bit Rate (bps);406 Unmodulated CW Time (ms);406 Transmission Time (ms);406 Mod Rise Time (us);406 Mod Fall Time (us);406 Positive Phase (rad);406 Negative Phase (rad);406 Phase Symmetry (%);S1;S2;S3;406 Short Term Stability;406 Medium Term Stability – Mean Slope;406 Medium Term Stability – Residual;406 Nominal Frequency;121 Freq (MHz);121 Peak Power (%);121 Sweep Direction;121 Audio Freq Upper (Hz);121 Audio Freq Lower (Hz);121 Audio Sweep Range (Hz);121 Mod Index (%);121 Sweep Rep Rate (Hz);121 Duty Cycle (%);243 Freq (MHz);243 Peak Power (%);243 Sweep Direction;243 Audio Freq Upper (Hz);243 Audio Freq Lower (Hz);243 Audio Sweep Range (Hz);243 Mod Index (%);243 Sweep Rep Rate (Hz);243 Duty Cycle (%);Full Binary;Description; Temperature 1;Temperature 2.

Note: All power measurement units are in dBm for Direct Input mode and in % for Antenna or Screen Box Input modes.

When the Tester is in **Continuous Mode**, each set of measurement data will be appended to the measurement data file.

VIT Data File Structure:

The VIT Data file is a delimited text file (TXT format) suitable for importing into a spreadsheet or database.

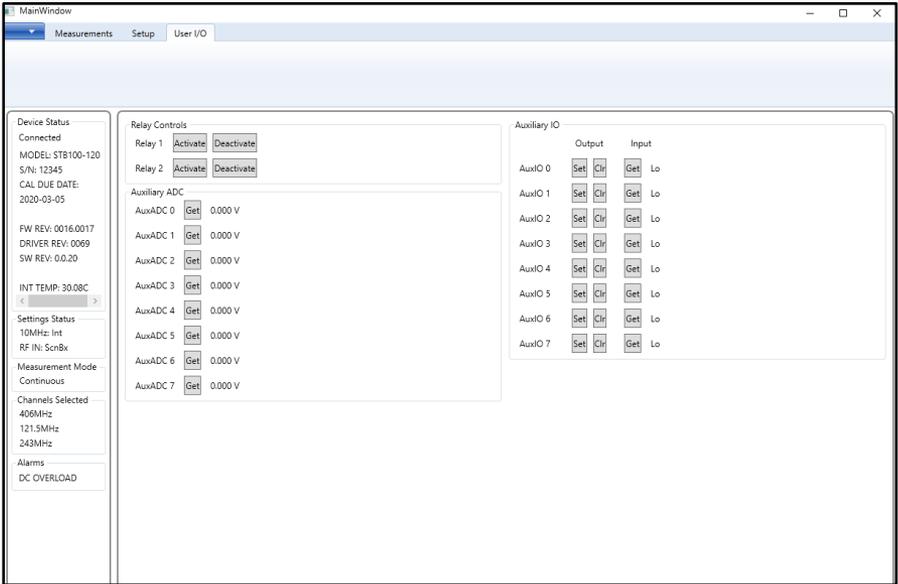
The header section of the file contains the Filename;Unit Model Number & Serial Number;Cal Due Date;Tester Internal Temperature; FW/Driver Revisions;Organization;Tested By;Date/Time.

The body contains the Delta Time;Current;Vin;Vout;Temperature 1;Temperature 2.

Graphics Files:

The Graphics folder contains the data used for the graphics files. This data represents each Graphic plot with 200 data points in a TXT format, along with a PNG format graphic for each measurement.

USER IO SCREEN



The STB100 is equipped with useful features in the USER IO section. These include:

- 2 Relays
- 8 Auxilliary ADC lines (0-12V)
- 8 Auxillary I/O lines (logic level)

These features can be used statically here. Those users that purchase the API Set option can integrate these features into their own customized software.

Click on the **USER IO** tab. This screen allows control of the Relays, Auxiliary ADC, and Auxillary I/O lines.

Breakout Board and Cable:

In order to make it easier to integrate USER IO functions, a Breakout Board and Cable are available from WST. The part number is 850-BB100.

SOFTWARE UPDATES

Software updates are available free of charge on the WS Technologies Inc. website: <https://www.wst.ca/stb100software.html>

You are encouraged to keep your STB100 software up to date by downloading and installing the most current software revision.

STB100 MODEL UPGRADING

All models can be remotely upgraded as desired. Please contact WS Technologies Inc. at sales@wst.ca for upgrade costs and procedures.

FREQUENTLY ASKED QUESTIONS

My STB100 won't receive either 406 MHz or 121.5 MHz.

Ensure that the proper Input mode is selected. If you are receiving a beacon self test transmission through its antenna, then select **Antenna**. If you are connected directly to the beacon then select **Direct Connection**.

When I activate the beacon in self test mode, the measurements produce questionable results. Is there a problem with the beacon?

In order to meet all of the Cospas-Sarsat requirements, a beacon is allowed a 15 minute warm-up period. When testing a beacon in self test, there is no warm-up period, hence some measurements may be somewhat skewed.

Also, in self-test, the 121.5 homing transmission may be different depending on the particular beacon. Some beacons transmit a short modulated signal, some beacons transmit a shorter unmodulated signal and some beacons transmit no signal.

I am testing an ELT with separate 121.5 and 406 output connectors. What do I do to get the results printed on one Test Report?

The WST accessory 850-CMB102 is a low loss, 121.5/406 signal combiner. It can be used to combine the separate outputs from the ELT. Alternatively, you can complete the measurement in two steps: first, connect to the 121.5 transmitter, then start the test. Once the STB100 gives the indication that the 121.5 signal has been received then switch the cable to the 406 transmitter without stopping the test. Once the 406 burst is received on the STB100, the measurement will be complete.

The beacon I want to measure has offset training frequencies on 121.5 and 243 MHz. How do I setup the Beacon Tester to receive these training frequencies?

Measuring Training Frequencies is easy. Go to the Setup > VHF Training Frequencies and select the training frequencies you are using.

SPECIFICATIONS

406 MHz Measurements		Uncertainty
Measures all Cospas-Sarsat Channels		-
15 HEX ID		-
Full HEX		-
Decodes all Cospas-Sarsat protocols		-
Frequency (Ext Ref)		± 0.1 Hz
Frequency (Int Ref)		
Leaving factory		± 100 Hz
Long Term		± 1.0 ppm/yr
Frequency Stability (using Ext Reference)	Nominal Frequency	± 2.5 x 10 ⁻¹¹
	Short Term	
	Medium Term – Mean Slope	
	Medium Term - Residual	
Power		± 0.25 dB ¹
Power rise time		± 0.5 ms
Pre-burst level		± 1.0 dB
Pulse Repetition period		± 10 ms
Bit rate		± 0.2 bps
CW preamble time		± 0.5 ms
Total transmission time		± 0.5 ms
Rise time		± 20 µs
Fall time		± 20 µs
Phase deviation: positive		± 0.04 rad
Phase deviation: negative		± 0.04 rad
Modulation phase symmetry		± 0.005
121.5/243 MHz Measurements		
Frequency (Ext Ref)		± 30 Hz
Frequency (Int Ref)		
Leaving factory		± 100 Hz
Long Term		± 1.0 ppm/yr
Peak Power		± 1dB
Sweep Direction		-
Audio Frequency - upper		± 30 Hz
Audio Frequency - lower		± 30 Hz
Audio Sweep Range		± 60 Hz
Modulation Index		± 5%
Sweep Rep Rate		± 0.1 Hz
Duty Cycle		± 2%
Graphic Measurements		
-406 spectrum mask graphics data		-
-406 output power during burst graphic data		-
-406 phase modulation graphics data		-

¹35-39 dBm

SPECIFICATIONS (cont'd)

Miscellaneous Measurements	Range	Uncertainty
Vin @ DC PWR IN	1V to 30V	± 2%
Vout @ DC PWR OUT	1V to 30V	± 2%
Iout @ DC PWR OUT	5mA to 8A	± 2% (>100mA)
leakage current @ DC PWR OUT	200 nA to 40 µA	± 5%
Vdropout (Vin to Vout)	50 mV/A	-
Aux Analog Input (Aux ADCn)	0 – 12V	± 2%
Temperature (probe 1 and probe 2)	-60°C to +75°C	± 0.5 C°

Interface Parameters		
50 Ω RF Input		
Connector		BNC-f
VSWR		1.20:1
Dynamic Range:	Direct Connection	Screen Box Connection
406 MHz Burst	+20 dBm to +43 dBm	-10 dBm min
121.5 MHz/243 MHz	+ 5 dBm to +35 dBm	-15 dBm min
Absolute Maximum Input Level (Burst)		+44 dBm
Absolute Maximum Input Level (Continuous)		+35 dBm
Antenna RF Input		
RF Range		
406 MHz	>10 m	
121.5 MHz/243 MHz	>3 m	
Connector		SMA-m (RP)
Absolute Maximum Input Level		10 dBm
10 MHz Input		
Connector		BNC-f
VSWR		1.40:1
Input Level Range		-10 to +10 dBm
GPS ANT Input		
Connector		SMA-f
Bias		+5V current limited
USER I/O Connector		
Connector		D-subminiature, 26 pin, HD
Functions:		
-AUX I/O	-8 I/O lines, 5V TTL Tolerant	
-AUX ADC	-8 analog inputs, 0V -12 V	
-RELAY1	-Relay1 NC/NO 60V 2A	
-RELAY2	-Relay2 NC/NO 60V 2A	
-PPS Out	-GPS 1 PPS Output	
-GPS Tx	-GPS Tx	
-GPS Rx	-GPS Rx	
-Ground	-Ground	
PPS OUT		
Connector		SMA-f
Level		Logic level
AC Power Input		
Connector		IEC 320 Appliance Input
Voltage		85-264 VAC
Frequency		47-63 Hz
Environmental and Mechanical		
Operating Temperature Range		+10°C to +35°C
Storage Temperature Range		-20°C to +60°C
Temperature Probe type		RTD
Dimensions: w x l x h mm (inches)		210 (8.3) x 280 (11.1) x 64 (2.5)
Weight		2.73 kg (6.0 lbs)

REGULATORY INFORMATION

CANADA

This device complies with Industry Canada's licence-exempt RSSs.

Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

USA

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

EUROPEAN UNION

DECLARATION OF CONFORMITY

Supplier Name: WS Technologies Inc.
Supplier Address: #2 – 215 Neave Road
Kelowna, B.C.
Canada V1V 2L9

Declares under our sole responsibility that the following product

Product Name: Beacon Test Bench
Model STB100

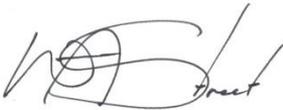
Conforms to the following normative European and International Standards

Normative Standards: EN 301 489-1 V1.9.2 (2011-09)
EN 55022:2010
EN 61000-4-2:2008
EN 61000-4-3:2010
EN 61000-4-6:2008-10
EN 61000-4-11:2004

Following the provisions of the normative European Council Directive 2004/108/EC EMC Directive.

Product conformance to cited product specifications is based on sample (type) testing, evaluation, or assessment at Celltech Labs Inc. located in Kelowna, Canada.

Supplementary Information: This product was tested and complies with all the applicable requirements for the CE Mark.



W. Street
President
WS Technologies Inc.
#2 – 215 Neave Road
Kelowna, BC
Canada V1Y 5L9
Phone: (250) 765-7583
FAX: (250) 765-1652

WARRANTY INFORMATION

WS Technologies Inc. (WST) warrants the products manufactured by WST to be free from defects in material and workmanship for one year from the date of shipment. Liability of WST under the foregoing warranty is limited to the replacement or repair, at the option of WST, of any products which show defective workmanship or materials within one year from the date of shipment, which replacement shall be made Exworks (EXW) WST's facility in Kelowna, BC, CANADA, upon proof satisfactory to WST of the defect claimed. Except for the foregoing warranty, WST makes no other warranty, express or implied, as to the merchantability or fitness for a particular purpose of products shipped or the performance thereof, and does not make any warranty to the purchaser's customers or agents.

CALIBRATION

The STB100 has been designed to have a standard two year calibration cycle. The calibration date appears on the Calibration Certificate supplied with the Beacon Tester and the Calibration sticker applied to the top of the unit.

Before returning a unit for calibration, email returns@wst.ca to obtain an RMA (Return Materials Authorization) number and shipping instructions. Once calibrated, a new Cal Due date label will be placed on the back of the unit and a new Calibration Certificate will be issued.

RETURNS

An RMA (Return Materials Authorization) number must be obtained by emailing returns@wst.ca . If the unit being returned is not covered under warranty, a minimum repair charge will apply. If damage is severe or the products have been tampered with, there may be additional charges.

POWER CONVERSION CHART - dBm to Watts

dBm	Watts	dBm	Watts	dBm	Watts
-12	0.06 mW	8	6 mW	28	630 mW
-11	0.08 mW	9	8 mW	29	800 mW
-10	0.10 mW	10	10 mW	30	1.0 W
-9	0.13 mW	11	13 mW	31	1.3 W
-8	0.16 mW	12	16 mW	32	1.6 W
-7	0.20 mW	13	20 mW	33	2.0 W
-6	0.25 mW	14	25 mW	34	2.5 W
-5	0.32 mW	15	32 mW	35	3.2 W
-4	0.40 mW	16	40 mW	36	4.0 W
-3	0.50 mW	17	50 mW	37	5.0 W
-2	0.63 mW	18	63 mW	38	6.3 W
-1	0.8 mW	19	79 mW	39	8.0 W
0	1.0 mW	20	100 mW	40	10 W
1	1.3 mW	21	126 mW	41	13 W
2	1.6 mW	22	158 mW	42	16 W
3	2.0 mW	23	200 mW	43	20 W
4	2.5 mW	24	250 mW	44	25 W
5	3.2 mW	25	316 mW	45	32 W
6	4 mW	26	398 mW	46	40 W
7	5 mW	27	500 mW	47	50 W