

# Beacon Test Bench

# **Operator's Manual**

**STB100** 

Version 2.10

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# 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.

**AIS(Rx):** Adds the capability to decode and measure the AIS channel in AIS-EPIRBs.

**AIS(Rx & Tx):** Adds the capability to measure AIS transceivers in accordance with IMO MSC.1Circ.1252. This option will measure AIS-EPIRBs also.

# UNPACKING

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

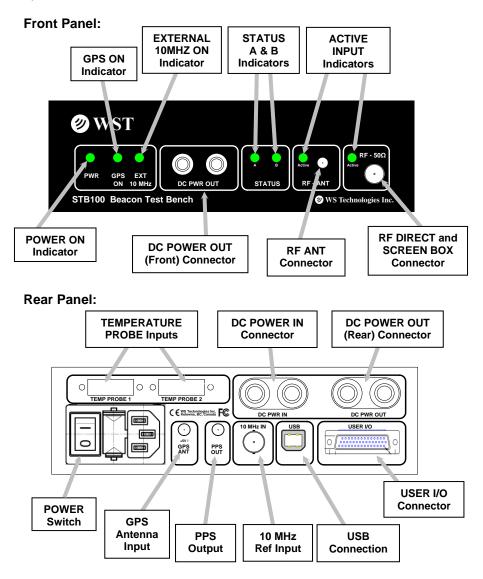
- STB100 Beacon Test Bench
- Operator's Manual
- Certificate of Calibration with Calibration Data
- Front Panel Antenna
- USB to PC Interface Cable
- GPS Magnetic Mount Active Antenna
- AC power cable

# 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.



# Installing the Application:

# NOTICE!

Install the Beacon Test Bench software before

connecting the device to the USB port.

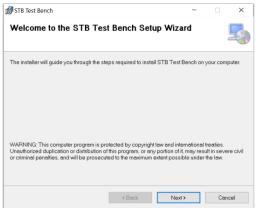
The STB100 Application must be installed on your computer prior to connecting the device.

Go to <u>www.wst.ca/stb100</u> and install the latest version of the STB100 software. The following message may appear.

	n't verify who	o created this file	e. Are you sure you	want to run this			
file?							
17	Name:TB100\Software\Builds\Build 292 - Beta\Installer.msi						
	Type:	Windows Install	er Package				
	From:	V-\PROJECTS\ST	B100\Software\Build	s\Build 292 - Be			
			Run	Cancel			

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

The STB Test Bench Wizard will appear.



Follow the prompts to complete the installation.

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 four main screens, the **Measurement** screen, the **Setup** screen, the **Limits** screen, and the **USER I/O** screen, each accessible from the tabs near the top of the screen.



If the STB100 includes the AIS(Rx&Tx) option, the following screen will appear:

Beacon					AIS			
Measuren	nents	Setup	Limits	User I/O	IMO Test	Individual Tes	sts Setu	up
-								
	Sing	le Cor	ntinuous	Measurem	ent - Basic	Detailed RF Meas	surements	AIS Details
	Sing Limits		nits Off	Measurem	ent - Basic		surements Graphics	AIS Details File View

# **Measurement Screen:**

STB100 Beacon Test Be Measurements Setur						
Single C			ilename: burst-35	Generate Pass Fail Test Report		
Device Status Not Connected O MODEL: S/N: CAL DUE DATE: 	15 Hex ID: Protocol: Full Hex: Burst Mode: Date/Time:				File View           ▷ burst-34 (3)           burst-33           burst-32           burst-31           ▷ burst-30 (32)           burst-29	^
FW REV: DRIVER REV: 2.15 SW REV: 2.15.290b	RF Measurements 406MHz Frequency (Int): Power:	121.5MHz Frequency (Int): Peak Power:	243MHz Frequency (Int Peak Power	n	burst-27 burst-26 burst-23 burst-21 burst-20 (5)	
INT TEMP: °C Settings Status 10MHz: Int RF IN: Direct	Power Rise Time: Pre-Burst Level: Repetition Period: Bit Rate: Unmodulated CW: Transmission Time:	Sweep Direction: Audio Frequency Upper: Audio Frequency Lower: Audio Sweep Range: Sweep Rep Rate: Modulation Index:	Sweep Direction Audio Frequency Upper Audio Frequency Lower Audio Sweep Range Sweep Rep Rate Modulation Inde	n n t: t:	burst-19 burst-18 burst-17 burst-16 burst-15	
Measurement Mode Continuous Limit Tester: Off	Modulation Rise Time: Modulation Fall Time: Positive Phase: Negative Phase:	Duty Cycle:	Duty Cycle		burst-14 burst-13 burst-12 burst-11	
Channels Selected 406MHz 121.5MHz 243MHz	Graphics				<ul> <li>burst-10 (2)</li> <li>burst-9</li> <li>burst-8</li> <li>burst-7</li> <li>burst-6</li> </ul>	
	Leakage Measure Leakage Leakage Current:				yolo-39 yolo-38 yolo-37 yolo-36	

# Setup Screen:

Beac	on	AIS	
asurements Setup	Limits User I/O IMO Test In	lividual Tests Setup	
vice Status nnected	User Data Name: Tester		Measurements Select Channels for Measurement
DEL: STB100-121 4: 60002	Company: Company		<ul> <li>✓ 406MHz</li> <li>✓ 121.5MHz</li> </ul>
L DUE DATE: 22-11-25	Device Settings		243MHz AIS
	10MHz	Internal     External	Test Duration
V REV: 0003.0074 RIVER REV: 2.16	RF IN Mode	<ul> <li>Direct</li> <li>Antenna</li> </ul>	Test duration in continuous mode: 30 (1 to 43200 minutes)
V REV: 2.16.292b		<ul> <li>Screen Box</li> </ul>	Cable Loss Factors
T TEMP: 28.7 °C	Files		_ 406 MHz 0.0 dB
tings Status	Measurement Files Location C:\WST\STB100 Browse		Browse dB
MHz: Int	Filename: burst	Auto Increment Filename	243 MHz 0.0 dB
IN: Direct	Report Header Logo		AIS 0.0 dB
easurement Mode	Report Header Logo		Location Format
ontinuous mit Tester: Off			dd.dddd*
annels Selected	Ø W		⊖ dd* mm.mm' ⊖ dd* mm'ss*
6MHz		31	Location
1.SMHz			0.000
3MHz	Update Image Senable Imag	e In Test Report	GPS on     Get GPS Location
	Upgrades and Software Updates		Location of STB100 installation (dd.dddd*)
			Latitude: 0.0000 *
	Upgrades		Longitude: 0.0000 *
	Check for Updates Current Version:	2.16.292b	VIT Settings
	Misc		VIT functions on VIT - real time: Voltage in:
	Measurement Detected Sound	On     Off	Zero Current Sensor Current:
		5.0 WILL	Ensure all loads are removed and Temperature 1:
	VHF Training Frequencies	121MHz Off ~	then press the button to zero the Temperature 2:

# Limits Screen:

Ø	STB100	Beacon	Test	Bench	
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- 🗆 ×

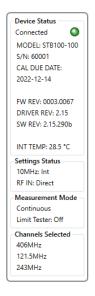
Measurements Setup	Limits	User I/O				
Limits Filename: Open limit tester file: F	Save Loa Browse	ad Defaults Select All Select Defaults Select	Stop measurement w Fail if location is defa Options			
Device Status	SELECT	PARAMETER	UNITS	LOWER LIMIT	UPPER LIMIT	
Not Connected 🥥	~	406 Frequency (Int Ref)	MHz	406.019575	406.081425	
MODEL:	~	406 Frequency (Ext Ref)	MHz	406.019999	406.081001	
S/N:	~	406 Power (Direct)	dBm	34.5	39.5	
CAL DUE DATE:	~	406 Power (Direct) (ELT-DT)	dBm	35.5	39.5	
		406 Power (Antenna)	%	5.0	110.0	
FW REV:		406 Power (Scn Box)	%	5.0	110.0	
DRIVER REV: 2.15		406 Power Rise Time	ms	0.00	5.50	
SW REV: 2.15.290b		406 Pre-Burst Level	dBm	-50.0	-11.0	
		406 Rep Period	5	47.5	52.5	
INT TEMP: °C		406 Rep Period (ELT-DT)	s	5.0	30.0	
Settings Status		406 Bit Rate	Hz	395.8	404.2	
10MHz: Int RF IN: Direct		406 Bit Rate (ELT-DT)	Hz	399.4	400.6	
		406 Unmodulated CW Time	ms	157.6	162.4	
Measurement Mode		406 Total Transmission Time (Short)	ms	435.1	444.9	
Limit Tester: Off		406 Total Transmission Time (Long)	ms	514.3	525.7	
Channels Selected		406 Mod Rise Time	μs	40.0	260.0	
406MHz		406 Mod Rise Time (ELT-DT)	μs	40.0	170.0	
121.5MHz		406 Mod Fall Time	μs	40.0	260.0	
243MHz		406 Mod Rise Time (ELT-DT)	μs	40.0	170.0	
		406 Positive Phase	rad	0.96	1.24	
		406 Negative Phase	rad	-1.24	-0.96	
		406 Phase Symmetry	%	0.00	0.50	
		406 Short Term	/100ms	0.000e00	2.000e-09	
		406 Medium Term - Slope	/min	-1.000e-09	1.000e-09	
		406 Medium Term - Residual		0.000e00	3.000e-09	
		406 Nominal Frequency	MHz	406.019575	406.019575	
		406 △ Distance (SLP, NLP, ELT-DT and RLS)	m	0	500	
		406 Δ Distance (ULP)	m	0	5250	
		406 Spectral Mask Corner 1 (3kHz) Corner 2 (7kHz) Corner 3 (12 kHz)	dBC		-17 -27 -32	
J	[	Corner 4 (24 kHz)			-37	

# User IO Screen:

STB100 Beacon Tes	t Bench					-	$\times$
Measurements S	tup Limits	User I/O					
Device Status	Relay C	ontrols		 Auxiliary IO			
Connected MODEL: STB100-10	Relay 1		te Deactivate	,	Output	Input	
S/N: 60001	Relay 2	Activat	te Deactivate	AuxIO 0	Set Clr	Get Lo	
CAL DUE DATE: 2022-12-14	Auxiliar	y ADC	-	AuxIO 1	Set Clr	Get Lo	
FW REV: 0003.0067	AuxAD	C 0 Get	0.000 V	AuxIO 2	Set Clr	Get Lo	
DRIVER REV: 2.15	AuxAD	C 1 Get	0.000 V	AuxIO 3	Set Clr	Get Lo	
SW REV: 2.15.290b	AuxAD	C 2 Get	0.000 V	AuxIO 4	Set Clr	Get Lo	
INT TEMP: 28.4 °C	AuxAD	C 3 Get	0.000 V	AuxIO 5	Set Clr	Get Lo	
Settings Status 10MHz: Int	AuxAD	C 4 Get	0.000 V	AuxIO 6	Set Cir	Get Lo	
RF IN: Direct	AuxAD	C 5 Get	0.000 V	AuxIO 7	Set Clr	Get Lo	
- Measurement Mode Continuous	AuxAD	C 6 Get	0.000 V				
Limit Tester: Off	AuxAD	C 7 Get	0.000 V				
Channels Selected 406MHz 121.5MHz 243MHz			u				

# **Device Status Panel:**

The Device Status Panel is shown on the left side which shows the user various device settings and the status of various functions.



# Beacon Setup Screen Configuration:

Go to the Setup Screen by clicking on the Setup tab.

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

#### User Data section:

Enter the **Name** of the user performing the tests. Enter the name of the **Company**. 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 directly the output of the beacon using a  $50\Omega$  cable. This mode will result in a very accurate absolute power measurement in dBm.

#### 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.

#### 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 %.

#### 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 beacon 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. You can start the auto-incrementing number at any desired number by placing '-#' at the end of the filename. The # is the start number.

#### Report Header Logo:

Click **Update Image** to select an image to be displayed at the top of a beacon test report. This image will be sized automatically to fit at the top of the Test Report.

To enable or disable displaying the selected image in a beacon Test Report, toggle *Enable Image In Test Report.* 

#### 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.

#### Misc:

#### Measurement Detected Sound:

Select On or Off to enable or disable the audio sounds played when a signal is detected.

#### 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. Click the **VHF Training Frequencies** dropdown to select the appropriate frequencies.

#### **Measurements:**

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

#### Select Channels for Measurement:

Select the channels you wish to receive. The 243MHz and AIS channels cannot be selected at the same time.

**Note**: The AIS channel is available with the AIS(Rx) or AIS(Rx&Tx) upgrade.

#### Test Duration:

Select the box and enter the desired duration of the test in minutes. Testing will continue for the specified duration when in Continuous mode. If not selected, the test will run until Stop is pressed.

#### Cable Loss Factors:

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

Location Format: Select the desired location format.

#### Location:

The location of the STB100 installation can be entered manually or automatically. To enter automatically, select **GPS On**. Ensure the GPS antenna is connected to the **GPS ANT** connector on the rear of the STB100. Once the internal GPS receiver has location data, the green **GPS ON** LED on the faceplate will illuminate. Press **Get GPS Location** and the location will be entered into the Latitude and Longitude boxes. 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 Limits tab.

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

#### Selecting Parameters:

You can select which parameters you wish to include in the Limits Testing. 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 changed 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 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.

# Selecting and Sorting Limits:

The **Select All**, **Deselect All** and **Select Defaults** buttons allow you easily modify selected limits. Clicking the **PARAMETER** and **SELECT** tabs will allow you to order the limits by name and selected.

#### **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 (\*\*.\*\*).

# Measurement Screen Configuration:

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

#### Measure:



The **Start** button will start the test. The test will continue until the **Stop** button is pressed or the test duration (setup in the Setup section) is reached.

**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), or until *Stop* is pressed.

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.

leasurements Setup	Limits User I/O		
Single C	ontinuous Measurement - Basic Detailed RF I		
Limits On	imits Off Stability VIT Leakage	Graphics File View Open Measurement File: Browse	
Measure	Screen Vie	Fail	
Device Status	15 Hex ID: 2788334E1EF	EREE	File View
Connected 🥥			burst-34 (3) burst-33
MODEL: STB100-100 5/N: 60001	Protocol: Standard Location Serial E Full Hex: FFFED093C419A70F322EF		burst-32
CAL DUE DATE:	Burst Mode: Self test mode (long)		burst-31
2022-12-14	Date/Time: 2021-01-29 10:36:21 AM		burst-30 (32)
1022-12-14			burst-29 burst-27
W REV: 0003.0067	406 Message Decode	RF Measurements	burst-2/ burst-26
RIVER REV: 2.15	15 Hex Checksum: 824D3	406MHz 121.5MHz	burrt-22
W REV: 2.15.290b	Country Code: Canada (316)	Frequency (Int): 406.036940 MHz Frequency (Int): 121.499938 MI Power: 16.0 dBm Peak Power: 20.4 dBm	Hz burst-21
	Serial Number: 9999 C/S Number: 102	Power Rise Time: 0.25 ms Sweep Direction: Upwards	▷ burst-20 (5)
NT TEMP: 29.1 *C	Bits 107 to 110: Default	Pre-Burst Level: -30.5 dBm Audio Frequency Upper: 1500	burst-19
ettings Status	Position Source: External GPS	Repetition Period: Audio Frequency Lower: 500	burst-18 burst-17
MHz: Int	Auxiliary Radio: 121.5 MHz	Bit Rate: 400.2 bps Audio Sweep Range: 1000 Unmodulated CW: 160.0 ms Sweep Rep Rate: 3.0 Hz	burst-1/ burst-16
F IN: Direct	Latitude: 49.9222° Longitude: -119.3944°	Transmission Time: 518.5 ms Modulation Index: 83.8 %	burst-15
easurement Mode	Model: NAT SATFIND-406	Modulation Rise Time: 148.5 µs Duty Cycle: 38.9 %	burst-14
ontinuous	GPIRB	Modulation Fall Time: 148.5 µs	burst-13
imit Tester: Off	Δ Distance: 12,055,323 m	Positive Phase: 1.05 rad	burst-12
hannels Selected		Negative Phase: -1.18 rad Modulation Symmetry: 0.00 %	burst-11
06MHz		industrial synthesis, and to	burst-10 (2) burst-9
21.5MHz	Graphics		burst-8
43MHz	Power vs Time	Spectrum Share Alexander Phase vs Time	burst-7
п	8d9/div Power vs Time 100ms/div 10	selidiv Spectrum 80kHz Span 0.5 matriciv Phase vs Time 1.0 matrix	burst-6
			yolo-39
			yolo-38 yolo-37
			volo-36
			volo-35 (4)
		a shalla f	▷ yolo-34 (3)
			▷ yolo-33 (3)
			▷ yolo-32 (4)
	Details		▷ yolo-31 (4) yolo-30
	Stability Le	akage	yolo-su ▷ yolo-29 (3)
	Short Term:	Measure Leakage	volo-28 (6)
	Med Term - Slope: Med Term - Residual:	Leakage Current:	yolo-27
	Ned Ierm - Residual: Nominal Frequency:	*	▷ yolo-26 (3)
	S1: 406036939.559		yolo-25
	S2: 406036904.388		volo-24 (2) volo-23
	S3: 406036904.105		yolo-23

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

**Detailed RF Measurements** includes 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.

**AIS Details** includes all associated AIS messages in a dropdown list displaying all decode details along with AIS channel number, frequency, power, and transmission time.

File View displays all measurements contained in the **Measurement** Files Location determined in the Setup. Click on a measurement to view the data. A dropdown on Continuous mode measurements is available to select specific bursts within the measurement.

#### File:



When running tests in Continuous mode, the filename will be appended with the measurement number in brackets. You can quickly view the previous measurements by pressing or holding down  $\triangleleft$  or  $\blacktriangleright$ .

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 saved in the Measurement File location.

With *Limits ON* selected, 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.

An image will be displayed in the top left-hand corner of the Test Report if you have selected **Enable Image In Test Report** in the **Report Header Logo** section of the **Setup** screen.

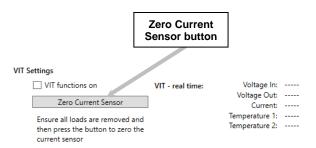
#### VIT Configuration:

On the **Setup** screen, 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 screen



# 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.
- 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 **filenameVIT.txt** file.
- When all frequency channels are unselected, the Measurement screen will display only VIT data once *Start* 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 **filenameVIT.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<sub>in</sub> measurement represents the voltage at the DC PWR IN terminals, while the V<sub>out</sub> 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 location is available via the *Get GPS Location* button in the **Setup** screen or if you have the **API Set** option. Please refer to the API Listing document.

Ensure the GPS antenna is connected to the **GPS ANT** connector on the rear of the STB100. Once the internal GPS receiver has location data, the green GPS ON LED on the faceplate will illuminate. Press **Get GPS Location** and the location will be entered into the **Latitude** and **Longitude** boxes. This information is used to provide a delta distance when location information is included in location protocol measurements.

# 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 50  $\Omega$  cable between the Beacon and the **RF-50**  $\Omega$  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:

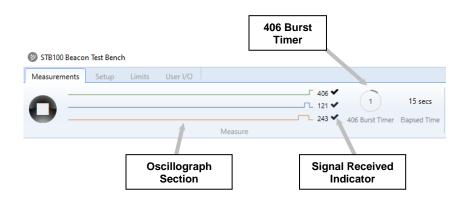
• select Screen Box in the Device Settings on the Setup page.

• attach a 50 $\Omega$  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 *Start*. The ribbon will show the **Oscillograph**, the **406 Burst Timer** and the **Elapsed Time**, along with a **Receive Indicator** for each channel. A check mark will appear in the appropriate **Indicator** box once the signal is received.

The number inside the **406 Burst Timer** will reset to zero after each 406 burst. The rotating indicator on the circumference of the circle is timed for 50 seconds.



The 121, 243, and AIS signals must be received before a 406 burst. 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 *Start.* The ribbon will show the **Oscillograph**, the **406 Burst Timer**, the **Elapsed Time**, the **Time Remaining** (if the Test Duration box has been selected in Setup), along with a **Receive Indicator** for each channel. A check mark will appear in the appropriate Indicator box once the signal is received.



The 121, 243, and AIS bursts must be received before a 406 burst. The measurement is deemed to be completed once a 406 burst is received.

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

Ø STB100	Beacon Test Bench			
Measurer	nents Setup Limits User I/O			
-		405	8 55 secs	Measurement - Basic Detailed RF Measurements AIS Details Filename: burst-1 (3) 💽 3 of 3 🕨
U		AIS1 C	406 Burst Timer Elapsed Tim	Stability VIT Leakage Graphics File View Open Measurement File: Browse
	Measure			Screen View File

The user may scroll through previous measurement results while waiting for the next measurement.

The measurement will terminate once the user clicks the **Stop** button or the **Test Duration** reaches zero.

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

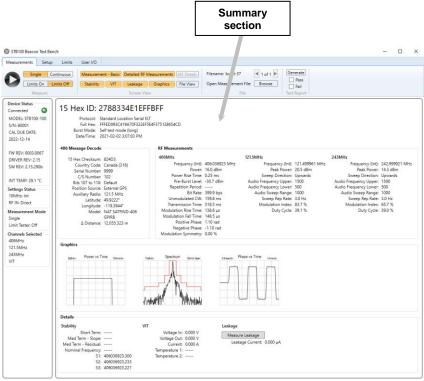
- Ensure the beacon is in its standby or auto mode
- Click the *Measure Leakage* button.

Aeasurements Setup	Limits	User I/O						
Single C			VIT		araphics AIS Details	Filename: burst-34 Open Measureme		Generate Pass Fail Test Report
Device Status Connected O MODEL: STB100-100 S/N: 60001 CAL DUE DATE: 2022-12-14	Burs	Protocol: Star Full Hex: FFF st Mode: Self	88334E ndard Location ED093C419A7( test mode (lor 1-01-29 10:36:	Serial ELT DF322EF5E4F ng)				
W REV: 0003.0067 DRIVER REV: 2.15 SW REV: 2.15.290b NT TEMP: 29.0 °C ettings Status 10MHz: Int F IN: Direct Aeasurement Mode single	15 Hex Coi Seri C Bits Posit		anada (316) 999 Vefault xternal GPS 21.5 MHz 9.9222*	06	Power Rise Tim Pre-Burst Leve Repetition Perio Bit Rat Unmodulated CV Transmission Tim Modulation Rise Tim Modulation Fall Tim	I: -30.5 dBm I: -30.5 dBm I: 400.2 bps I: 160.0 ms I: 518.5 ms I: 148.5 µs I: 148.5 µs	Peak Sweep Di Audio Frequency Audio Frequency Audio Sweep Sweep Re Modulation	
Limit Tester: Off Dhannels Selected 406MHz 121.5MHz	Graphics -	A Distance: 1 Power vs Tim		100kdv	Positive Phas Negative Phas Modulation Symmetry	e: -1.18 rad /: 0.00 %	hase vs Time 10ms/v	
	Med Te Med Term	S2: 4			je sure Leakage 			
	L					Meas Leaka butte	age	

# **MEASUREMENT RESULTS**

#### **Results Screen:**

Once the measurement is completed, 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. In the **Test Report** ribbon, 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.

With the **Limits OFF**, the user can manually enter Pass or Fail before clicking Generate. The Pass or Fail will be shown on the Test Report.

If **Enable Image In Test Report** is selected in **Report Header Logo** section of the Setup screen, the image will be placed in the top left corner of the generated beacon report.

#### 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 easy 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>

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

# Main 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 Freg (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 Frea Upper (Hz): 243 Audio Frea 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.

# AIS Measurement Data File Structure:

The AIS 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 AIS; Receive Channels; FW/Driver Revisions; Organization; Tested By; Date/Time. The body contains the Delta Time (s); Channel Number; Message #; Frequency; Power; Transmission Time; Latitude; Longitude; Description; Full Hex.

#### 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 I/O SCREEN**

easurements Setup	Limits User I/O		
Device Status	Relay Controls	Auxiliary IO	
MODEL: STB100-100	Relay 1 Activate Deactivate	Output	Input
S/N: 60001	Relay 2 Activate Deactivate	AuxIO 0 Set Cli	Get Lo
CAL DUE DATE: 2022-12-14	Auxiliary ADC	AuxIO 1 Set Cli	Get Lo
	AuxADC 0 Get 0.000 V	AuxIO 2 Set Cli	Get Lo
W REV: 0003.0067 DRIVER REV: 2.15	AuxADC 1 Get 0.000 V	AuxIO 3 Set Cli	Get Lo
SW REV: 2.15.290b	AuxADC 2 Get 0.000 V	AuxIO 4 Set Cli	Get Lo
NT TEMP: 28.4 °C	AuxADC 3 Get 0.000 V	AuxIO 5 Set Cli	Get Lo
ettings Status 10MHz: Int	AuxADC 4 Get 0.000 V	AuxIO 6 Set Cli	Get Lo
RF IN: Direct	AuxADC 5 Get 0.000 V	AuxIO 7 Set Cli	Get Lo
Measurement Mode Continuous	AuxADC 6 Get 0.000 V		
Limit Tester: Off	AuxADC 7 Get 0.000 V		
hannels Selected 406MHz			
121.5MHz 243MHz			

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.

# AIS TRANSCEIVER MEASUREMENTS

AIS Transceiver Measurement functionality is only available with the AIS (Rx&Tx) option. Both Class A and Class B AIS transceivers can be measured. No attenuator is required between the AIS transceiver and the STB100.

#### General:

The user must add the AIS transceiver information before making measurements. The STB100 software will keep a list of previously added transceivers which can easily be recalled.

The measurements can be made using a measurement wizard via the *Auto Test Button*, or alternatively, the user can manually select each individual test. The results from each test will be automatically inserted into the appropriate section of the IMO AIS Test Report in accordance with IMO MSC.1/Circ.1252.

Measurements are made with the AIS transceiver connected directly to the STB100 via a 50 $\Omega$  coaxial cable, except for Section 6, *On Air Performance Test*, when the AIS transceiver uses its normal antenna. The 50 $\Omega$  coaxial cable (WST p/n 130-031) and an optional UHF to BNC adapter (WST p/n 385-UHF-101) are available from WST.

#### **Application Screens:**

The **AIS** section has three main screens: the **IMO Test** screen, the **Individual Tests** screen, and the **Setup** screen, each accessible from the tabs near the top of the screen.

🤣 STB100 Beacon Test Bench										
	Beacor	n			AIS					
Measurements	Setup	Limits	User I/O	IMO Test	t Individual Tests Se					
$\mathbf{O}$	Add	elect / Mo	- dify Delete	Gen	erate Open	Show				
Start New Test		Transce	eiver		Report	Device				

# IMO Test screen:

Ø STB100 Beacon Test Bench	h							-	×
Beacon	1		AIS						
Measurements Setup	Limits User I/O	IMO Test	Individual Tests	Setup					
Add S Start New Test	ielect / Modify Delete	Gen	Report Open	Show	v Hide				
Device Status Connected	Transceiver						Test History		
Connected O MODEL: STB100-120	Station				Ship				
S/N: 60001	MMSI Number				Name of Ship:				- 11
CAL DUE DATE: 2022-12-14	Manufacturer:				Port of Registry:				
FW REV: 0003.0067	Model:				Gross Tonnage:				
DRIVER REV: 2.15	Serial Number:				Date Keel Laid:				- 11
SW REV: 2.15.290b	Type:				IMO Number:		Modify	Delete	
INT TEMP: 29.3 °C									_
Settings Status	Test Details								_
10MHz: Int RF IN: Direct	Measurement	Summary	v			Test Steps Summary			
Pilot Plug			,			·····,			
Not Connected									
1 11									- H

# Individual Tests screen:

STB100 Beacon Test Benc	h					-	×
Beaco	1		AIS				
Measurements Setup	Limits User I/O	IMO Test	Individual Tests	Setup			
Add Select / Modify Transceiver	Delete Conne Pilot Pl	ct 📃	AIS1 AIS2 AIS Tx Channel		Direct     Antenna     Screen Box     RF Input Mode		
Device Status Connected  MODEL: ST8100-120 S/N: 60001 CAL DUE DATE: 2022-12-14 FW REV: 0003.0067 DRIVER REV: 2.15 SW REV: 2.15.290b INT TEMP: 29.3 °C Settings Status INT TEMP: 29.1 °C	Tests Receive AIS Mess Receive AIS Mess Receive AIS Mess Receive AIS Mess Receive AIS Mess Send AIS Messag View Pilot Plug Do	age 3 age 5 age 11 age 18 age 24 e 1	Re	sults			
RF IN: Direct Pliet Plug Not Connected	Start Clear Activity Log	Display					

# Setup screen:

Ø STB100 Beaco	n Test Bend	:h						-	×
	Beaco	n			AIS				
Measurements	Setup	Limits	User I/O	IMO Test	Individual Tests	Setup			
Device Status		Radio Ir	nspector Da	ita					
Connected	•	Name:		Tester					
MODEL: STB10 S/N: 60001	0-120	Compa	1014	Company					
CAL DUE DATE:	.	compa	iny.	company					
2022-12-14		Place:							
		Device	Settings						
FW REV: 0003.0 DRIVER REV: 2.		10MHz	2	Internal					
SW REV: 2.15.2				<ul> <li>External</li> </ul>					
		Pilot Plu	ug						
INT TEMP: 29.3		Bau	ud rate:	38400					
- Settings Status 10MHz: Int		Da	ata bits:	8					
RF IN: Direct			Parity:	None					
Pilot Plug		C4.	op bits:	1					
Not Connected	-			-					
		Port	t name:						
			Connect	Ec	dit				
		Report	Header Log	10					
					1.0	20.1			
					IN	10			
			Update Ima	ige					
			Jse beacon i	eport image					
				e in test report					

#### **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 the status of various functions.

# **IMO Test Configuration:**

The ribbon in the **IMO Test** screen has the following sections: Start New Test; Transceiver; Report; and Device Status Panel.

	Bead	:on			AIS		
Measurements	Setup	Limits	User I/O	IMO Test	Individual Tests	Setup	
•	23	2035235 - 55	5 Atlantis			STB100 Co	nnected 🔕
	Add	Select / Modi	fy Delete	Gene	erate Open	Show	Hide
tart New Test		Transceiv	er		Report	Device Sta	atus Panel

## Transceiver:

The **Add** button will open up a new window where users enter information on the AIS transceiver to be tested.

Ø Add Transceiver					-		×
Station Info		!	Ship Info Name of Ship: Port of Registry:				
Model: Serial Number:			Gross Tonnage: Date Keel Laid:	Select a date			15
Туре:	AIS Class A v		IMO Number:	Auto Fill	Save	(	Close

Press *Auto Fill*. The receiver will wait for the Transceiver signal transmission and extract the necessary details. Alternatively, the user manually completes the information, then clicks *Close*.

The **Select/Modify** button will allow users to select a Transceiver from a list of previously tested AIS Transceivers to be tested or to modify the current Transceiver data.

In the **Select/Modify** window, the **Select** button will select the highlighted transceiver. Double-clicking will also select a Transceiver.

In the **Select/Modify** window, the **Modify** button allows users to edit a previously created Transceiver.

Each Transceiver in the list will display the MMSI number, Ship Name, and how many Tests are associated with that ship. Navigate through pages of Transceivers by clicking the arrows. Each page will show a maximum of 10 Transceivers.

The *Delete* button will allow users to delete a selected Transceiver. **Note**: All Tests must be deleted from a Transceiver before deletion can occur.

#### Start New Test:

The *Start New Test* button creates a new IMO Test and opens up a new *IMO Test Summary* window based on the selected Transceiver.

The *IMO Test Summary* is the main window for running IMO tests and inputting IMO test data.

lew Test Summary Press Start Auto Test or doubl	e click an individual te	est				
New Test Created	/					
est Name: IMO Test-1	Created on:	2021-02-08 3:20 PM	Transce	eiver MM	SI: 23203	52
Test Summary						
Step		Completed	Co	mpleted	On	
1. Installation Details		×				
2. AIS programming - Static in	formation	×				
3. AIS programming - Dynami	c information	×				
4. AIS programming - voyage	related information	×				
5. Performance test using mea	suring instrument	×				
6. "On air" performance test		×				
Start Auto Test	Add Com	ments: Remarks	Electro	magnetic	Interfere	no
Start Auto lest	Add com	herres.		inagineare	interiere	- The

The **IMO Test Summary** window allows users to change the **Test Name**, start an *Auto Test*, view the **Activity Log** window, add **Test Remarks**, add **Electromagnetic Interference Comments**, view completion of individual test steps, and navigate to each section of the IMO Test Report.

The *Test Name* will auto generate to the name entered in the **IMO Test** section in the **Setup** tab. It can also be edited here.

The **Show Activity Log** button allows users to show and hide the activity information regarding the current test.

The *Remarks* and *Electromagnetic Interference* buttons open a text box to allow the user to enter information. Information that has been entered here will be shown in the appropriate sections of the IMO test report. *Remarks* and *Electromagnetic Interference* data can also be modified in the **Test Steps Summary** section under *Comments* in the **IMO Test** tab.

#### **Report:**

The **Generate** button will generate an *IMO Test Report* for the selected test. The IMO test generated is based on standards according to IMO SN/Circ.227 and resolution MSC.74 (69), annex 3.

Reports will be saved in the folder named '.../(Transceiver MMSI) – (Transceiver ship name)/'.

The test report will be saved as '(Test date created)-(Test Name).pdf' by default. Options to change the default test name, auto increment test name, and remove the date from the filename are located in the **Setup** screen under the **IMO Test** section.

Options to update the *IMO Test Report* image, disable showing an image in the *IMO Test Report*, or use the Beacon report image are located in the **Setup** screen under the **Report Header Logo** section.

The **Open** button will open the file location where reports are saved for the selected transceiver. If a transceiver is not selected, the button will open at '../(Transceiver MMSI) – (Transceiver ship name)/'.

#### **Device Status Panel:**

The **Show** and **Hide** buttons allow users to show or hide the **Device Status** panel on the left side of the screen.

#### Main IMO Test Screen:

Once the tests are completed or Close has been pressed on the IMO Test Screen page, the Main IMO Test Screen appears.

		A/S				
Setup Limits	User I/O IMO	Test Individual Tests Setup				
Trans	ceiver	Report Dev	ice Status Panel			
er					Test History 1-3 of 3 € →	
Station			Shin		2021-02-09 4:55 PM Name: IMO Test-3	
				- Mark South Str	2021-02-08 3:38 PM Name: IMO Test-2	
		2			2021-02-08 3:20 PM Name: IMO Test-1	
Serial Number:	123456		Date Keel Laid:	021-02-01		
Type:	AIS Class A		IMO Number:	54321	Modify Delete	
Frequency: 16 Power: 41	1.975204 MHz 5 d8m	Frequency: 162. Power: 41.4	025197 MHz dBm	<ul> <li>4. AIS programming - voy</li> </ul>	age related information	
essage Decode		Message Decode				
				1. Installation Details	1.1 AIS transponder type: AIS Class A	
essage 3 (Antenna)				A 7 Initial Installation		
				r.a muar installation o		
Power: 89	.0 %			1.5 M		
	ms					
					rear pilots operating position? Yes / AC provided near pilot plug? Yes	
	232035235 Add Select / M Select / M Station MMS Number Manufacturer Model Serial Number Serial Number Type 3 Details Cannet & Remore M Frequency 16 Power 40 Cannet & Sesage 3 (Anterna)	22203523 - 55 Atlanti Ard Searci Modify Defet Turcestore P Station MMS Number 20205235 Manufacture: McMards Manufacture: McMards Sand Number 220565 Sand Number 220555 Sand Number 2205555 Sand Number 2205555 Sand Number 2205555 Sand Number 2205555 Sand Number 2205555 Sand	222035235 - 55 Adamtis Aradi Select / Modiky Deters Brownshiver er Station MMS Number: 22005235 Manufacturer: McMaudo Model: MS Serial Number: 224585 Type: AIS Clare: A -3 Details Generate Report ment Summary sage 3 (Anternal) Charteri ALS Sage Decode Sage 1 (Anternal) Charteri ALS Sage Decode Sage 1 (Anternal) Charteri ALS Sage 2 (Anternal) Charteri ALS Sage 1 (Anternal) Charteri ALS Sage 1 (Anternal) Charteri ALS Sage 2 (Anternal) Charteri ALS Sage 2 (Anternal) Charteri ALS Sage 2 (Anternal) Charteri ALS Sage 2 (Anternal) Charteri ALS Sage 3 (Anternal) Charteri ALS Sage 2 (Sage 2 Sage 2 S	222035235 - 55 Atlants Are Select / Modify Delite Parameter Par	22035235 - 55 Atlantis     General Open     Still to Connected Open       Signed Kind Marked     Beport     Device Status Parel       Per     Station     Ship       Mass Murdea     Parel     Device Status Parel       Markeduruer     Marka     Parel       Status     Marka     Parel	Z2203523 - 55 Atlantit       Image Strate Connected Image Strate Connected Image Strate Connected Image Strate Stra

The main **IMO Test Screen** displays information based on the selected transceiver; test history associated with the selected transceiver; and a details section that includes measurement and IMO test related data for a selected test.

#### Transceiver:

Information in this section will display read-only data of the selected Transceiver.

#### Test History:

The *Test History* section allows users to **Modify** or **Delete** existing tests associated with the selected transceiver. Clicking the arrows will load more pages of tests. Tests are ordered by the newest created. Add a new test by clicking the **Start New Test** button in the ribbon.

The Modify button will open up an *Existing Test Summary* window.

The **Delete** button will prompt the user by asking if they are sure they want to delete the Test before deleting.

#### Test Details:

The **Test Details** section includes a *Measurement Summary* section and a *Test Steps Summary* section.

The *Measurement Summary* section includes the received AIS measurements and decoded data for the selected test.

The **Test Steps Summary** section includes a selectable list of IMO test sections. Clicking on one of the test sections in the list will display related test data underneath. The **Modify** button will take the user to the **Existing Test Summary** window for the selected individual test. The **Comments** option allows users to view and modify the **Remarks** and **Electromagnetic Interference** fields.

#### Individual Tests Screen Configuration:

The ribbon in the **Individual Tests** screen has the following sections: Transceiver; Pilot Plug; AIS Tx Channel; and RF Input Mode.

Beacon				AIS		
Measurements Setup	Limits	User I/O	IMO Test	Individual Tests	Setup	
232035235 - SS Atlan	tis	Not Conne	ected			<ul> <li>Direct</li> </ul>
Add Select / Modify De	elete	Connec	.t 📃	AIS1 AI	S2	<ul> <li>Antenna</li> <li>Screen Box</li> </ul>
Transceiver		Pilot Plu	Ia	AIS Tx Channe		RF Input Mode

#### Transceiver:

The *Transceiver* section in the ribbon has the exact same functionality as the *Transceiver* section in the **IMO Test** screen's ribbon.

#### Pilot Plug:

The **Connect** button will connect or disconnect a Transceiver Pilot Plug connection. If an error occurs during connection, an error window will be displayed to the user displaying the error.

Configuration for connecting to a pilot plug can be adjusted in the **Setup** screen under the **Pilot Plug** section.

Note: Viewing pilot plug data can be done using the 'View Pilot Plug Data' test.

#### AIS Tx Channel:

Allows users to toggle between channels AIS1 or AIS2 before running tests.

#### **RF Input Mode:**

Allows users to manually switch the STB100 input mode before running tests. This section will also switch the AIS Tx mode to the selected mode.

# Main Individual Test Screen:

Beac	on			AIS				
Measurements Setup	Limits	User I/O	IMO Test	Individual Tests	Setup			
232035235 - SS A Add Select / Modify Transceiver	tlantis Delete	Not Connec Connec Pilot Plu	t	AIS1 AIS2 AIS Tx Channel		Direct     Antenna     Screen Box     RF Input Mode		
Device Status Connected  MODEL: STB100-121 S/N: 60002 CAL DUE DATE: 2022-11-25 FW REV: 0120.0310 DRIVER REV: 3.11 SW REV: 3.11.313b INT TEMP: 32.0 °C	Recei Recei Recei Recei Recei Send	ve AIS Messa ve AIS Messa ve AIS Messa ve AIS Messa ve AIS Messa ve AIS Message AIS Message Pilot Plug Da	ige 3 ige 5 ige 11 ige 18 ige 24 : 1	Re	sults –			
Settings Status 10MHz: Int RF IN: Direct Pilot Plug Not Connected	Star	t Clear	Display					

The main **Individual Test** screen allows users to run individual tests associated with AIS transceivers. This screen has 3 sections: Tests; Results; and Activity Log.

#### Tests:

The **Tests** section contains a list of all available tests to run on an AIS transceiver. With no active transceiver selected in the **Transceiver** section, only the 'Receive AIS message', 'Send AIS Message 1', and 'View Pilot Plug Data' options will be available.

**Note**: The '*Receive AIS message*' test will receive and display the next available AIS message in the *Results* section.

If a Class A AIS transceiver is selected, options 'Receive AIS message 3', 'Receive AIS message 5', and 'Receive AIS message 11' become available to use. Likewise, when a Class B AIS transceiver is selected, options 'Receive AIS message 18', 'Receive AIS message 24' become available to use.

All tests have *Start* and *Clear Display* buttons, which respectively start the selected test and reset the data in the **Results** and **Activity Log** sections.

The 'View Pilot Plug Data' test enables the **Save to File** and **Pop Out** buttons.

The **Pop Out** button opens a new window to view Pilot Plug data.

\$GPGGA,180437.00,4955.32217,N,	1923.68802,W,2,12,0.76,4	26.7,M,-16.1,N	1,,0000	)*6E
\$GPGSA,M,3,16,51,07,09,02,03,26,2	2,29,31,46,04,1.51,0.76,1.3	31*0E		
\$GPGSV,4,1,13,02,08,334,42,03,55,1	85,48,04,80,314,49,06,22,	296,48*75		
\$GPGSV,4,2,13,07,11,233,43,09,40,2	87,47,16,38,128,47,22,32,	172,45*7C		
\$GPGSV,4,3,13,26,44,084,45,29,05,0	34,40,31,19,056,44,46,32,	192,46*7A		
\$GPGSV,4,4,13,51,32,164,44*4D				
\$GPZDA, 180437.00, 22, 01, 2021, 00, 0	0*6F			
\$GPGBS,180437.00,0.6,0.4,1.1,,,,*4A				
!AIVDO.1.1.4.,B3ceFq000=oG@p79	3 <gq3wsuop06.0*68< td=""><td></td><td></td><td></td></gq3wsuop06.0*68<>			
!AIVDO,1,1,5,,B3ceFq000MoG@p79	3 <gq3wt5op06,0*7e< td=""><td></td><td></td><td></td></gq3wt5op06,0*7e<>			
!AIVDO,1,1,6,,B3ceFq000=oG@p79	3 <gq3wtuop06,0*6d< td=""><td></td><td></td><td></td></gq3wtuop06,0*6d<>			
!AIVDO,1,1,7,,B3ceFq000=oG@p79	3 <gq3wu5op06,0*0d< td=""><td></td><td></td><td></td></gq3wu5op06,0*0d<>			
!AIVDO,1,1,8,,B3ceFq000=oG@p79	3 <gq3wuuop06,0*62< td=""><td></td><td></td><td></td></gq3wuuop06,0*62<>			
!AIVDO,1,1,9,,B3ceFq000=oG@p79	3 <gq3wv5op06,0*00< td=""><td></td><td></td><td></td></gq3wv5op06,0*00<>			

**Note:** Please verify if the *Pilot Plug* configuration in the AIS **Setup** screen is correct before connecting to the **Pilot Plug**.

The **Save to File** button will become enabled when **Pilot Plug** data is present. The Pilot Plug data will be saved to a file located at '../Pilot Plug Data/'. The name format of each file generated will be 'yyyymmddhhmmss-PilotPlugData.txt'.

#### Results:

The received AIS message from the selected test as well as **Pilot Plug** data will display in this section.

Activity Log:

The *Activity Log* section will display the processes taking place in the STB100 while running tests.

#### Setup Screen Configuration:

Go to the AIS **Setup Screen** by clicking on the **Setup tab** under the AIS header.

The **Setup Screen** has the following sections: Radio Inspector Data; Device Settings; Files; Pilot Plug; Report Header Logo; IMO Test; and Individual Tests.

#### Radio Inspector Data:

Enter the **Name** of the user performing the tests. Enter the name of the **Company**. Enter the **Place** where the test is taking place. This data will appear at the bottom of a generated *IMO Test Report*.

#### **Device Settings:**

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

#### Files:

Click **Browse** to enter the desired location where all AIS files and reports will be located. Default location is 'C:\WST\STB100 – AIS'.

#### **Pilot Plug:**

Click *Edit* to modify the Pilot Plug connection settings. Baud rate, Data bits, parity, and stop bits are all default to common connection rate settings for Pilot Plug to USB connections.

Port name requires users to locate and find the correct Pilot Plug COM port. Users can find this information by opening up Device Manager and dropping down the 'Ports (COM & LPT)' section. Once open, this section will update every time a COM port is connected and disconnected. Once you have confirmation on your pilot plug COM port, select it from the **Port Name** dropdown and click **Save**.

If a user clicks **Connect** and a connection could not be made to the Pilot Plug COM port, a detailed error message will display information on the cause of the issue.



# Report Header Logo:

Click **Update Image** to select an image to be displayed at the top of an IMO test report.

Toggle **Use beacon report image** to enable or disable the use of the image selected in the **Beacon Setup** screen.

Toggle *Enable image in test report* to enable or disable displaying the selected image in a *Beacon Test Report*.

#### IMO Test:

Enter the desired test name in the **Default test name** box. When **Auto increment test name** is selected, the test name will be appended with a number. This number will automatically increment with each test. The user can specify a custom auto increment number by placing '-#' at the end of the default test name. The **#** is the auto increment starting number.

Toggle *Remove date from filename* to enable or disable adding the current date and time to the start of the IMO report saved filename.

#### Individual Tests:

Select either AIS1 or AIS2 in **AIS Tx channel** to select the STB100 AIS transmitting channel.

The **Clear individual tests from database** button will delete all data in the **Measurement** table. All measurements that fall under this condition will be measurements that were saved to the database via an individual test.

The **Setup STB100 Tx AIS Message** button allows users to modify the AIS Message 1 data transmitted by the STB100. Information on AIS Message 1 and the acceptable adjusted parameter values can be found at <u>https://www.navcen.uscg.gov/?pageName=AISMessagesA</u>.

AIS Message 1 can be sent by selecting the **Send AIS Message 1** test in the **Individual Tests** screen.

# MAKING AIS MEASUREMENTS

You can use the **Auto Test** which will prompt you for various actions until all the tests are completed, or you can complete the tests manually by individually selecting each test.

#### Auto Testing:

Press the **Start Auto Test** button to begin requesting and receiving the appropriate AIS measurement data based on the selected AIS transceiver. A series of popup windows will direct the user on the proper STB100 and AIS transceiver setup for the current test. Each section of the Auto Test will make 3 attempts if it is not successful. All AIS measurement tests in sections 2 to 5 in the **Test Summary** are run in **Direct connection** mode. The section 6 AIS measurement test will be run in **Antenna** mode.

#### Manual Testing:

Double-clicking a *Step* in the *Test Summary* list will navigate the user to the selected individual test.

1. Installation Details:

Installation Details     Please fill out answers to questions				
1.1 AIS transponder type:	AIS Class A	~		
1.2 Type approval certificate	Yes	~		
1.3 Initial installation configuration report on board?	Yes	~		
1.4 Drawing approved?	Yes	~		
1.5 Main source of electrical power	AC	[	Leave	blank
1.6 Emergency source of electrical power	Generator	[	Leave	blank
1.7 Capacity to be verified if the AIS is connected to a battery	Yes	v		
1.8 Pilot plug near pilots operating position?	Yes	~		
1.9 120 V AC provided near pilot plug?	Yes	~		
rest Complete: 🖌				
est complete.				
Go To Summary Page				
			Ck	

Section 1.1 auto selects the transceiver type based on which AIS transceiver class was specified when creating the associated transceiver.

Section 1.5 and 1.6 require users to manually fill out these sections. These sections on the *IMO Test Report* will be left empty if the *Leave Blank* checkbox has been selected. 'N/A' will display on the *IMO Test Report* if no data has been entered and the *Leave Blank* option is unselected.

All other sections have a dropdown list of values to choose from. Leaving a dropdown option unselected will result in 'N/A' displaying on the *IMO Test Report*.

The **Go To Summary Page** button will return to the **Test Summary** window.

2. AIS Programming - Static Information		
2.1 MMSI number	232035235	
2.2 IMO number	Not available	
2.3 Radio call sign	WSTWST1	
2.4 Name of ship	TECH	
2.5 Type of ship	(30) Fishing	
2.6 Ship length and beam	L: 20m B: 20m	
2.7 Location of GPS antenna		
	1m from port. 10m from bow	
Re-Test     Test Complete:		

2. AIS Programming – Static Information:

The *Test* button will start interrogating the selected AIS transceiver for the section 2 AIS message.

The AIS measurement test in section 2 is run in *Direct Connection* mode.

## 3. AIS Programming – Dynamic Information:

IMO Test Summary: 232035235 - SS Atlantis	-		>
3. AIS Programming - Dynamic Information			
3.1 Ships position with accuracy and integrity status	Position Accuracy: Low Longitude: -119.3952° Latitude: 49.9220°		
3.2 Time in UTC	16s		
3.3 Course over ground (COG)	Not available		
3.4 Speed over ground (SOG)	0.8 knots		
3.5 Heading	Not available		
3.6 Navigation status	Constrained by her draught		
3.7 Rate of turn, where available (ROT)	Not available		
3.8 Angle of heel, pitch and roll, where available	N/A		
Re-Test Complete: 💙			
Setting AIS message request to 5 Input mode set to Direct Sending message request and searching for requested measuren Measurement detected Querying measurement data Stopping AIS measurement Stop measurement succeeded	nent		
Go To Summary Page			
lide Activity Log		Cl	ose

The *Test* button will start interrogating the selected AIS Transceiver for the Section 3 AIS message.

The AIS measurement test in section 3 is run in *Direct Connection* mode.

# 4. AIS Programming – Voyage Related Information:

4. AIS Programming - Vo	yage Related Information			
4.1 Ships draught		25.6m		
4.2 Type of cargo		N/A		
4.3 Destination and ETA		Destination: PARIS ETA: 12240807 UTC		
4.4 Route plan		N/A		
4.5 Short safety-related	messages (message 14)	N/A		
Re-Test Message 5	Test Message 14	Test Complete: 💙		
Stop measurement succed Attempt 1 failed Setting AIS Channel to 2 Setting uAIS database lo Setting out and the setting Setting Succe MMSI num Setting AIS message reque Setting source MMSI num Setting AIS message reques Measurement detected Querying measurement Stop measurement succed	ocation number to 232035235 liber to 99999999 est to 5 and searching for requested ata nt	f measurement		
Go To Summary Page				

Section 4.5 requires a user to actively transmit a safety-related message (SRM) from the selected AIS Transceiver. To complete this section, click the **Test Message 14** button and transmit AIS message 14 from the selected transceiver. Please refer to the Transceiver's instruction manual for information on sending the SRM Message 14. Once Message 14 has been received, section 4.5 will update to 'OK'.

The **Test Message 5** button will start interrogating the selected AIS Transceiver for AIS message 5.

The AIS measurement tests in section 4 are run in *Direct Connection* mode.

# 5. Performance Test:

5. Performace Test					
5.1 Frequency measurements		51: 161.97520 52: 162.02519			
5.2 Transmitting output	Channel AIS Channel AIS	1: 41.5 dBm 2: 41.4 dBm			
5.3 Polling information Ch. 70	N/A				
5.4 Read data from AIS	ОК				
5.5 Send data to AIS	ОК				
5.6 Check AIS response to virtual vessels		Test	Virtual	Vessel	
Test Complete: 💙					
Querying measurement data					_
Stopping AIS measurement					
Stopping AIS measurement Stop measurement succeeded					
Stopping AIS measurement Stop measurement succeeded Setting STB100 MMSI number to 999999999					
Stopping AIS measurement Stop measurement succeeded Setting STB100 MMSI number to 999999999 Input mode set to Direct Latitude set to 50.1015"					
Stopping AIS measurement Stop measurement succeeded Setting STB100 MMSI number to 999999999 Input mode set to Direct Latitude set to 50.1015* Longitude set to -119.1164*					
Stopping AIS measurement Stop measurement succeeded Setting STB100 MMSI number to 999999999 Input mode set to Direct Latitude set to 50.1015* Longitude set to -119.1164* Sending message 1 to selected transceiver					
Stopping AIS measurement Stop measurement succeeded Setting STB100 MMSI number to 999999999 Input mode set to Direct Latitude set to 50.1015° Longitude set to -119.1164° Sending message 1 to selected transceiver Message 1 sent					
Stopping AIS measurement Stop measurement succeeded Setting STB100 MMSI number to 999999999 Input mode set to Direct Latitude set to 5.1015* Longitude set to -119.1164* Sending message 1 to selected transceiver Message 1 sent Selected transceiver successfully received virtual vessel					
Stopping AIS measurement Stop measurement succeeded Setting STB100 MMSI number to 999999999 Input mode set to Direct Latitude set to 50.1015° Longitude set to -119.1164° Sending message 1 to selected transceiver Message 1 sent					
Stopping AIS measurement Stop measurement succeeded Setting STB100 MMSI number to 999999999 Input mode set to Direct Latitude set to 50.1015° Longitude set to -119.1164° Sending message 1 to selected transceiver Message 1 sent					~

The *Test Virtual Vessel* button will send a position report message to the selected transceiver to emulate a ship in the area.

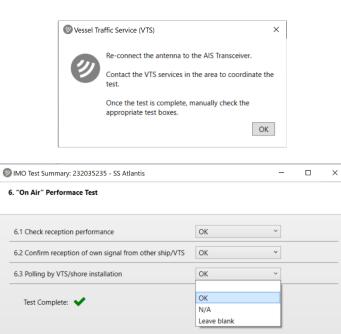
The latitude and longitude included in the sent AIS position report are associated with the latitude and longitude of the transceiver under test. If a position report has not been received by the STB100 for the selected transceiver, the STB100 latitude and longitude located in the **Setup** tab will be used to spoof a ship's location.

The AIS measurement test in section 5 is run in *Direct Connection* mode.

Note: DSC Measurements are not available in the STB100.

## 6. "On Air" Performance Test:

The **"On-Air Performance Test"** requires the Transceiver to be connected with its antenna. The user must contact the Vessel Traffic Services (VTS) in the local area to verify transmission and reception of signals.



Once verified, enter the desired result for each test using the pull-down box.

Close

When completed, click Close.

Go To Summary Page

#### **Review:**

Once the tests have been completed, go to the **Summary** page for reviewing the data prior to generating the *IMO Test Report* 

	Beacon		0		WS						
easurements	Setup Limit	User I/O	IMO Test	Indiv	idual Tests	Setup					
	232035235	- SS Atlanti				070100.0	onnected				
	Add Select / 1	lodify Dele	e Ge	merate	Open	Show	Hide				
rt New Test	Tran	Deiver		Report		Anno and a second second	tatus Panel				
Transceiv	vor							Tect	History 1-3 of 3 +>		
Tanseen	Station						Ship		02-09 4:55 PM Name: IMO Test-3		
	MMSI Number:	202025225					Control Port		2021-02-08 3:38 PM Name: IMO Test-2		
							Name of Ship:		2021-02-08 3:20 PM Name: IMO Test-1		
	Manufacturer:					Port of Registry:					
	Modelt	M5					Gross Tonnage:				
Serial Number						Date Keel Laid:					
	Type:	AIS Class A		IMO Number: 61			IMO Number:	21 ,	Modify Delete		
	rement Summar lessage 3 (Direct)			М	essage 5 (Di			Test Steps Summary - Select a Test Step to View A	Associated Data		
M		51 1.975204 MH .5 dBm		Tra	Char Freque Po	nnel: AIS2 mcy: 162.0251 wer: 41.4 dBm ime: 51.5 ms		<ul> <li>State and a state state state state</li> </ul>	nation		

In the **Details - Measurement Summary** section, the user can review the RF measurement data and the decoded AIS data from each of the received messages.

In the **Details – Test Steps Summary** section, the user can review the data from each individual test.

Once the user is satisfied with the results, the *IMO Test Report* can be generated by pressing the *Generate Report* button.

# IMO TEST REPORTS AND DATA FILES

# Generate and Print IMO Test Report:

Use the buttons in the **Report** ribbon in the **IMO Test** screen to **Generate** or **Open** an IMO test report. A **Generate Report** button is available in the **Test Details** section in the **IMO Test** main screen if a test is selected.

You must have a suitable PDF viewer installed on your PC in order to view and print the IMO Test Report.

If **Enable image in test report** is selected in **Report Header Logo** section of the AIS **Setup** screen, the image will be placed in the top section of the generated IMO test report.

The *IMO Test Report* generated is based on standards according to IMO SN/Circ.227 and resolution MSC.74 (69), annex 3.

## Data Files and Folder Structure:

All measurement, test and transceiver data on the AIS side is saved to an **SQLite Version 3** database named **AISMeasurements.db.** The database is located in the selected folder in the **Files** section in the AIS **Setup** screen. The default location is 'C:\WST\STB100 – AIS'. Measurements can be viewed in the database via a third-party database viewing tool (example: 'DB Browser for SQLite').

*IMO Test Reports* will be saved at '../(Transceiver MMSI) – (Transceiver ship name)/'. The *IMO Test Report* filename will be saved as '(Test date created)-(Test name).pdf' by default. Options to change the default test name, auto increment test name, and remove date from filename are located in the **Setup** screen under the *IMO Test* section.

#### Measurement Table Schema:

```
TABLE Measurement (
    measurement_id TEXT PRIMARY KEY,
    test id TEXT,
    name TEXT,
    date time DATETIME,
    delta time seconds FLOAT,
    channel number TEXT,
    frequency TEXT,
    power TEXT,
     transmission_time_miliseconds FLOAT,
    latitude FLOAT,
    longitude FLOAT,
    description TEXT, -- AIS beacon class comma separated list
    full hex TEXT,
    input_mode TEXT,
    reference mode TEXT
);
```

## SOFTWARE UPDATES

Software updates are available free of charge on the WS Technologies Inc. website: <u>https://www.wst.ca/stb100</u>

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 <u>sales@wst.ca</u> for upgrade costs and procedures.

# FREQUENTLY ASKED QUESTIONS

Also see FAQ on the website - www.wst.ca

## 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*. If you are connected via an external Screen Box, then select **Screen Box**.

# 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 short unmodulated signal, and some beacons transmit no signal.

# The beacon I want to measure has offset training frequencies on 121.5 and 243 MHz. How do I set up 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.

#### Why is my AIS Transceiver not responding to the STB100?

The most common cause of the AIS transceiver being unresponsive to the STB100 is due to the incorrect MSSI number entered. Double-check the STB100's MSSI setting matches the transceiver.

# How can I find out my AIS Transceiver's MSSI (User ID) number?

When setting up a transceiver, select the "Auto Fill" button in the Add Transceiver screen to have it automatically filled in. To check it manually, go into the Beacon Tester side, select AIS only, and wait for a burst. It will be displayed as the User ID number.

#### I am testing an ELT with separate 121.5 and 406 output connectors. How do I get the results printed on one Test Report? WST has a 121/406 high power, low loss combiner (p/n 850-CMB102) that can be used to combine both channels into one output. Contact sales@wst.ca for information.

#### Is the characteristic swept tone audio that I hear when the Beacon Tester receives a 121.5/243 MHz signal the actual demodulated audio from the beacon?

No, the swept tone audio is just an audio file played when the tester has received a 121 MHz or 243 MHz signal.

# The audible sounds that occur when a signal is received are wonderful, but can I disable them?

Under the Beacon tab, go to Setup > Misc and check the Off box adjacent to Measurement Detected Sound.

Notes:

# SPECIFICATIONS

406 MHz	Measurements	Uncertainty		
Measures all	l Cospas-Sarsat Channels	-		
15 HEX ID	•	-		
Full HEX		-		
Decodes all	Cospas-Sarsat protocols	-		
Frequency (	Ext Ref)	± 1.0 Hz		
Frequency (	Int Ref)			
Leaving fa	actory	$\pm$ 50 Hz		
Long Tern		$\pm$ 1.0 ppm/yr		
Frequency	Nominal Frequency			
Stability	Short Term	$\pm 2.5 \times 10^{-11}$		
(using Ext	Medium Term – Mean Slope	± 2.5 x 10		
Reference)	Medium Term - Residual			
Power		$\pm 0.25 \ dB^{1}$		
Power rise ti	ime	$\pm 0.5$ ms		
Pre-burst lev		± 1.0 dB		
Pulse Repeti	ition period	± 10 ms		
Bit rate		$\pm 0.1$ bps		
CW preamb	le time	± 0.8 ms		
Total transm	ission time	± 0.8 ms		
Rise time		$\pm 10 \ \mu s$		
Fall time		$\pm 10 \ \mu s$		
Phase deviat	tion: positive	± 0.02 rad		
Phase deviat	tion: negative	± 0.02 rad		
Modulation	phase symmetry	± 0.005		
121.5/243	MHz Measurements			
Frequency (	Ext Ref)	± 30 Hz		
Frequency (				
Leaving fa	actory	± 60 Hz		
Long Tern		$\pm$ 1.0 ppm/yr		
Peak Power		± 1.0 dB		
Sweep Direc	ction	-		
Audio Frequ	iency - upper	± 30 Hz		
Audio Frequ	iency - lower	± 30 Hz		
Audio Swee	p Range	± 60 Hz		
Modulation	Index	± 5%		
Sweep Rep 1		± 0.1 Hz		
Duty Cycle		± 2%		
AIS Meas	urements			
Frequency (	AIS1 & AIS2) (Ext Ref)	± 30 Hz		
Frequency (	Int Ref)			
Leaving fa		± 60 Hz		
Long Tern		$\pm 1.0 \text{ ppm/yr}$		
Power		± 1.0 dB		
•	Aeasurements			
	m mask graphics data	-		
	power during burst graphic data	-		
-406 phase r	nodulation graphics data	-		

<sup>1</sup>35-39 dBm

# SPECIFICATIONS (cont'd)

Miscellaneous Mea	surements	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		± 5%	
Vdropout (Vin to Vout	)	50 mV/A		-	
Aux Analog Input (Au		$0 - 12V$ $\pm 2\%$			
Temperature (probe 1 a		-60°C to +	75°C	$\pm 0.5 \ C^{\circ}$	
Interface Paramete	rs				
50 Ω RF Input			2110.0		
Connector			BNC-f		
VSWR	D: 10		1.20:1 Screen Box Connection		
Dynamic Range:	Direct Connec				
406 MHz Burst	+20  dBm to +		-13 dBm min		
121.5 MHz/243 MHz	+5  dBm to +		-16 dBm min		
AIS	+20  dBm to +		+5 dBm min +44 dBm		
Absolute Maximum Ing Absolute Maximum Ing	ut Level (Burst)	none)	+44 dBm +35 dBm		
Antenna RF Input		uous)	+55 ubiil		
RF Range					
406 MHz			>5 m		
121.5 MHz/243 MHz			>5 m		
AIS			>30m		
Connector			SMA-m (RP	')	
Absolute Maximum Inp	out Level		10 dBm		
10 MHz Input					
Connector			BNC-f		
VSWR			1.40:1		
Input Level Range			-10 to +10 d	Bm	
GPS ANT Input					
Connector			SMA-f		
Bias			+5V current limited		
USER I/O Connector					
Connector			D-subminiat	ure, 26 pin, HD	
Functions:					
-AUX I/O			-8 I/O lines, 5V TTL Tolerant		
-AUX ADC			-8 analog inputs, 0V -12 V -Relay1 NC/NO 60V 2A		
-RELAY1					
-RELAY2 -PPS Out			-Relay2 NC/NO 60V 2A -GPS 1 PPS Output		
-GPS Tx			-GPS T PPS	output	
-GPS Rx			-GPS Rx		
-Ground			-Ground		
PPS OUT					
Connector			SMA-f		
Level			Logic level		
AC Power Input					
Connector			IEC 320 App	pliance Input	
Voltage			85-264 VAC		
Frequency			47-63 Hz		
Environmental and					
Operating Temperature			+10°C to +35°C		
Storage Temperature R			-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) 2.73 kg (6.0 lbs)		
Weight			0.701		

# **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	EN 301 489-1 V1.9.2 (2011-09)
Standards:	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 2-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 <u>returns@wst.ca</u> 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 <u>returns@wst.ca</u>. 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