TECHNICAL MANUAL

OPERATION AND MAINTENANCE
WITH
ILLUSTRATED PARTS BREAKDOWN

TEST SET
PORTABLE ACOUSTIC SONOBUOY SIMULATOR II

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OPERATION INSTRUCTIONS AND MAINTENANCE
DESCRIPTION, PRINCIPLES OF OPERATION, AND OPERATING PROCEDURES
PASS II TEST SET

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1   PURPOSE

1.1   General Information

The Portable Acoustic Sonobuoy Simulator II (PASS II) is a test set designed for laboratory acoustic system integration and airborne/maritime acoustic system operation verification. It is a field usable electronic transmitter, receiver, and data processor. Standard NATO Sonobuoy signals are simulated, including selectable environmental conditions. Command Signal Generation (CSG) and Command Function Select (CFS) capability are provided. Variable strength baseband stimuli are supported, as well as data streaming. The PASS II transmitter can also be used to test On Top Position Indicator (OTPI) systems used on aircraft.

The PASS II uses a Digital Signal Processor (DSP) to provide signal synthesis for the various supported Sonobuoy types. All test signals are developed using a fully digital architecture, and are then used in digital form to modulate the output RF. The fact that the test signals are not converted to analog signals for modulating the RF assures that the PASS II provides high fidelity, accurate, artifact-free test signals. The test signals are made available in analog form for direct acoustic processor input and for aural monitoring purposes.

A Direct Digital Synthesis (DDS) RF Generator develops the RF output. Digital data containing the desired frequency and the desired signal output is developed by the DSP and fed directly into the RF synthesis device for signal generation. Baseband and RF frequencies are generated to within 0.003% of the desired frequency, and FM deviation levels are generated within 0.1% of the desired level.

1.2   Referenced Documents

FSC 5845
Production Sonobuoy Specification

MIL-STD-810G
Environmental Test Methods

1.3   PASS II Applications

The PASS II provides both RF modulated and baseband stimuli. Specific applications of the PASS II unit are:

- Evaluation of acoustic system performance during integration testing.
- Evaluation of individual portions of aircraft/maritime acoustic systems (VHF antenna, VHF receiver, UHF downlink, acoustic processor, data recorder).
- Functional end-to-end testing of fully configured aircraft/maritime acoustic systems.
- Signal source to aid in establishing technician and operator familiarity with aircraft/maritime acoustic system equipment setup and operating modes.
- "Rooftop" airfield signal source having known test parameters for aircraft preflight verification.
- Extremely accurate stimulus for acoustic system calibration.
- Aid in determining the Bit Error Rate (BER) of an acoustic suite or Sonobuoy Receiver.

1.4   Abbreviations:

AC	Alternating Current		
AGC	Automatic Gain Control	C	Celsius
ALFEA	A-size Low Frequency Electro-Acoustic	CAMBS	Command Active Multi-Beam Sonobuoy
AMLCD	Active Matrix Liquid Crystal Display	CFS	Command Function Select
		CO	Calibrated Omni
		CSG	Command Signal Generator
BER	Bit Error Rate	CSO	Calibrated Shallow Omni
BIT	Built In Test	CW	Continuous Wave
BNC	Bayonet Neill Conselman		
BT	Bathythermograph	dB	Decibel
Buoy	Sonobuoy	dBm	Decibel Relative To A Milliwatt
BW	Bandwidth	DC	Direct Current

DDC	Digital Down Converter
DDS	Direct Digital Synthesis
Deg	Degree
DEMON	Demodulated Noise
DICASS	Directional Command Activated Sonobuoy System
DIFAR	Directional Frequency Analyzing and Recording
DPMM	Directional Passive Multi-Mode
DSP	Digital Signal Processor
EER	Extended Echo Ranging
EXT PWR	External Power
F	Fahrenheit
FM	Frequency Modulation
FSK	Frequency Shift Keying
GMSK	Gaussian Minimum Shift Keying
ID	Identification
kHz	Kilohertz
HIDAR	High Instantaneous Dynamic Range
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LOFAR	Low Frequency Analyzing and Recording
MDA	Main Display Area
MHz	Mega Hertz
MOD	Modulation
MPA	Maritime Patrol Aircraft
mW	Milliwatt
NATO	North Atlantic Treaty Organization
OTPI	On Top Position Indicator
PASS II	Portable Acoustic Sonobuoy Simulator II
PC	Personal Computer
PC I/O	Personal Computer Input/Output
PRBS	Pseudo Random Bit Stream, CCITT 0.152 Linear Feedback Shift Register Polynomial is $x^{11} + x^9x + 1$
POST	Power On Self Test
RF	Radio Frequency
RITP	Range Indicator Trigger Pulse
RMS	Root Mean Square

SBC	Single Board Computer
SDSR	Software Defined Sonobuoy Receiver
SNR	Signal to Noise Ratio
UART	Universal Asynchronous Receiver/Transmitter
UHF	Ultra High Frequency
USB	Universal Serial Bus
V	Voltage
VAC	Alternating Current Voltage
VDC	Direct Current Voltage
VHF	Very High Frequency
VLAD	Vertical Line Array DIFAR
μPa	Micro Pascal

1.5 Warnings and Cautions

WARNING
THE PASS II MAY BE POWERED BY 115-230 VAC. DUE SAFETY PRECAUTIONS SHOULD BE TAKEN

Caution
To prevent Li-Ion battery damage and potential injury to the operator, do not:
- Open or disassemble the battery
- Do not expose battery to open flame
- Do not puncture, deform, incinerate, or heat the battery above 85°C (194°F)

Caution
To prevent Li-Ion battery damage, observe the following temperature limits.
Storage temperature range: -32ºC to +60ºC
Operating temperature range: -32ºC to +55ºC

Caution
Prior to shipment or long-term storage, ensure that the unit is powered off, and stow the battery by removing and re-installing it in a rotated (non-contact) orientation.

Caution
Limit the UHF Input signal power to the PASS to 20 mW or less. Input signals greater than 20 mW could cause damage to the PASS II internal circuitry.

Caution
Do not use abrasive rubbing compounds or solvents to clean painted surfaces or the AMLCD Touch Panel. This may result in permanent damage to these surfaces.

2   PASS II DESCRIPTION:

The PASS II is an acoustic test set. It is light-weight, one-man portable, and inclement weather resistant. The unit is housed in a 15.25" x 12.5" x 9.75"ruggedized case. The PASS II, including all accessories and components required for operation weighs less than 29 pounds. The PASS II is convection cooled.

The PASS II accessories are housed in a storage compartment located inside the PASS II cover. The compartment is accessed by depressing the two quick release fasteners, located in each inside top-hand corner of the cover.

2.1   Accessories

The following accessories are provided with the PASS II unit:
- VHF Antenna
- UHF Antenna
- Self Test Cable
- AC Power Cable
- DC Power Cable
- Target Pattern Card, PASS II

Figure 1 shows the PASS II and Accessories. Table 1 provides details of each item.

2.2   PHYSICAL INTERFACES:

The PASS II unit includes the following hardware interfaces:

- AMLCD touch panel display
- External Power input
- External Power ON/OFF Switch
- Unit ON/OFF Switch
- Battery Charging Indicator
- USB1

- USB2
- ETHERNET
- UHF IN
- UHF OUT
- VHF OUT
- VHF FSK OUT
- VHF BASEBAND OUT
- MOD Input
- Headphone Jack
- Handles (2)

The hardware interfaces are shown in Figure 2, and descriptions of each are given in Table 2.

2.3   FUNCTIONAL INTERFACES:

The PASS II provides the following functional interfaces:

- AC/DC External Power Interface
- Analog Baseband Output
- External Analog Input
- Headphone Aural Output
- UHF Receiver Input
- Modulated UHF Output
- Modulated VHF Output
- Computer Interface
- Data Input Interface
- Touch Panel Interface

A functional interface block diagram is shown in Figure 3, and the functional interface descriptions are provided in Table 3.

2.4   PASS II Functional Limits

Table 4 summarizes the functional limits of the PASS II unit.
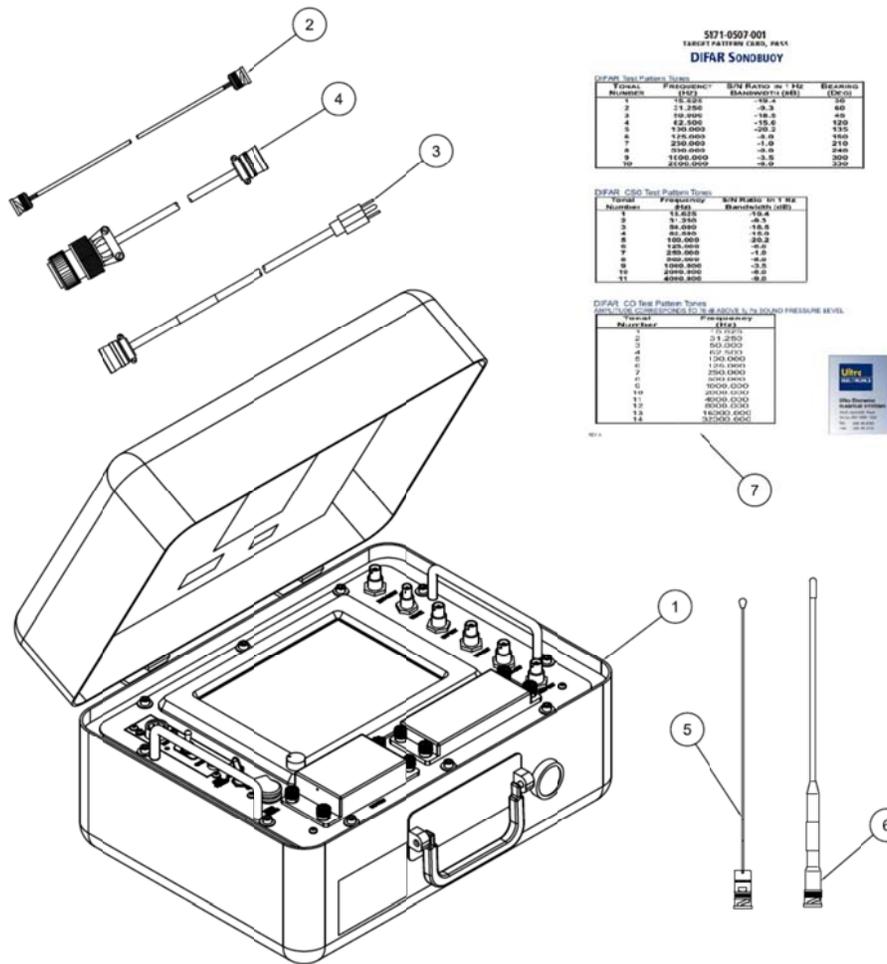
Figure 1: PASS II and Accessories

ITEM #	ITEM	DESCRIPTION
1	PASS II	The Portable Acoustic Sonobuoy Simulator II.
2	Self Test Cable	Allows a generated UHF output signal to be routed to the UHF input. This is used during PASS II Self Test which is part of the Built-in Test.
3	AC Power Cable	Allows the PASS II to be connected to a 115-230 VAC 50-400 Hz power source.
4	DC Power Cable	Allows the PASS II to be connected to a 28 VDC power source on aircraft. Pin A is ground and Pin B is 28V.
5	UHF Antenna	Allows the PASS II to radiate or receive UHF signals. Connects to either the UHF Out or UHF In connectors.
6	VHF Antenna	Allows the PASS II to radiate VHF signals. Connects to the VHF Out, FSK Out, or the Mod Out connectors.
7	Target Pattern Card, PASS II	Provides the echoes, ranges, speeds, and bearings, frequencies, and SNRs for DIFAR, DICASS, and SSQ-573 (LA mode) simulations

Table 1: PASS II and Accessories Description
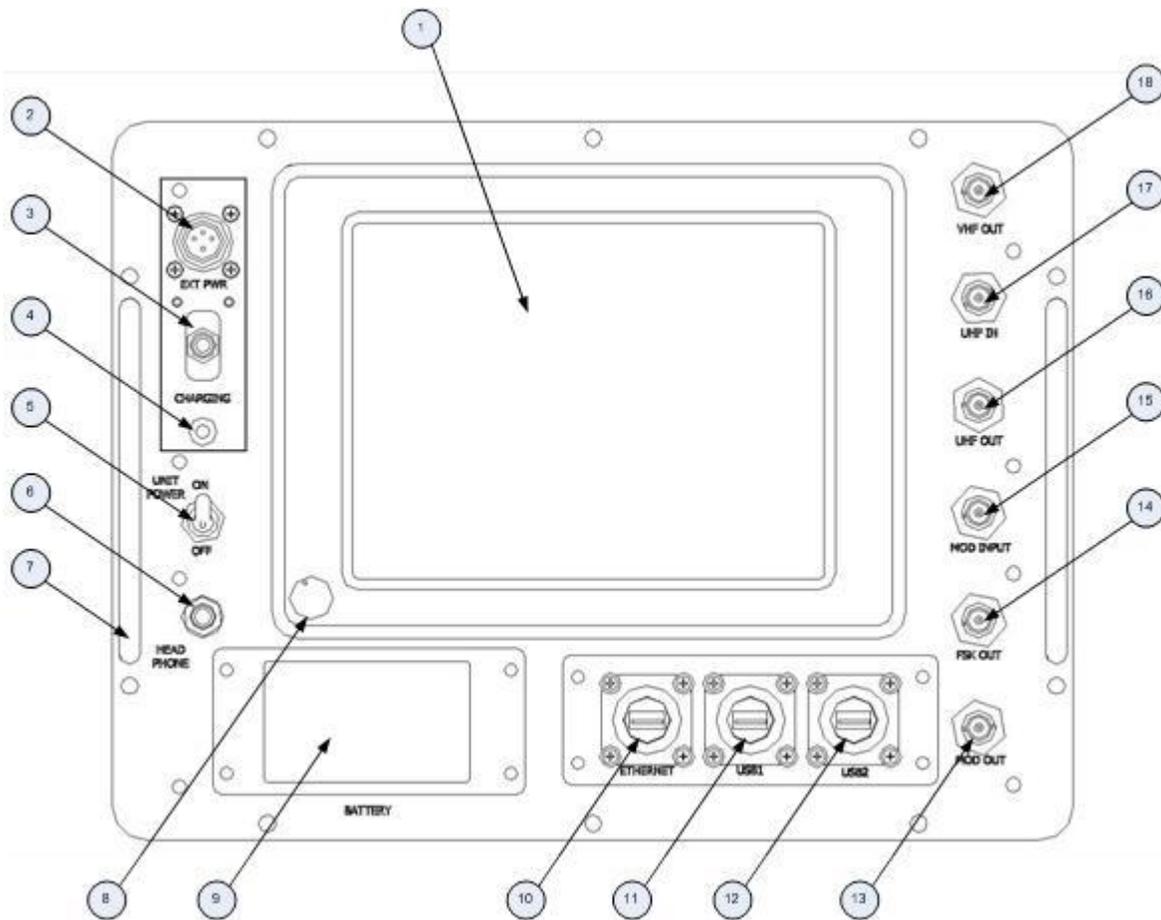
Figure 2: Physical Interfaces

Note: Figure 2 Battery and Interface Connector covers removed for clarity.

ITEM	INTERFACE	DESCRIPTION
1	AMLCD Touch Panel Display	Operator control of the PASS II is provided with a color AMLCD touch panel display. The display provides excellent readability in a strong sunlight environment, as well as low light conditions. The display is weatherproof, allowing the unit to be operated in rain or snow with the cover open. The display information is divided into operator input sections and reserved screen areas. Refer to section 5 for LCD Touch Panel operation and layout information
2	External Power Input	The External Power Input Connector provides the PASS II interface for connecting to an external power source. The PASS II can operate from 110-240 VAC 47-60 Hz power, or alternately 28 ±3 VDC power.
3	External Power On/Off Switch	The External Power On/Off Switch acts as a circuit breaker for the PASS II. When in the ON position, the battery charger will operate, allowing the battery to charge. When in the OFF position, external power is isolated from the PASS II. Should an over current condition exist, the switch will trip to the

ITEM	INTERFACE	DESCRIPTION
		OFF position to protect the PASS II circuitry.
		Note: The PASS II internal battery charger will only operate when connected to 115-230 VAC 50-400 Hz external power, with the EXT PWR switch On.
4	Battery Charging Indicator	Indicates the status of the battery charger. A steady light indicates that the battery is charging. No light indicates that the battery is not charging.
5	Unit ON/OFF Switch	Applies power to the unit and the LCD Touch Panel Display, to allow the operator to command the PASS II.
6	Headphone Jack	Provides an interface for the operator to aurally monitor Sonobuoy simulations. The connector accepts a 1/8"audio jack.
7	Handle	Two handles are provided to support testing mobility in the field.
8	Display Brightness Knob	Adjusts the brightness of the AMLCD display. Turn clockwise to brighten, counterclockwise to dim.
9	Battery Access Cover	Allows access to the unit's Li-Ion battery, should battery replacement be required.
10	Ethernet	1000BASE-T Interface. Can be used for software updates and simulation file streaming. Growth capability to support Acoustic Suite/Sonobuoy Receiver BER calculations.
11	USB1	Provides the ability to retrieve downlink data in legacy format. Requires the use of a null modem USB cable. Growth ability for remote control of the PASS II. Accepts a USB mouse for user input.
12	USB2	Provides the ability to retrieve downlink data in legacy format. Requires the use of a null modem USB cable. Growth ability for remote control of the PASS II. Accepts a USB mouse for user input.
13	Mod Out	This BNC connector provides modulated baseband signal content, and may be connected to an acoustic processor. The signal output level is such that a sinusoidal modulation signal providing 75 KHz peak deviation will produce approximately a two volt RMS signal level at the MOD OUT connector. A captive dust cap is also provided.
14	FSK Out	Growth interface to transmit digitally modulated VHF uplink signals (FSK, GMSK). The connector type is BNC, and is provided with a captive dust cap.
15	MOD Input	Provides a direct connect interface for Analog input for baseband modulation (FM) of VHF transmit signal (growth capability for digital input). The connector type is BNC, and is provided with a captive dust cap.
16	UHF Out	Provides the capability to transmit modulated UHF downlink signals (CFS/CSG commands/responses). The connector type is BNC, and is provided with a captive dust cap.
17	UHF IN	Provides the interface to receive modulated UHF downlink information (291.4 MHz) from an aircraft/vessel downlink transmitter, or from a Sonobuoy. This connector supports UHF reception via a direct or radiated connection. The connector type is BNC, and is provided with a captive dust cap.
18	VHF Out	Provides the interface to transmit Sonobuoy simulations. This connector provides the interface to transmit modulated VHF transmission sonobuoy simulations via a direct or radiated connection. The connector type is BNC, and is provided with a captive dust cap. The output level provides signal reception at ranges greater than 1000 ft in most environments.

Table 2: Physical Interface Descriptions
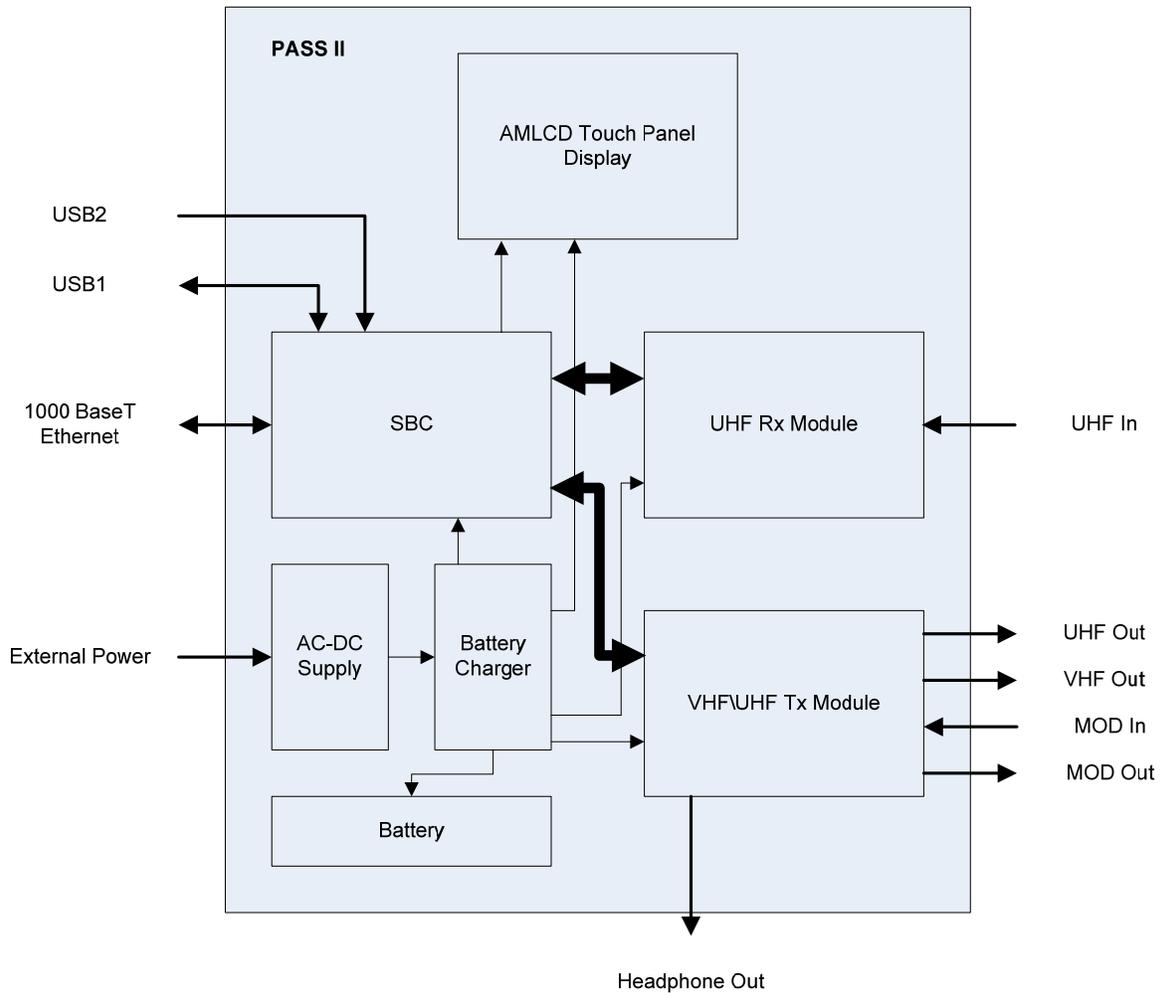
Figure 3: Functional Interfaces

FUNCTIONAL INTERFACE	DESCRIPTION
AC/DC Power Input	Either 115-230 VAC 50-400 Hz power or 28 VDC power will operate the PASS II. An internal battery provides approximately 2 3/4 hours of operation (with no internal or external power amplifier option). The battery charger will charge the internal battery to 90% capacity within two and a half (2.5) hours, and 100% capacity with an additional two hours when 115 VAC external power is supplied. Operation of the PASS II during charging may require additional time to recharge the battery. Note: The battery charger will operate with 115-230 VAC external power, but will not operate with a 28 VDC external power source.
Analog Baseband Output	The PASS II provides an interface for the transfer of baseband data directly to an acoustic processor. The modulation output is single-ended with a ground reference.
External Analog Input	The PASS II provides an interface for receiving baseband data representing the modulation content of down link transmissions or data intended for FM modulation on the PASS II up link signal. The interface is single-ended with a ground reference.

FUNCTIONAL INTERFACE	DESCRIPTION
Headphone Aural Output	The PASS II provides an interface for headphones to allow aural monitoring of baseband up link modulation content. This interface is able to drive a stereo headphone set, with the output level selectable over a 20 dB range.
UHF Receiver Input	The PASS II provides a RF interface to receive UHF signals from an aircraft/vessel acoustic system
Modulated UHF Output	The PASS II provides a RF interface for the output of UHF amplitude modulated RF signals containing down link CSG and CFS data.
Modulated VHF Output	The PASS II provides an interface for FM modulated VHF uplink signals to be input into an acoustic system.
USB 1Input/Output	Provides the ability to retrieve downlink data in legacy format. Accepts a USB mouse for user input.
USB 2 Input	Provides the ability to retrieve downlink data in legacy format. Accepts a USB mouse for user input.
Ethernet Input	1000BASE-T Interface. Can be utilized to support software reprogramming and external data streaming. Growth ability to support Acoustic Suite/Sonobuoy Receiver BER calculations.
Touch Panel Interface	Provides the operator the ability to select the PASS II simulation/command desired. Refer to section 3 for a detailed description of the AMLCD Touch Panel.

Table 3: Functional Interfaces

Function	Limits
Operating Temperature	-10ºC to +40ºC
Storage Temperature	-20ºC to +45ºC
Battery Charging Temperature	0ºC to +45ºC (Internally limited)
VHF Output	-113 dBm to -80 dBm (Low VHF), & -40 dBm to +0 dBm (High VHF)
UHF Output	>-10 dBm
UHF Input	-90 dBm to 0 dBm, input overload protected to 100 Watts intermittent
Input Interface	0 Vrms to 4 Vrms
Headphone Aural Output	25 mW minimum for a 16 ohm load. Minimum headphone impedance 4 ohms.

Table 4: PASS II Functional Limits

3 PRINCIPLES OF OPERATION

3.1 Acoustic System Verification

The PASS II allows testing of all functional elements of an aircraft/vessel acoustic system. The unit can radiate signals that are received by acoustic system antennas to verify that the antennas are properly receiving valid signals. Sonobuoy simulations/test patterns are available to verify proper Sonobuoy Receiver and Acoustic

Processor operation. Baseband data can be generated to confirm proper Acoustic Processor and Acoustic Recorder operation. Additionally, the PASS II can be used to verify CFS and CSG message transmission and reception ability of the acoustic Suite and CFS/CSG capable sonobuoys.

Figure 4 illustrates how the PASS II can be used to test Acoustic suites and sonobuoys.
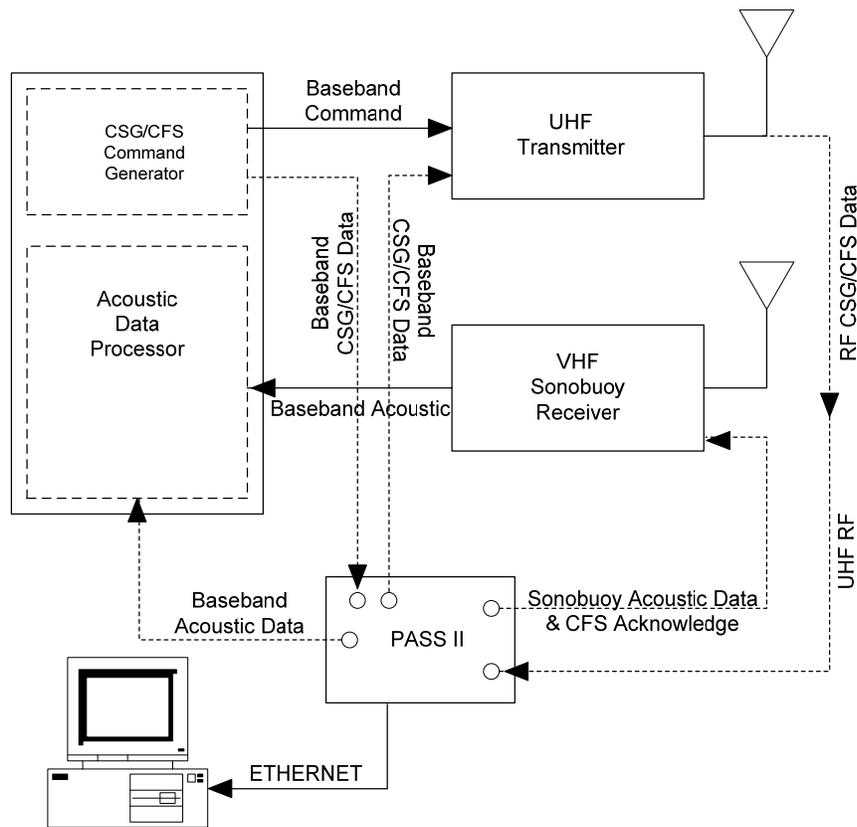
Figure 4: Acoustic Suite Verification

3.2 Sonobuoy Simulations Supported

The PASS is able to simulate Analog and Digital sonobuoys, whether they are active or passive.

3.2.1 Analog Sonobuoys

The analog sonobuoys currently supported are the AN/SSQ-62 DICASS, the AN/SSQ-36, AN/SSQ-536, and AN/SSQ-937 Bathythermograph (BT), the AN/SSQ-41 and AN/SSQ-906 LOFAR, the AN/SSQ-53 and AN/SSQ-954 DIFAR, the AN/SSQ-77 VLAD, the AN/SSQ-573 DPMM, the AN/SSQ-110 EER, and the AN/SSQ-926 ALFEA.

3.2.1.1 DICASS (AN/SSQ-62)

The DICASS simulation accurately simulates the AN/SSQ-62 B, C, D, and E Sonobuoy variants.

DICASS sonobuoys are an active Sonobuoy, but they are active only when they receive Command Signal Generator (CSG) commands from an external source. A DICASS Sonobuoy can determine the bearing of a Target from magnetic north in a manner similar to a DIFAR Sonobuoy. It is also able to measure the range and velocity of a target.

As in the case of a DIFAR Sonobuoy, the underwater transducer is a three element array. Like the DIFAR array, the DICASS array includes two bi-directional hydrophones orthogonally placed so that the directional characteristics of the one are shifted 90 degrees with respect to the directional characteristics of the other. As well as the omni directional hydrophone, the DICASS Sonobuoy also employs a projector/hydrophone.

The DICASS Sonobuoy functions under direct control of a Maritime Patrol Aircraft (MPA). UHF transmissions from the aircraft command the Sonobuoy to scuttle, change its hydrophone depth, or to ping. Ping commands to the Sonobuoy provide the actual Sonobuoy ping signal at the correct Sonar frequency and the correct duration. When deployed each Sonobuoy operates on one of four Sonar frequencies between 6.5 kHz and 9.5 kHz, with the Sonar frequency of operation being a function of the RF channel on which the Sonobuoy is operating.

VHF transmissions from the Sonobuoy use the same multiplexing format as the DIFAR Sonobuoy, with a frequency pilot, phase pilot, Omni hydrophone data, Sine hydrophone data, and Cosine hydrophone data.

The ping echoes received at the directional hydrophones are heterodyned so that they fall within the 2.4 kHz acoustic bandwidth of the multiplexing format. When not activated, a DICASS Sonobuoy functions as a passive DIFAR Sonobuoy. A heterodyned frequency of 800 Hz is referred to as the "zero doppler" frequency, as this is the frequency to which the normal Sonar frequency is heterodyned. Since the echoes received acoustically at the Sonobuoy are all heterodyned to a common frequency band, the uplink data from all sonobuoys looks very similar regardless of the operating Sonar frequency. However, since the Sonar frequencies of the sonobuoys differ, the same amount of doppler shift will represent different associated target radial velocities for each of the Sonar frequencies of operation. The test pattern produced for the DICASS Sonobuoy type is the most elaborate of the supported Sonobuoy patterns.

The operator is able to select between a CW Short (0.1 sec duration), CW Medium (0.5 sec duration), CW Long (1.0 sec duration), FM Up, FM Down, and a FM Up/Dn ping. The FM Up ping has a duration of one second, which begins 200 Hz below the nominal Sonar frequency and sweeps to a frequency 200 Hz higher than the nominal Sonar frequency. In a similar fashion, the FM Down ping produces a one second duration tone that starts 200 Hz above the nominal Sonar frequency, and sweeps to 200 Hz below the nominal Sonar frequency. When the FM Up/Dn ping is selected, FM Up and FM Down pings are alternately sent on alternate pings. If the target pattern of the ping type is modified, the new selection takes effect upon the ping for the following pattern cycle.

When the PASS II defaults to the DICASS Low doppler stair step pattern discussed below, the PASS II does not default to a particular ping type. The operator must manually select the desired ping type before the PASS II will initiate a ping. Until a ping is selected, the MDA text box will display "No Ping Selected".

The simulated echo patterns are doppler test patterns with Doppler excursions scaled for each of the four available Sonar frequencies. High and Low CW reverberation models which use ten closely spaced tone frequencies near the Sonobuoy zero doppler frequencies with exponentially decaying level and diverse bearings are selectable. The High pattern provides a generally increasing doppler frequency with less reduction in target level as the simulated range increases. Alternately, the Low pattern provides a generally decreasing doppler frequencies, with the simulated echo reducing progressively as the simulated range increases. The Ranges and Speeds shown in Tables 5 and 6 were calculated using a speed of sound in water of 4,900 ft/sec.

Echo	Range (Kyards)	Speed (Knots)	Bearing (Deg)
1	817	30.9	45
2	2450	23.2	135
3	4083	7.7	225
4	5717	-7.7	515
5	7350	-23.2	45
6	8983	-30.9	135
7	10617	30.9	225

Table 5: DICASS High Simulated Target Pattern

Echo	Range (Kyards)	Speed (Knots)	Bearing (Deg)
1	817	-38.7	45
2	2450	-23.2	135
3	4083	-7.7	225
4	5717	7.7	515
5	7350	23.2	45
6	8983	38.7	135
7	10617	-30.9	225
8	12250	15.5	315

Table 6: DICASS Low Simulated Target Pattern

Additionally, a 3.2 kHz trigger tone may be selected to appear during the simulated ping interval. The FM deviation produced by the Trigger tone is ±75 kHz peak deviation.

When no automatic means of synchronizing the PASS II and Acoustic Processor ping intervals is provided, the PASS II can be placed in a Free Run mode. This causes the PASS II to initiate a new ping upon ping type selection and upon the completion of each echo pattern.

Operating the PASS II in the default Synchronized mode will cause the PASS II to pause at the end of each simulated echo pattern, and await a signal to initiate a new ping interval. The operator or downlink command provides this signal (the operator by pressing the Ping key at the bottom of the display).

3.2.1.2 Bathythermograph (BT) (AN/SSQ-36, AN/SSQ-536, and AN/SSQ-937)

BT sonobuoys are used to measure ocean temperatures at various depths, so that maritime aircraft/vessels can build a temperature versus depth profile for the ocean being surveillanced. The information that is provided by a BT Sonobuoy is required for accurate targeting information, as ping and echo propagation delays actively change with varying water temperature.

The PASS II BT simulations allow the operator to select a specific temperature in either Celsius or Fahrenheit. The corresponding tone is generated which relates to the specific temperature selected. The tone is calculated by the following formulas:

Modulation frequency = 1440+36T Hz, where T is the water temperature in °C, or
Modulation frequency = 800+20T Hz, where T is the water temperature in °F

The modulation level for the BT sonobuoys is 75 kHz peak deviation

3.2.1.3 LOFAR (AN/SSQ-41 and AN/SSQ-906)

LOFAR sonobuoys are passive (listen only), and are equipped with omni directional hydrophones. A single LOFAR Sonobuoy can detect the presence of a submarine, and can provide information used to estimate the target's location. In tactical use, several LOFAR sonobuoys can be used simultaneously, and are strategically placed.

The LOFAR test pattern is the same as that used for DIFAR sonobuoys, except the pilot tones and directional hydrophone signals are eliminated. The Environmental settings of Sea State and Target Strength affect the produced LOFAR signal. LOFAR sonobuoys are simulated with the following test pattern.

Tonal Number	Frequency (Hz)	S/N Ratio in 1 Hz BW (dB)
1	15.625	-19.4
2	31.250	-9.3
3	50.000	-18.5
4	62.500	-15.0
5	100.000	-20.2
6	125.000	-8.0
7	250.000	-1.0
8	500.000	-8.0
9	1000.000	-3.5
10	2000.000	-8.0

Table 7: Default LOFAR Test Pattern Tones

3.2.1.4 DIFAR (AN/SSQ-53, AN/SSQ-954)

The PASS II is able to simulate the B, C, D, and F variants of the AN/SSQ-53 DIFAR Sonobuoy.

DIFAR sonobuoys are equipped with a three hydrophone array which operates in a passive mode only, and a flux gate compass. The three hydrophone array consists of a single omni directional hydrophone and two bi-directional hydrophones whose response is 90 degrees from each other. The flux gate compass is used to produce a signal that continually establishes the position of the bi-directional hydrophones from true north. The Sonobuoy also contains data processors, which create a composite signal from these four devices. The composite signal is then transmitted to the aircraft/vessel. From the information received, the aircraft/vessel is able to determine the bearing of a detected target.

For these sonobuoys, ten discrete targets having frequencies between 15 Hz and 2000 Hz are provided, each having a unique bearing.

Tonal Number	Frequency (Hz)	S/N Ratio in 1 Hz BW (dB)	Bearing (Deg)
1	15.625	-19.4	30
2	31.250	-9.3	60
3	50.000	-18.5	45
4	62.500	-15.0	120
5	100.000	-20.2	135
6	125.000	-8.0	150
7	250.000	-1.0	210
8	500.000	-8.0	240
9	1000.000	-3.5	300
10	2000.000	-8.0	330

Table 8: Default DIFAR Test Pattern Tones

DEMON data consisting of filtered noise in two bands ranging from 350 Hz to 1600 Hz, and from 1600 Hz to 3000 Hz is available, by selecting DEMON from the Environmental Setup screen. The noise in each band is capable of being modulated up to 50%, with a 25 Hz modulating signal.

This noise is added to the background Sea Noise that is also selectable from the Environmental Setup screen, at a level up to 100% of the background noise, and will create a DIFAR bearing of 45 degrees for the DEMON component.

A simulated SWATH target may also be selected from the Environmental Setup screen, with the center frequency, bandwidth, bearing, and signal-to-Noise ratio of the SWATH target being selectable. A SWATH component is a tone whose bandwidth is spread so that it is no longer a discrete frequency (broadband noise), and is representative of cavitations.

3.2.1.4.1   DIFAR CSO
The AN/SSQ-53 F Calibrated Shallow Omni (CSO) ability is supported through operator selection of the CSO operating mode on the DIFAR Setup screen. This test pattern has eleven discrete targets with frequencies between 15 Hz and 4000 Hz, with no pilot tones or directional information.

Tonal Number	Frequency (Hz))	S/N Ratio in 1 Hz BW (dB)
1	15.625	-19.4
2	31.250	-9.3
3	50.000	-18.5
4	62.500	-15.0
5	100.000	-20.2
6	125.000	-8.0
7	250.000	-1.0
8	500.000	-8.0
9	1000.000	-3.5
10	2000.000	-8.0
11	4000.000	-9.0

Table 9: Default DIFAR CSO Test Pattern Tones

3.2.1.4.2   DIFAR CO/ Extended CO
The AN/SSQ-53F Calibrated Omni (CO) and Extended CO abilities are supported through operator selection of the appropriate operating mode on the DIFAR Setup screen. The CO test pattern has thirteen discrete targets with frequencies between 15 Hz and 16 kHz, while the Extended CO test pattern has fourteen discrete targets with frequencies between 15 Hz and 32 kHz. The CO and Extended CO test patterns do not have pilot tones or directional information. DEMON and SWATH target types are not available with the CO mode selected.

Note: The amplitudes correspond to 76 dB above the 1µPa sound pressure level.

Tonal Number	Frequency (Hz))
1	15.625
2	31.250
3	50.000
4	62.500
5	100.000
6	125.000
7	250.000
8	500.000
9	1000.000
10	2000.000
11	4000.000
12	8000.000
13	16000.000
14*	32000.000*

* Note: XCO Only

Table 10: Default DIFAR CO & Extended CO Test Pattern Tones

3.2.1.5 VLAD (AN/SSQ-77)

The AN/SSQ-77 Vertical Line Array DIFAR (VLAD) Sonobuoy is a special purpose sonobuoy based on the AN/SSQ-53 DIFAR sensor in conjunction with two arrays of eight omni hydrophones each, and is designed to increase the detection of signals of interest. The VLAD has the directional capabilities of the AN/SSQ-53B DIFAR with the omni replaced with a vertical line array of omnidirectional hydrophones, which provide for improved tracking capability in a noisy, high-traffic environment.

The VLAD Sonobuoy functions under direct control of a Maritime Patrol Aircraft (MPA). UHF transmissions from the aircraft command the Sonobuoy to perform no operations, power off, set transmitter power, and set the life of the sonobuoy.

For the VLAD sonobuoy simulation, ten discrete targets having frequencies between 15 Hz and 2000 Hz are provided, each having a unique bearing.

Tonal Number	Frequency (Hz)	S/N Ratio in 1 Hz BW (dB)	Bearing (Deg)
1	15.625	-19.4	30
2	31.250	-9.3	60
3	50.000	-18.5	45
4	62.500	-15.0	120
5	100.000	-20.2	135
6	125.000	-8.0	150
7	250.000	-1.0	210
8	500.000	-8.0	240
9	1000.000	-3.5	300
10	2000.000	-8.0	330

Table 11: VLAD Test Pattern Tones

3.2.1.6 DPMM (AN/SSQ-573)

The Directional Passive Multi-Mode (DPMM) Sonobuoy has Electronic Function Select (EFS) which allows the Sonobuoy to operate in in one of three selectable modes (DIFAR, HIDAR, and Low Frequency Active Receiver (LA)). The mode is set using the EFS function prior to launch, and operates in the mode selected upon Sonobuoy activation. The SSQ-573 includes GPS capability.

When simulating the standard DIFAR mode, the PASS II generates the ten discrete targets as identified in Table 8. DEMON data and a simulated Swath are available as detailed in section 3.2.1.4.

When simulating the HIDAR mode, the PASS II generates the HIDAR simulation as detailed in section 3.3.1.

When the LA mode is selected the PASS II generates the following target pattern.

Tonal Number	Frequency (Hz)	S/N Ratio in 1 Hz BW (dB)	Bearing (Deg)
1	1450.00	-19.4	30
2	1630.00	-9.3	60
3	1646.00	-18.5	45
4	1698.15	-15.0	120
5	1760.00	-20.2	135
6	1801.85	-8.0	150
7	1890.00	-1.0	210
8	1905.56	-8.0	240
9	2020.00	-3.5	300
10	2150.00	-8.0	330

Table 12: SSQ-573 LA Mode Test Pattern Tones

3.2.1.7 ALFEA (AN/SSQ-926)

The A-size Low Frequency Electro-Acoustic (ALFEA) Sonobuoy is a source Sonobuoy intended for use in buoy fields comprising multiple ALFEA and passive sonobuoys. The ALFEA Sonobuoy is commandable via UHF downlink, and provides its status via a VHF uplink.

The PASS II provides the ability to decode CFS commands valid for the exportable ALFEA Sonobuoy, and simulates buoy status messages generated based on downlink commands sent. GPS data is also simulated.

The PASS II does not simulate the source signal generated by an actual ALFEA Sonobuoy.

3.2.1.8 EER (AN/SSQ-110)

The Extended Echo Ranging (EER) sonobuoy is an A-size, expendable, non-repairable sonobuoy that is a commandable, air-dropped, high level acoustic source. The EER sonobuoy operates on any of the 99 Sonobuoy selectable RF channels and is composed of two sections. The upper section is called the control buoy and is similar to the upper electronics package of the AN/SSQ-62 DICASS sonobuoy. The lower section consists of two Signal Underwater Sound (SUS) explosive payloads. The arming and firing mechanism is hydrostatically armed and detonated. The sonobuoy relays, by VHF FM transmission, the sonobuoy initialization signal and the

confirmation signal acknowledging receipt of the command signal. The sonobuoy VHF transmitter transmits on the pre-assigned RF channel for a specified period to indicate successful launch. The payloads remain unarmed until the command to deploy is received from the aircraft. The buoy transmits for a specified period on the pre-assigned VHF channel to indicate reception of command signals.

The PASS II EER simulates the deployment of the sonobuoy by counting down for 60 seconds, after which the PASS II transmits the EER deployed tone. A simulation running indication is then provided, along with the following information "Deployed. Awaiting downlink commands.". The PASS II will then generate the appropriate EER response tone when an appropriate EER command is received by the PASS II.

3.3   Digital Sonobuoys

The PASS II is able to generate simulations/sequences to allow an operator to confirm that an acoustic suite can properly receive and process DIGITAL sonobuoys. The Digital Buoys main menu screen allows the user to choose from the following digital Sonobuoy types: HIDAR, BARRA, CAMBS, and AN/SSQ-101.

3.3.1   HIDAR (AN/SSQ-955)

High Instantaneous Dynamic Range (HIDAR) sonobuoys are passive directional sonobuoys that are suitable for use in littoral and deep water operations. The HIDAR sonobuoy is designed for multistatic operations, and is a fully digital design.

The PASS default HIDAR simulation provides a digital Gaussian Minimum Shift Keyed (GMSK) signal at a 224 Kb/sec data rate. Simulated sea noise, target acoustic data (identified in the table below), compass signal, synchronization and parity data are provided as part of the simulation.

Environmental variables (Target Strength, and Magnetic Variation) are hard coded in the HIDAR simulation. Adjusting these parameters will have no effect on the simulation output. The Sea State is selectable for the simulation, and is set from the Environmental Sea State submenu.

Tonal Number	Frequency (Hz)	S/N Ratio in 1 Hz BW (dB)	Bearing (Deg.)
1	10	-3.0	0
2	20	-2.0	45
3	30	-1.0	90
4	50	0.0	135
5	100	2.0	180
6	200	4.0	225
7	300	6.0	270
8	1000	8.0	315

Table 13: HIDAR Test Pattern

Additional HIDAR simulation files are included with the PASS II, and can be generated upon command.

3.3.2   BARRA (AN/SSQ-981E S Mode)

BARRA sonobuoys are passive directional sonobuoys that are suitable for use in littoral and deep water operations. The BARRA sonobuoy utilizes a large horizontal planar array sensor consisting of 25 hydrophones, and is designed for multistatic operations.

The PASS II default BARRA simulation provides a digital Gaussian Minimum Shift Keyed (GMSK) signal at a 224 Kb/sec data rate. Simulated sea noise, target acoustic data quantized to one bit (identified in the table below), a digital magnetic compass signal and frame sync signal are provided as part of the simulation.

Environmental variables (Target Strength, and Magnetic Variation) are hard coded in the HIDAR simulation. Adjusting these parameters will have no effect on the simulation output. The Sea State is selectable for the simulation, and is set from the Environmental Sea State submenu.

Tonal Number	Frequency (Hz)	S/N Ratio in 1 Hz BW (dB)	Bearing (Deg.)
1	30	+3.0	0
2	80	-3.0	170
3	170	-6.0	225
4	310	0.0	290
5	390	0.0	340
6	670	3.0	60
7	1430	0.0	250
8	2350	3.0	30

Table 14: BARRA Test Pattern

Additional BARRA simulation files are included with the PASS II, and can be generated upon command.

3.3.3   CAMBS (AN/SSQ-963D)

CAMBS sonobuoys are active directional sonobuoys that are suitable for use in littoral and deep water operations. As in the case of the BARRA sonobuoy, the CAMBS sonobuoy utilizes a large horizontal planar array sensor

consisting of 25 hydrophones, and is designed for multistatic operations.

The PASS II CAMBS simulation utilizes simulation files that are generated by the PASS II when CAMBS pings are received by the PASS II. The exportable CAMBS sonobuoy is supported by the PASS II. CAMBS downlink decoding is provided by the PASS II.

3.3.4   AN/SSQ-101

The AN/SSQ-101 waveform is a new waveform defined for use by NATO countries for a common RF uplink for any uplink transmission of any digital acoustic data. The acoustic payload information is country specific and not defined in the standard.

The AN/SSQ-101 waveform uses CPFSK with a Gaussian pulse shaping filter with a BT = 0.303 and uses a modulation index of 0.75. All data rates are supported by the PASS II.

The AN/SSQ-101 downlink waveform utilizes unshaped CPFSK at a rate of 9.6 kbps and a modulation index of 0.7. A data link layer protocol allows for various message types for buoy configuration and communication. The PASS II is able to receive and decode AN/SSQ downlink commands.

For all AN/SSQ-101 modes other than IEER Legacy, the simulations are a playback of files recorded from an AN/SSQ-101 sonobuoy.

For IEER Legacy mode, the PASS II simulates an initial blast using a burst of high level noise. This noise is enough to trigger a sweep on an ARR-78 processor. Sample data doesn't contain actual targets. It has been designed to provide a known display on the acoustic processor and is sufficient for performing the end-to-end IEER preflight checks of an acoustic suite.

3.4   CFS/CSG Overview

The PASS II is able to generate both CFS and CSG commands. Both CFS and CSG commands are transmitted through the PASS II UHF transmitter at the downlink frequency. For U.S. Sonobuoy types, the command data is amplitude modulated on the UHF carrier and is present at the UHF Out connector on the PASS II front panel for the duration of the command. The command data is also provided in analog form at the MOD out and Headphone front panel connectors.

3.4.1   CSG Command Test Generator

The CSG will generate different types of commands to be performed by a specific Sonobuoy. Two tone frequencies are established for each of the 99 channels from 15 designated frequencies between 10 KHz and 20 KHz in order to address a Sonobuoy. Once the two tones are sent and the correct Sonobuoy is addressed, the Sonobuoy acts based on the single tone that follows. It will either tell the Sonobuoy to scuttle, lower its hydrophone to an intermediate depth, lower its hydrophone to its deepest depth, or ping with the current tone provided.

The CSG Command Test Generator provides a means for the PASS II to internally generate commands for all variants of the AN/SSQ-62 DICASS Sonobuoy. The operator is able to command a specific Sonobuoy RF channel. Depending on the channel selected, the default Sonar channel (A, B, C, or D) is enabled. The operator may select a different Sonar channel than the default, if desired.

The operator has the option to select between the three CSG commands: scuttle, intermediate depth, and deep depth. Besides the ability to specify a command, the operator is also able to specify the ping type (CW Short, CW Medium, CW Long, FM Up, FM Down, and FM Up/Dn). Refer to the DICASS Sonobuoy ping description for individual ping characteristics.

3.4.2   CFS Command Test Generator

The PASS II can generate CFS commands either by the operator inputting the hexadecimal characters to form a valid command string, or by using the PASS II text menus to select a specific command.

The following is an example of a valid CFS command:

Each message is comprised of twelve words. Two hexadecimal characters equal one word. Each message contains two individual commands.

(1) The first word (55) is the command preamble. All CFS commands begin with the 55 preamble. This preamble doesn't need to be entered by the operator, as it is implicit.

(2) The second and third words (00) correspond to the Sonobuoy ID.

(3) The fourth word corresponds to RF channel information.

(4) Words five through eight define the Command, Subcommand, and two data words for the first CFS command of the message, respectively.

(5) Words nine through twelve define the Command, Subcommand, and two data words for the second CFS command of the message, respectively.

If command data isn't entered, the message generated will contain a default 00, which corresponds to a "no operation" command. Once the message has been manually input or selected via the PASS II text menus, pressing the send key on the CFS Command Generation screen will generate the message.

For manual CFS message string generation, refer to Appendix A for valid CFS word codes.

4 PASS II USER MENU

4.1 Structure

The PASS II touch panel display provides the operator with user-friendly screens, to allow the operator to perform the desired operation with minimal effort.

Upon power up, the PASS II initially displays the Flightline Systems screen, and then defaults to the Presets screen. A Power On Self Test (POST) is performed on power up. The results of the Post can be viewed by selecting the Diagnostics submenu from the Tools menu.

Main Menu selections are provided along the right-hand side of the screen. Not all Main Menu selections are able to be shown at once on the same screen. A Next soft key is located in the lower-right corner of the display. Pressing this soft key updates the Main Menu selections on the right-hand side of the display. When the Next soft key is pressed and the Main Menu selections are updated, the lower right hand soft key is renamed as Previous. Pressing this button will display the default Main Menu soft keys. The Main Menu selections available are Presets, RF Setup, Passive Buoys Setup, Active Source Buoys Setup, Recorded Simulations, Special Setup, Environmental Settings, GPS Settings, Target patterns, Downlink, CSG, CFS, Options, Tools, and Report Config.

The Presets option allows the operator access to the preset simulations that have been loaded into the PASS II. Up to 12 preset simulations can be loaded/stored in the PASS II. Pressing any of the default simulation soft keys will generate the applicable pre-determined sonobuoy simulation.

The RF Setup option allows the operator to select the RF characteristics of the output signal produced by the PASS II (RF Output & RF Channel).

The Passive Buoys Setup option provides the operator the ability to command the PASS II to generate six different types of passive sonobuoy simulations: BT, DIFAR, LOFAR, HIDAR, VLAD, and SSQ-573. Once the type of Sonobuoy has been selected, the PASS II provides the operator with variables specific for the particular sonobuoy that can be set as desired.

The Active Source Buoys Setup option provides the operator the ability to command the PASS II to generate a DICASS simulation, a SSQ-110 EER simulation, or an ALFEA simulation.

The Recorded Simulations selection allows the operator to generate HIDAR, BARRA, CAMBs, AN/SSQ-101 HAASW simulations. Streaming of recorded buoy simulations from a PC is also supported.

The Special Setup selection allows the operator to generate an unmodulated carrier, generate a calibration tone, use external modulation for generating a simulation, or generate a demodulated simulation.

The Environmental Settings selection allows the operator to select sea state, target strength, magnetic variation, SWATH, and DEMON soft keys, to further define these values that can be included with the sonobuoy simulations generated by the PASS II.

The GPS Settings selection allows the operator to set GPS Lat/Long, GPS Drift Bearing, GPS Drift Speed, and GPS Update Rate values for inclusion with GPS capable buoy simulations.

The Target Patterns selection allows the operator to change the frequency, bearing, and signal-to-noise ratio of the simulated targets for LOFAR, DIFAR (including CO, XCO, & CSO modes), and the SSQ-573 (LA mode) simulations.

The Downlink option allows the operator to select between Downlink History, Downlink Utilities, or Downlink Options submenus.

The CSG selection allows the operator to specify and generate Command Signal Generation commands. The Operator has two submenus available (Cmd/Ping/Send CSG and Sono/VHF) to specify the particular CSG command to generate.

The CFS main menu selection allows the operator to specify and generate Command Function Select commands either by entering the appropriate command string, or by selecting valid parameters to specify the particular command desired. The following submenus are available for CFS: Sono ID/RF Send CFS, New RF Ch. Command, DIFAR Cmd Set, VLAD Cmd Set, DICASS Cmd Set, and Enter Cmd String.

The Options selection allows the operator to specify how the Graphical User Interface (GUI) is displayed by the PASS II.

The Tools selection allows the operator to set the time, date, year, and headphone volume. The operator may

also view the system log, or run PASS II diagnostics from this menu.

The Report Config. Selection allows the operator to select between Report Config, Unit Status information, or Sim Files Onboard. Elapsed Time Meter (ETM)

information is also displayed on the Report Config. submenu page.

Figure 5 provides a pictorial view of the PASS II menu structure. The menu structure is provided to help guide the operator to access the desired PASS II ability.
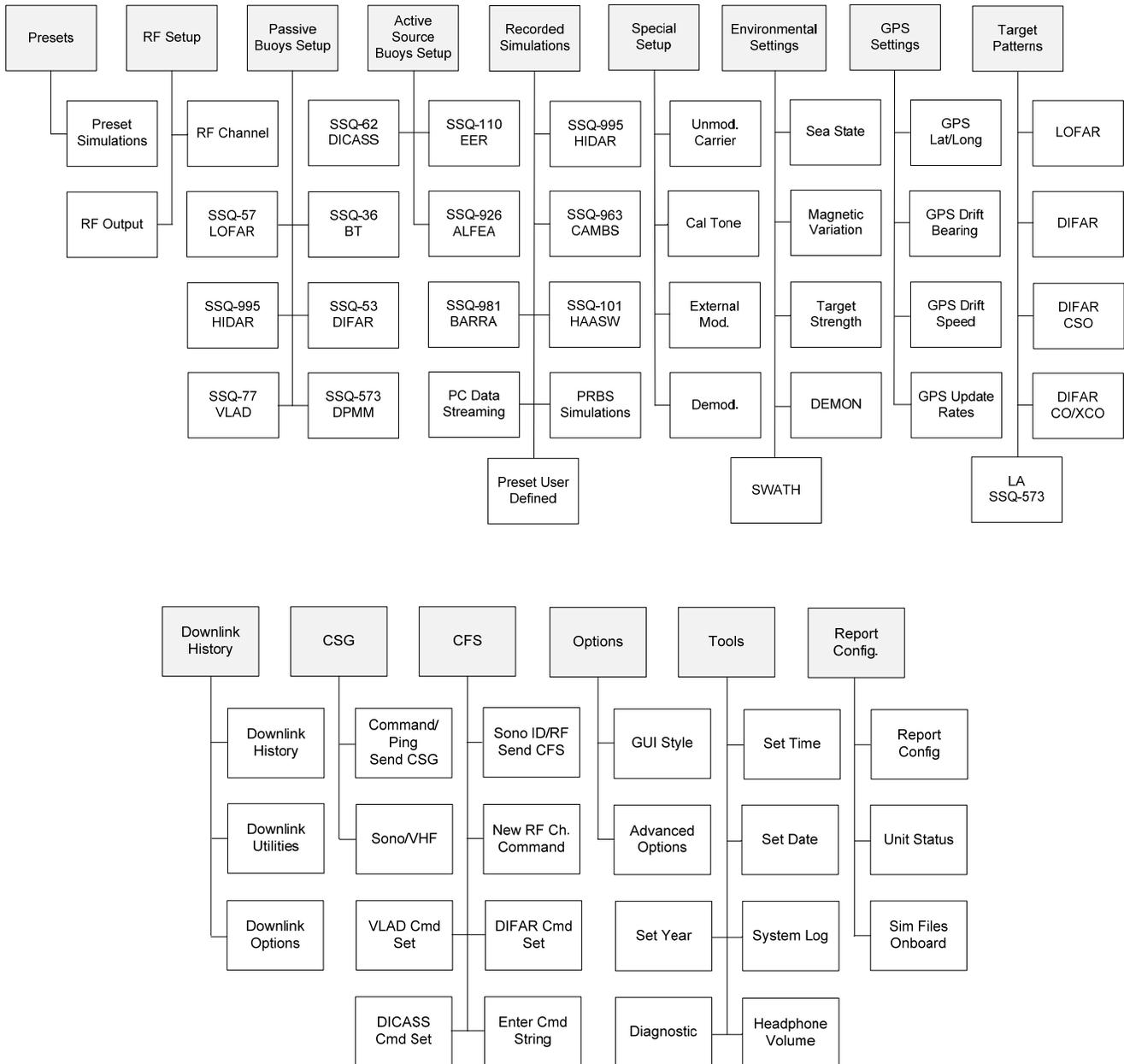
Figure 5: PASS II Menu Structure

5   OPERATION

To access the PASS II controls, release the two latches on the front of the PASS II, and open the cover of the unit. If the cover resists opening, depress the pressure relief valve next to the handle. This will equalize the pressure inside the PASS II with its surroundings, and allow the cover to open freely.

The PASS II allows operation from an external power source, or from internal batteries. PASS II default values will be re-established each time power is cycled.

5.1   OPERATION USING EXTERNAL POWER

The PASS II can be powered by a 115-230 VAC 47-63 Hz power source, or by a 28VDC power source. Both types of power cords are supplied with the PASS II, and are stored in the cover storage compartment when not being used.

Select the appropriate power cord for the power source to be used. Connect the cable to the EXT PWR receptacle on the PASS II front panel. Connect the other end to the available power source. Place the EXT PWR switch in the On position to provide power to the PASS II.

Should an over current condition exist, the EXT PWR switch will trip to the OFF position to protect the PASS II circuitry.

When the PASS II is connected to an AC power source, the EXT PWR CHARGING LED will illuminate if the unit determines the battery is not fully charged, and will remain lit until the battery is fully charged. The battery will charge to 90% of its capacity within 2.5 hours. The last 10% of charging requires approximately 2 hours longer period due to the charging characteristics of the battery. If the battery is fully charged, or reaches a fully charged state, the charging LED will be extinguished.

Note: PASS II battery charging will be disabled below 0°C and above 50°C. A reduced charging rate will occur between 45°C and 50°C.

Note: The PASS II internal battery charger will only operate with 115-230 VAC 47-63 Hz external power, not with 28 VDC external power.

Press the UNIT POWER ON/OFF Switch to turn on the PASS II (the switch's green LED will illuminate when in the "On" position). The PASS II boot up cycle takes approximately 50 seconds after power application.

Refer to Figure 7 for the PASS II Basic Setup Screen that is displayed once the unit has booted.

5.2   OPERATION USING BATTERY POWER

The PASS II can be operated using the internal battery. The battery provides the PASS II just under three hours of operation, with the display backlight enabled and no power amplifier option used.

Press the UNIT POWER ON/OFF Switch to turn on the PASS II (the switch's green LED will illuminate when in the "On" position), and wait for the boot cycle to complete before beginning operations. Refer to Figure 7 for the PASS II Basic Setup Screen that is displayed once the unit has finished booting.

The PASS II will automatically shut itself off if the internal battery voltage is low, to protect the battery from over-discharge. If the battery is discharged to a low level and the unit is not used for an extended period the battery may enter a safe mode to protect it from over-discharge, which will prevent PASS II units with IDR-008 or earlier software from being able to recharge it. In this instance, an external charger should be used to wake the battery out of its safe mode, after which the PASS II unit will be able to recharge the battery.

5.3   LCD TOUCH PANEL DISPLAY

The PASS II touch panel display is the primary operator interface. Reserved screen areas display the current status of the unit. Operator input areas provide an interactive means of unit control, to allow for simulation/test signal definition.

Refer to Figure 6 for a depiction of the display layout. Grey shaded areas are reserved sections, while white shaded areas allow for operator input.
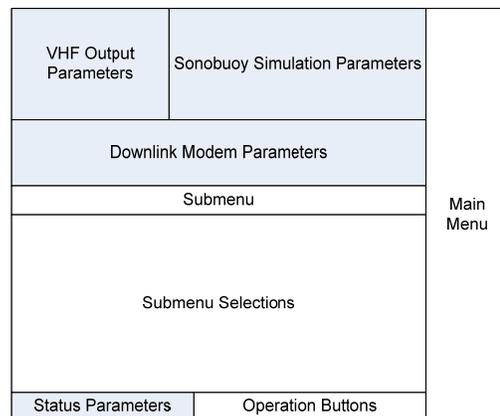
Figure 6: PASS II Display Layout

5.3.1.1   Soft Keys

Software keys allow the operator to select a desired action, and to enable and disable valid parameters for the action selected by pressing/clicking on the applicable key outline on the display.

5.3.2   Reserved Screen Areas

The touch panel display contains reserved areas. These areas include a VHF Output Parameters section, a Sonobuoy Simulation Parameters section, a Downlink Modem Parameters section, and a Status Parameters section.

5.3.2.1   VHF Output Parameters Section

The VHF Output Parameters section is displayed in the upper left corner of the screen. The current selected sonobuoy channel, its associated frequency, and RF transmission level are displayed. VHF output is shown as either on (green indicator), or as off (grey indicator). Modulation is shown as enabled (green indicator), or as disabled (grey indicator).

5.3.2.2   Sonobuoy Simulation Parameters Section

This section provides information on the type of sonobuoy simulated, as well as environmental and other settings specific to the particular sonobuoy selected.

5.3.2.3   Downlink Modem Parameters Section

The Downlink Modem Parameters section provides an indication (green indicator) if a CFS or CSG message has been detected, as well as if PC logging is active. A received signal strength meter provides a 5 bar visual indication of the currently received transmission signal strength. Besides the 5 bar visual indication, the received signal strength is displayed in S levels, dBm, and watts.
Note: S level 1 corresponds to a signal strength of approximately -90 dB. There are a total of ten S levels (0-9), with each S level differing from the next by 6 dB.

Additionally, the most recently received downlink command is displayed. A CFS or CSG indication, the time of receipt, RF Channel, Command, % modulation, and received power are displayed for each downlink message received. The currently displayed message will be overwritten when the next valid downlink command is received/decoded, and the most recent command is displayed. The latest downlink command will be displayed until the unit is powered down, or another valid downlink command is received.

5.3.2.4   Status Parameters Section

The status parameters section includes a smart battery meter, charging indicator, clock, and date indication.

5.3.2.4.1   Battery Meter

A "smart" battery meter is displayed in the lower left-hand section of the display. This display gives a visual representation of the amount of battery life remaining. When the battery charge remaining drops below 12% remaining, the battery meter is flashed on and off to alert the operator that the battery will need to be recharged.

5.3.2.4.2   Charging Indicator

A yellow lightning bolt symbol is displayed to the right of the battery meter when the battery is charging. When the battery isn't being charged (battery is fully charged or the unit is powered by the battery, the yellow lightning bolt charging symbol isn't displayed.

5.3.2.4.3   Clock

The current time is displayed in hours and minutes (hh:mm) to the right of the battery and charging indicators. Select Tools from the main menu, and then the Set Time submenu to set the current time in the PASS II. Alternately, pressing on the time display portion of the touch screen will automatically bring up the Time/Date menu, allowing for the time to be set.

5.3.2.4.4   Date

The current month, day, and year are provided just below the clock display. To initially set/reset the current date, select Tools from the main menu, and then Set Date and Set Year to input the current date into the PASS II. Alternately, pressing on the time display portion of the touch screen will automatically bring up the Time/Date menu, allowing for the date to be set.

5.3.3   Operator Input Areas

5.3.3.1   Operation Buttons

The PASS II provides two operation soft keys at the bottom of the display, Simulation Start/Stop and Manual Ping. The **Stop Simulation** soft key will disable the currently defined sonobuoy simulation. The **Manual Ping soft** key allows the operator to command a ping when the PASS II is simulating an active type sonobuoy (DICASS, etc). The Pinging indicator in the Sonobuoy Simulation Parameters section of the display turns green during the time that the PASS II generates the commanded ping. When no sonobuoy or a passive type

sonobuoy is selected, the Manual Ping soft key is greyed out, and is not selectable.

5.3.3.2   Main Menu

The Main Menu section is located along the right-hand side of the display, and allows the operator to call up the following submenus:

*   Presets
*   RF Setup
*   Passive Buoys Setup
*   Active Source Buoys Setup
*   Recorded Simulations
*   Special Setup
*   Environmental Settings
*   GPS Settings
*   Target Patterns
*   Downlink
*   CSG
*   CFS
*   Options
*   Tools
*   Report Config.

The Downlink, CSG, CFS, Options, Tools, and Report Config. submenus can be accessed by pressing the Next soft key at the bottom of the Main Menu section of the display. The PASS II will display the Main Menu default selections (Basic Setup, RF Setup, Passive Buoys Setup, Active Source Buoys Setup, Recorded Simulations, Special Setup, Environmental Settings, and GPS Settings) by pressing the Previous soft key displayed at the bottom of the display.
The currently selected Main Menu soft key is identifiable by a red left side bar and red lettering. Non selected main menu soft keys are displayed with a grey left side bar and grey lettering.

5.3.3.3   Presets

The Presets main menu is the default power-up menu for the PASS II. The PASS II is able to have up to twelve (12) preset simulations. The PASS II is delivered with two preset selections programmed: Power up Defaults, and 1kHz Cal Tone. The user has the ability to program each of the PASS II's 12 available presets using PASS II Configuration Utility, P/N 6476-9352.
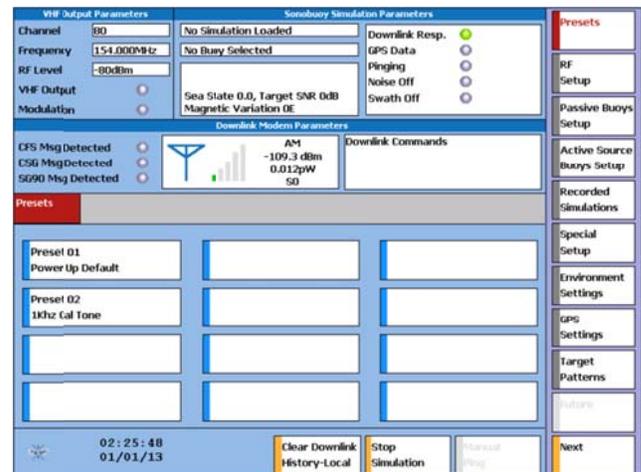
Figure 7: Presets Screen

5.3.3.3.1   Power up Defaults

Selection of the Power up Defaults soft key will return the PASS II settings to those at initial power up (Channel 80, RF Level of -80 dBm, no simulation loaded, no sonobuoy selected).

5.3.3.3.2   1 kHz Cal Tone

Selection of the **1 kHz TSG** soft key commands the PASS II to generate a test signal. The tone frequency is 1 kHz with a FM deviation of 75 kHz.

5.3.3.4   RF Setup

The RF Setup main menu allows the operator to configure the PASS II simulation RF parameters. The following submenus are available: RF Channel and RF Output. The PASS II defaults to the RF Channel submenu once the RF Setup soft key is pressed.

5.3.3.4.1   RF Channel

Selecting the **RF Channel** main menu soft key calls up a touch pad screen which allow the operator to select any of the 99 operational sonobuoy channels, or either test channel (100 or 101). Once the desired channel number has been selected, press the **Enter** soft key to tune the PASS II to that particular frequency. If an undesired channel is entered, the operator can select the **CLR** soft Key and re-input the desired channel number. The **Enter** soft key is grayed out for invalid sonobuoy channel selections (102 and above). Selection of channel 0 disables the RF output of the PASS II.
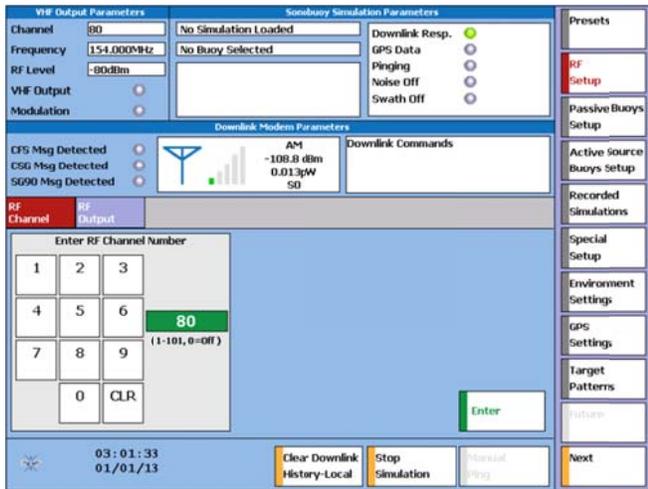
Figure 8: RF Channel Screen
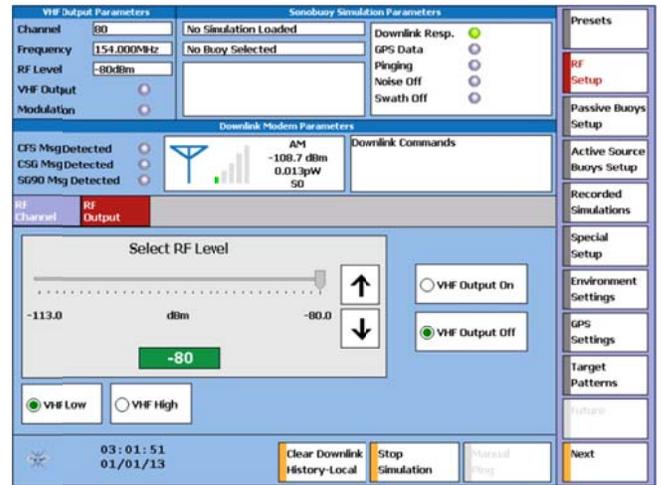
Figure 9: RF Output Screen

5.3.3.4.2 RF Output

The PASS II offers the operator the ability to generate either a VHF Low (-113 to -80 dBM RF level, or a VHF High (-40 to +0 dBm RF level) by selecting the appropriate soft key. The PASS II defaults to the VHF Low setting of -80 dBm. RF levels in whole dBm are selectable by pressing either the ↑ soft key (increases the RF level) or the ↓ soft key (decreases the RF level). Alternately, the operator can drag the RF level pointer to the desired level using the touch panel. A numerical representation of the currently selected RF level is displayed in the Select RF Level box.

The operator can enable or disable the VHF output by selecting either the **VHF Output On** or **VHF Output OFF** soft keys. The PASS II defaults to VHF Output Off.

5.3.3.5 Passive Buoys Setup

The Passive Buoys Setup main menu allows the operator to simulate any one of the following passive sonobuoys: Bathythermograph (BT), DIFAR, LOFAR, and HIDAR. The PASS II defaults to the BT submenu.

5.3.3.5.1 BT

Selecting the BT submenu soft key will allow the operator to set up the PASS II to generate a Bathythermograph sonobuoy simulation. The operator is able to select between entering the desired water temperature in either degrees Celsius or degrees Fahrenheit by pressing the appropriate soft key. Refer to the following BT simulation screen.
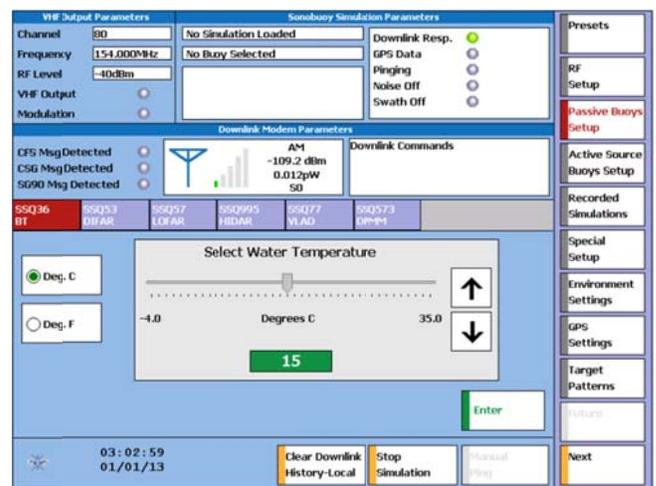
Figure 10: BT Simulation Screen

When the **Deg. C** soft key is selected, water temperatures between -4°C and 35°C in whole degrees are supported, with the default being 15°C. When the **Deg. F** soft key is selected, water temperatures between 25°C and 95°C are supported, with the default being 59°C.

The operator is able to use the Up Arrow or Down Arrow soft keys to either increase or decrease the simulated water temperature. Alternately, the operator is able to press on the water temperature marker on the screen, and drag the pointer either left or right to the approximate value desired, and then fine tune the marker with the up or down soft keys. Once the desired level is indicated, press the **Enter** soft key to command the PASS II to generate the BT sonobuoy simulation. The operator is able to confirm that the BT simulation has been set by verifying that the desired sonobuoy and water temperature are displayed in the Sonobuoy Simulation Parameters section of the screen. Pressing the **Simulation Stop** soft key located along the bottom of the screen will Halt the simulation.

5.3.3.5.2   DIFAR

Selecting the DIFAR submenu soft key allows the operator to enable/disable noise control and GPS, and to select between five different types of pattern simulations: DIFAR, ATSG DIFAR (low pattern), Calibrated Shallow Omni (CSO), Extended Calibrated Omni (CO), or a Calibrated Omni (CO) simulation. Pressing any of these buttons will cause a green indicator on the left side of the soft key to illuminate, indicating the button has been selected. Refer to the DIFAR simulation screen shown below.

Figure 11: DIFAR Simulation Screen

Selecting the **Noise Control On** soft key causes the PASS II to simulate uncorrelated (non-repetitive) broadband noise along with the target tonals, while selecting the **Noise Control Off** soft key will cause the PASS II to only generate the target tonals for the simulation selected.

Selecting the **GPS On** soft key will include GPS data with the DIFAR simulation. A GPS carrier frequency of 33.5 kHz is used for the DIFAR, ATSG DIFAR, CSO, and CO simulations. A GPS carrier frequency of 45 kHz is utilized for the Extended CO simulation. The GPS data simulated by the PASS II was created using data generated by an actual GPS sonobuoy. The PASS II generates this information (when enabled) based on the user selected inputs via the GPS Settings menu. User selected GPS inputs include Lat/Long, Drift Bearing, Drift Speed, and update rate. All four GPS message types (GSA, GGA, RMC, and GSV) are included in the simulation.

Once the desired settings are selected, press the **Enter** soft key to command the PASS II to generate the specific DIFAR sonobuoy simulation. The operator is able to confirm that the desired sonobuoy simulation is being generated by verifying the appropriate settings are displayed in the Sonobuoy Simulation Parameters section of the screen. Pressing the **Simulation Stop** soft key located along the bottom of the screen will halt the simulation.

5.3.3.5.3   LOFAR

Selecting the LOFAR submenu soft key allows the operator to generate a LOFAR simulation with or without noise control enabled. Pressing either button will cause a green indicator on the left side of the soft key to illuminate, indicating the button has been selected. Refer to the LOFAR simulation screen below.
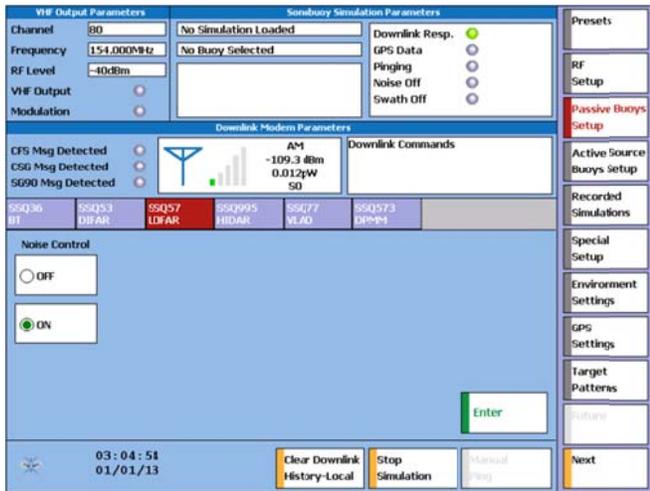
Figure 12: LOFAR Simulation Screen

Selecting the Noise Control **On** soft key causes the PASS II to simulate uncorrelated (non-repetitive) broadband noise along with the LOFAR target tonals, while selecting the Noise Control **Off** soft key will cause the PASS II to only generate the LOFAR target tonals for the simulation.

Once the desired setting for noise control has been selected, press the **Enter** soft key to command the PASS II to generate the LOFAR sonobuoy simulation. The operator is able to confirm that the desired sonobuoy simulation is being generated by verifying the appropriate settings are displayed in the Sonobuoy Simulation Parameters section of the screen. Pressing the **Simulation Stop** soft key located along the bottom of the screen will disable the simulation.

5.3.3.5.4   HIDAR

Selection of the HIDAR submenu allows the operator to configure HIDAR simulation.

The PASS II will generate the HIDAR simulation detailed in section 3, which is transmitted out of the VHF OUT and Mod Out ports when the Enter soft key is pressed.

Selecting the Noise Control **On** soft key causes the PASS II to simulate uncorrelated (non-repetitive) broadband noise along with the target tonals, while selecting the Noise Control **Off** soft key will cause the PASS II to only generate the target tonals for the simulation selected.

Selecting the **GPS On** soft key will include GPS data with the HIDAR simulation. GPS data is inserted in the frames aux field. The PASS II generates this information (when enabled) based on the user selected inputs via the GPS Settings menu. User selected GPS inputs include Lat/Long, Drift Bearing, Drift Speed, and update rate. All four GPS message types (GSA, GGA, RMC, and GSV) are included in the simulation. The GPS update rate is not selectable for the HIDAR simulation.

The operator is able to confirm that the desired sonobuoy simulation is being generated by verifying the appropriate settings are displayed in the Sonobuoy Simulation Parameters section of the screen. Pressing the **Simulation Stop** soft key located along the bottom of the screen will halt the simulation if it is running.
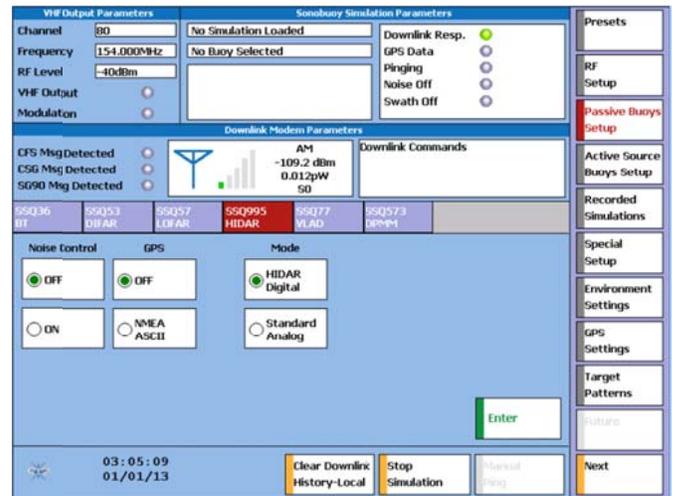
Figure 13: HIDAR Simulation Screen

5.3.3.5.5   VLAD

Selecting the VLAD submenu soft key allows the operator to enable/disable noise control, and to select between two different types of pattern simulations: PASS VLAD, and ATSG VLAD (low pattern) simulation. Pressing any of these buttons will cause a green indicator on the left side of the soft key to illuminate, indicating the button has been selected. Refer to the following VLAD simulation screen.
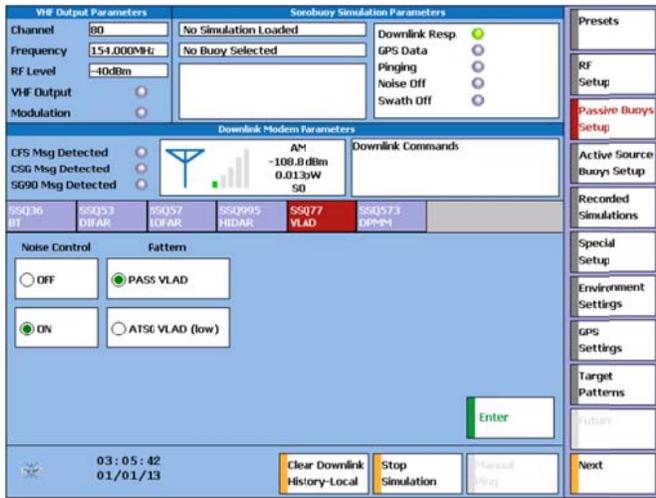
Figure 14: VLAD Simulation Screen

Selecting the Noise Control **On** soft key causes the PASS II to simulate uncorrelated (non-repetitive) broadband noise along with the target tonals, while selecting the Noise Control **Off** soft key will cause the PASS II to only generate the target tonals for the simulation selected.

Once the desired settings are selected, press the **Enter** soft key to command the PASS II to generate the specific VLAD sonobuoy simulation. The operator is able to confirm that the desired sonobuoy simulation is being generated by verifying the appropriate settings are displayed in the Sonobuoy Simulation Parameters section of the screen. Pressing the **Simulation Stop** soft key located along the bottom of the screen will halt the simulation.

5.3.3.5.6 SSQ-573

Selection of the SSQ-573 submenu allows the operator to configure a SSQ-573 simulation.

Selecting the Noise Control **On** soft key causes the PASS II to simulate uncorrelated (non-repetitive) broadband noise along with the target tonals, while selecting the Noise Control **Off** soft key will cause the PASS II to only generate the target tonals for the simulation selected.

Selecting the GPS **NMEA ASCII** soft key will include GPS data with the SSQ-573 simulation. The PASS II generates this information (when enabled) based on the user selected inputs via the GPS Settings menu. User selected GPS inputs include Lat/Long, Drift Bearing,

and Drift Speed. Four GPS message types (GSA, GGA, RMC, and GSV) are included in the simulation.

Selecting the Mode **DIFAR** soft key will cause the PASS II to generate the DIFAR simulation detailed in section 3 once the **Enter** soft key is pressed. Selecting the **HIDAR** soft key will command the HIDAR simulation, and the **LA** soft key will command the Low-Frequency Active Receiver simulation when the **Enter** soft key is pressed. Pressing the **Simulation Stop** soft key located along the bottom of the screen will halt the simulation.
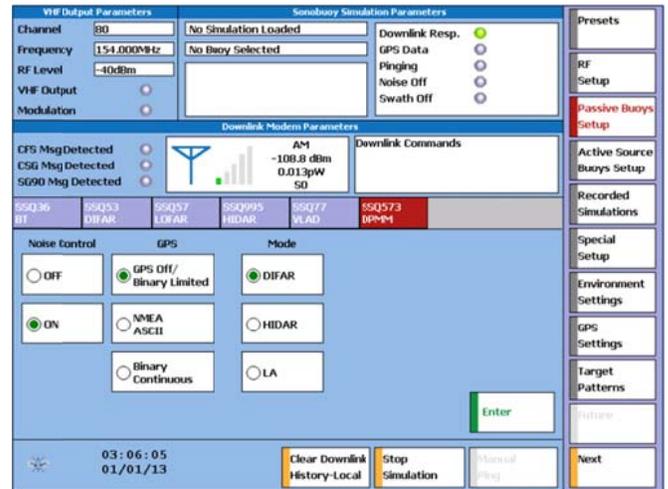
Figure 15: SSQ-573 Simulation Screen

5.3.3.6 Active Source Buoys Setup

The Active Source Buoys Setup main menu allows the operator to simulate a DICASS, EER, or ALFEA sonobuoy.

5.3.3.6.1 DICASS

Selecting the DICASS submenu soft key allows the operator to select the desired test pattern and Ping type, and to enable or disable noise control, free run, reverb, trigger tone, and to enable/disable GPS.

To either enable or disable Noise Control, Free Run, Reverb, or Trigger Tone, press the corresponding soft key below the appropriate heading. Pressing any of these buttons will cause a green indicator on the left side of the soft key to illuminate, indicating the button has been selected.

The Trigger tone is 3.2 kHz during the ping interval. Simulated reverberation is not available when FM Up or FM Down ping types are selected. The operator makes the desired selections by pressing the

appropriate soft keys. The sea state noise used when the noise control is enabled is the current value specified in the Environment Settings screen.

Selecting the **Noise Control On** soft key causes the PASS II to simulate uncorrelated (non-repetitive) broadband noise along with the DICASS target tonals, while selecting the **Noise Control Off** soft key will cause the PASS II to not generate uncorrelated noise with the simulation target tonals.

To select the high test pattern for the DICASS simulation, press the **High** soft key under the Test Pattern heading. Press the **Low** soft key to select the low test pattern. Pressing either of these buttons will cause a green indicator on the left side of the soft key to illuminate, indicating the button has been selected.

Selecting the GPS **On** soft key will include GPS data with the DICASS simulation. GPS data is inserted in the frames aux field. The PASS II generates this information (when enabled) based on the user selected inputs via the GPS Settings menu. User selected GPS inputs include Lat/Long, Drift Bearing, Drift Speed, and update rate. All four GPS message types (GSA, GGA, RMC, and GSV) are included in the simulation.

The operator is able to select between CW Short, CW Medium, CW Long, and FM UP/DN for the simulated Ping. Press the appropriate soft key to select. A green indicator on the left side of the selected soft key will illuminate, indicating the button has been selected.
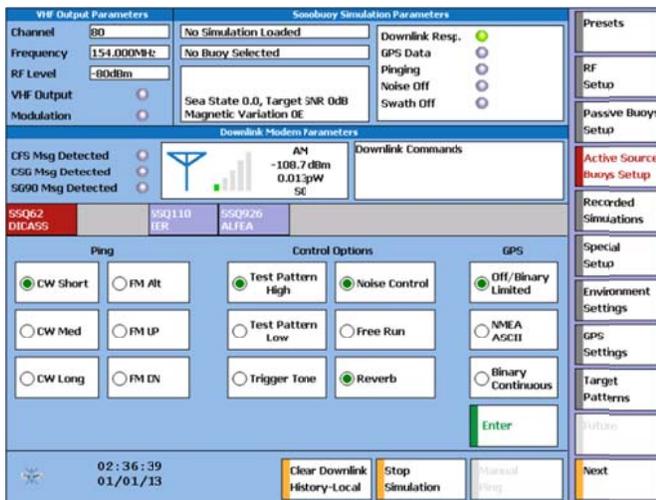
Figure 16: DICASS Simulation Screen

Once the desired settings have been selected, press the **Enter** soft key to command the PASS II to generate the DICASS sonobuoy simulation. The operator is able to confirm that the desired sonobuoy simulation is being generated by verifying the appropriate settings are displayed in the Sonobuoy Simulation Parameters section of the screen. Pressing the **Simulation Stop** soft key located along the bottom of the screen will halt the simulation.

5.3.3.6.2   SSQ-110 EER

Selecting the SSQ-110 EER submenu soft key allows the operator to generate the Extended Echo Ranging sonobuoy simulation. Pressing/clicking on the Enter soft key will cause the PASS II to automatically delay for 60 seconds (simulating the deployment of the sonobuoy), after which the PASS II generates the EER deployed tone. A simulation running indication is then provided, along with the following information "Deployed. Awaiting downlink commands.". The PASS II will then generate the appropriate response tone when a valid EER command is received by the PASS II. Pressing the Simulation Start/Stop soft key located along the bottom of the screen will disable the simulation.
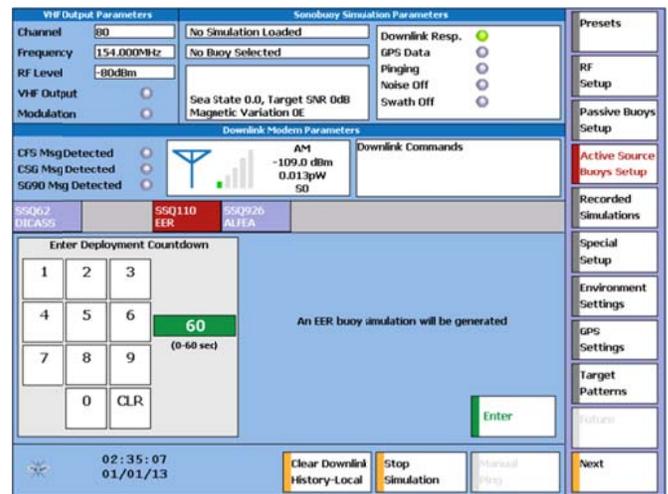
Figure 17: SSQ-110 EER Simulation Screen

5.3.3.6.3   ALFEA

Selecting the SSQ-926 ALFEA submenu soft key allows the operator to simulate ALFEA buoy responses for the Deployment Countdown, Buoy ID/Depth, and Operating Life. The PASS II ALFEA simulation defaults to the Deployment Countdown submenu.

The operator is able to define the simulated deployment countdown from 0 seconds to 60 seconds as shown in the following screen.
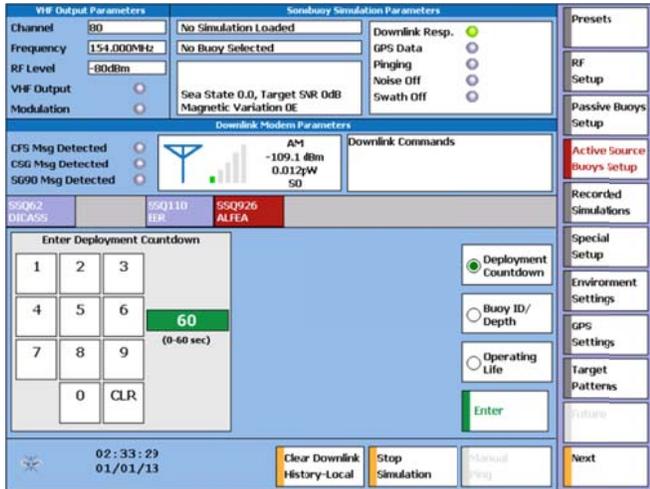
Figure 18: ALFEA Deployment Countdown Simulation Screen

Selecting the **Buoy ID/Depth** soft key allows the operator to define the Sonobuoy ID. Valid ID inputs range from 0 to 255, with the PASS II defaulting to 161.

The operator is also able to select between three different depth simulations for the ALFEA simulation. Selecting the **Shallow** soft key will cause the PASS II to simulate a depth of 30 meters ± 15%. Selecting the **Intermediate** soft key will cause the PASS II to simulate a depth of 60 meters ± 10%. Selecting the **Deep** soft key will simulate a depth of 250 meters ± 10%. A depiction of the Buoy ID/Depth submenu screen is shown below.
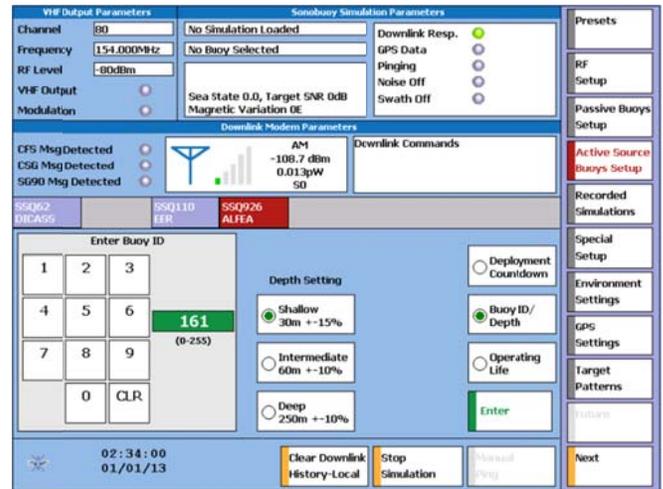
Figure 19: ALFEA Buoy ID/Depth Simulation Screen

Selecting the **Operating Life** soft key allows the operator to simulate a buoy life of 1 to 6 hours in one hour increments, or to disable this function. The PASS II defaults to the Disable value. A depiction of the Operating Life submenu screen is shown below.
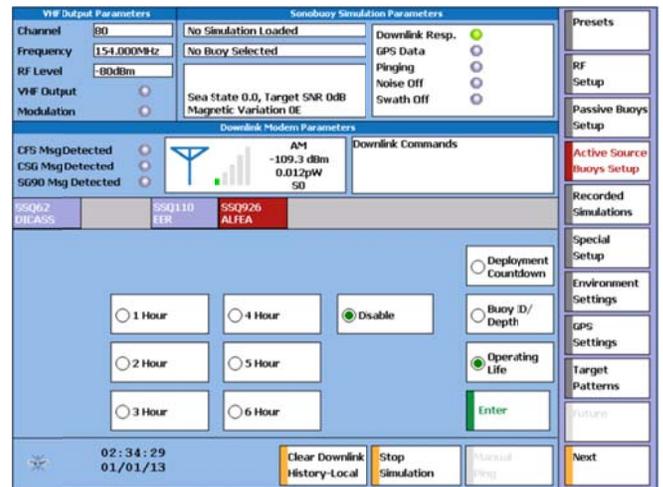
Figure 20: ALFEA Operating Life Simulation Screen

5.3.3.7   Recorded Simulations

The Digital Buoys main menu allows the operator to command the PASS II to generate HIDAR, BARRA, CAMBS, SSQ-101 HAASW, and PRBS sonobuoy simulations by selecting the appropriate submenu soft keys. The PASS II Presets are able to incorporate a recorded simulation file, and the PASS II is also able to stream PC data.

5.3.3.7.1 HIDAR

Selection of the HIDAR submenu allows the operator to select the HIDAR Default simulation, the HIDAR Simulation #1, or a HIDAR Simulation #2 for the PASS II to generate. Selecting the **Loop** soft key will cause the PASS II to automatically replay the selected simulation once the **Enter** soft key is pressed until commanded to stop or a different simulation is selected.

Selecting the **HIDAR Default** soft key will cause the PASS II to generate the HIDAR simulation detailed in section 3, which is transmitted out of the VHF OUT and Mod Out ports. Environmental selections available with other sonobuoy simulations are not supported with the HIDAR simulation. The Sonobuoy Simulation Parameters section of the display indicates that the simulation is active.

Selection of the HIDAR Simulation #1 and the HIDAR Simulation #2 soft keys will cause the PASS II to generate alternate HIDAR simulations.

The operator is able to confirm that the desired sonobuoy simulation is being generated by verifying the appropriate settings are displayed in the Sonobuoy Simulation Parameters section of the screen. Pressing the **Simulation Stop** soft key located along the bottom of the screen will disable the simulation.
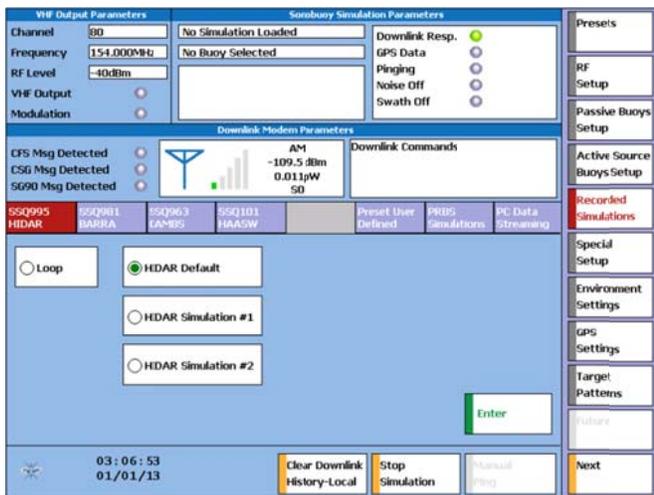
Figure 21: HIDAR Simulation Screen

5.3.3.7.2 BARRA

The BARRA submenu allows the operator to select the BARRA Default simulation, the BARRA Simulation #1,

or the BARRA Simulation #2 for the PASS II to generate. Selecting the **Loop** soft key will cause the PASS II to automatically replay the selected simulation once the **Enter** soft key is pressed until commanded to stop or a different simulation is selected.

Selection of the **BARRA Default** soft key will command the PASS II to generate the BARRA simulation described in section 3. This simulation runs for 30 minutes and then stops.

Selection of the BARRA Simulation #1 and the BARRA Simulation #2 soft keys will cause the PASS II to generate alternate BARRA simulations.

The operator is able to confirm that the desired sonobuoy simulation is being generated by verifying the appropriate settings are displayed in the Sonobuoy Simulation Parameters section of the screen. Pressing the **Simulation Stop** soft key located along the bottom of the screen will disable the simulation.
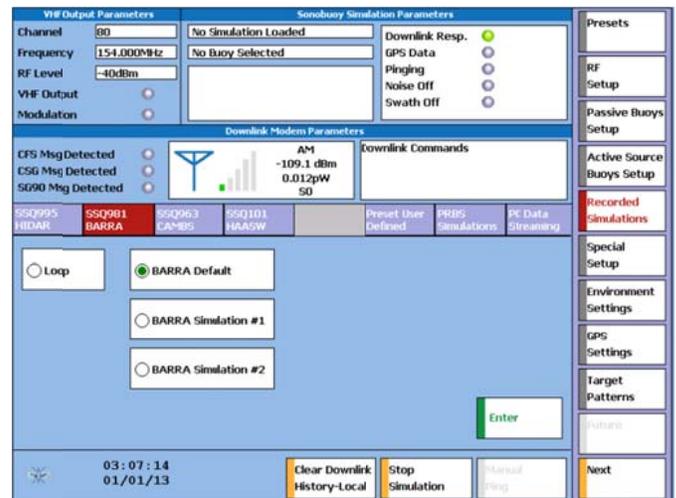
Figure 22: BARRA Simulation Screen

5.3.3.7.3 CAMBS

The CAMBS submenu allows the operator to cause the PASS II to generate different CAMBS simulations based on what ping type is received by the PASS II.

CAMBS pings supported by the PASS II are CW Long, CW Short, Low CW Long, Low CW Short, High CW Long, High CW Short, FM Up, and FM Down. Upon receipt of a corresponding valid ping, the PASS II will generate a CAMBS simulation.

The operator is able to confirm that the desired sonobuoy simulation is being generated by verifying the appropriate settings are displayed in the Sonobuoy Simulation Parameters section of the screen. Pressing the **Simulation Stop** soft key located along the bottom of the screen will disable the simulation.
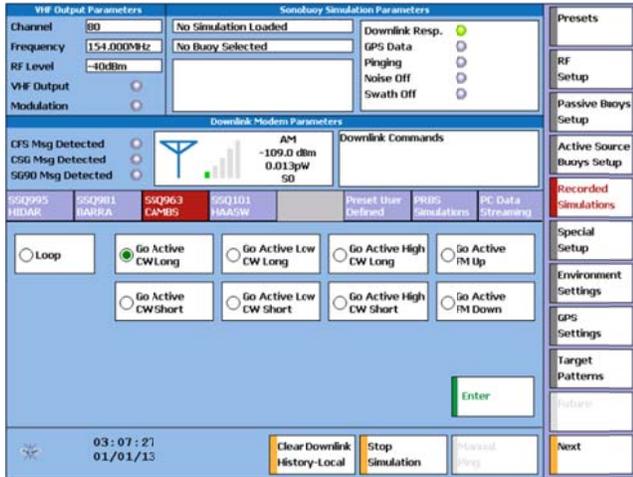
Figure 23: CAMBS Simulation Screen

5.3.3.7.4   SSQ-101 HAASW

Selection of the SSQ-101 HAASW submenu allows the operator to select recorded simulation files for the different SSQ-101 buoy modes and submodes.

Selection of the **Env Low A** soft key will cause the PASS II to generate the Environment Mode Low, HAASW State, Submode A simulation.

Selection of the **Env Low B** soft key will cause the PASS II to generate the Environment Mode Low, HAASW State, Submode B simulation.

Selection of the **Env Mid A** soft key will cause the PASS II to generate the Environment Mode Mid, HAASW State, Submode A simulation.

Selection of the **Env Mid B** soft key will cause the PASS II to generate the Environment Mode Mid, HAASW State, Submode B simulation.

Selection of the **Env High A** soft key will cause the PASS II to generate the Environment Mode High, HAASW State, Submode A simulation.

Selection of the **Env High B** soft key will cause the PASS II to generate the Environment Mode High, HAASW State, Submode B simulation.

Selection of the **Passive A** soft key will cause the PASS II to generate the Passive Mode, HAASW State, Submode A simulation.

Selection of the **Passive B** soft key will cause the PASS II to generate the Passive Mode, HAASW State, Submode B simulation.

Selection of the **Comp MAC A** soft key will cause the PASS II to generate the Compressed MAC Mode, HAASW State, Submode A simulation.

Selection of the **Comp MAC B** soft key will cause the PASS II to generate the Compressed MAC Mode, HAASW State, Submode B simulation.

Selection of the **PAC MAC A** soft key will cause the PASS II to generate the PACMAC Mode, HAASW State, Submode A simulation.

Selection of the **PAC MAC B** soft key will cause the PASS II to generate the PACMAC Mode, HAASW State, Submode B simulation.

Selection of the **IEER Legacy** soft key will cause the PASS II to generate an IEER, Legacy State simulation.

Selection of the **IEER A** soft key will cause the PASS II to generate an IEER, HAASW State, Submode A simulation.

Selection of the **IEER B** soft key will cause the PASS II to generate an IEER, HAASW State, Submode B simulation.

Selection of the **MAC Legacy** soft key will cause the PASS II to generate a MAC, Legacy State simulation.

Selection of the **MAC A** soft key will cause the PASS II to generate a MAC, HAASW State, Submode A simulation.

Selection of the **MAC B** soft key will cause the PASS II to generate a MAC, HAASW State, Submode B simulation.

Selection of the **Omni Legacy** soft key will cause the PASS II to generate an Omni Audio, Legacy State simulation.

Selection of the **Omni A** soft key will cause the PASS II to generate an Omni Audio, HAASW State, Submode A simulation.

Selection of the **Omni B** soft key will cause the PASS II to generate an Omni Audio, HAASW State, Submode B simulation.

Selection of the **Loop** soft key will cause the PASS II to continue to replay the selected simulation file over and over, until another simulation is commanded or the **Stop Simulation** soft key is pressed.

Simulation Parameters section of the screen. Pressing the **Simulation Start/Stop** soft key located along the bottom of the screen will disable the simulation.
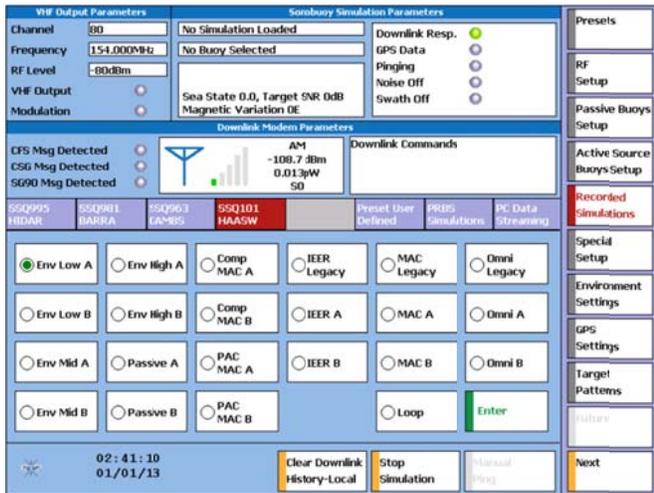
Figure 24: SSQ-101 HAASW Screen

5.3.3.7.5   PRBS Simulations

Selection of the PRBS Simulations submenu will command the PASS II to generate a pseudo-random polynomial bit pattern. This bit pattern can be used to verify the Bit Error Rate (BER) of the Sonobuoy Receiver or of the full acoustic suite for BARRA, HIDAR, and CAMBS sonobuoy data formats, depending on the soft key selected. Pressing the **Simulation Stop** soft key located along the bottom of the screen will disable the simulation.
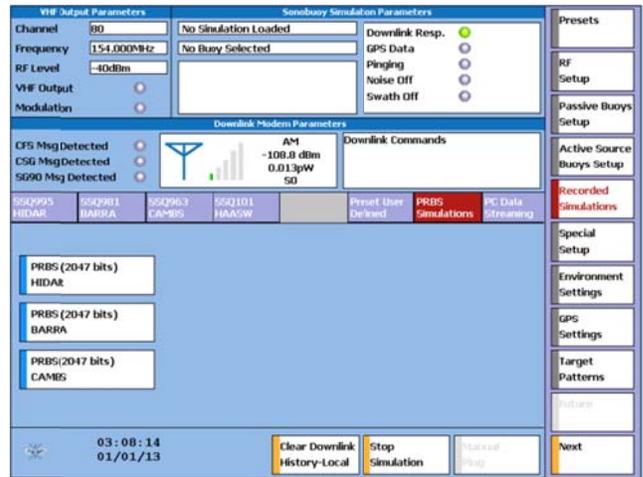
Figure 25: PRBS Simulations Screen

5.3.3.7.6   Preset User Defined

When a preset that incorporates a recorded simulation file is commanded from the Preset screen, the PASS II will display a screen which identifies the Preset User Defined Recorded Simulation file, the Preset Defined Modulation Type, and the Preset User Defined Loop for the selected preset. A depiction of this screen is provided below.
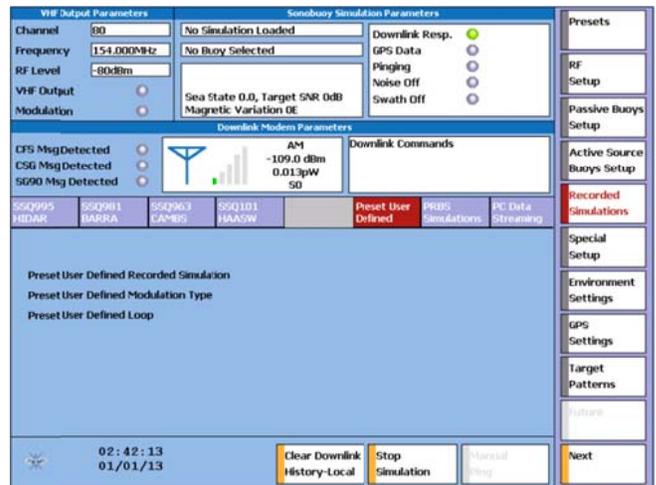
Figure 26: Preset User Defined Screen

5.3.3.7.7   PC Data Streaming

The PC Data Streaming submenu allows for data to be transferred from a PC to the PASS II over Ethernet.

Supported digital buoy data files include HIDAR, BARRA, and CAMBS.

The data files are stored on a PC in the STANAG Format. For example a source file can be created using an SDSR and tuning a PIC as a digital buoy and recording the STANAG output for that PIC.

The PC Application **PASS II Utilities** can be used to select the Ethernet Address, Data file, and Start/Stop streaming data.

To stream Data, the modulation type should be selected in the submenu below followed by "Enter". Then the "Start Streaming Data" button on the **PASS II Utilities** screen should be selected.

Figure 27: PC Data Streaming Screen

Figure 28: PC Application, Pass II Utilities

5.3.3.8   Special Setup

The Special Setup menu allows the PASS II operator to generate unmodulated carriers, generate calibration tones, use external modulation for a PASS II simulation, or generate demodulated simulations.

5.3.3.8.1   Unmod Carrier

The Unmod Carrier submenu allows the operator to generate baseband signals with no modulation by pressing the **Enter** soft key. The unmodulated carrier is transmitted from the VHF Out connector of the PASS II.
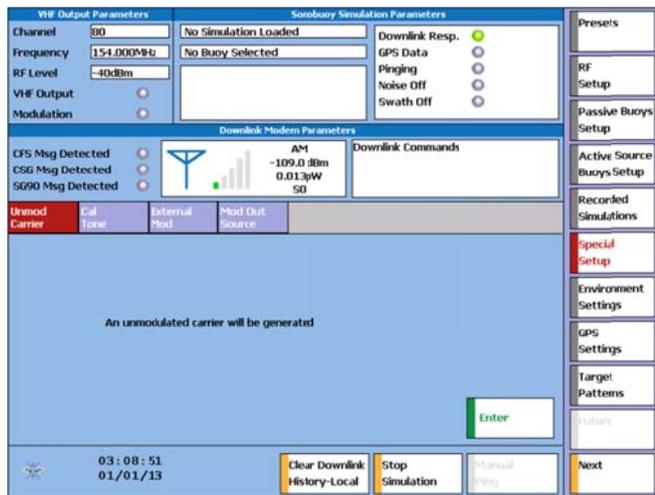
Figure 29: Unmod Carrier Screen

Figure 30: Cal Tone Screen

5.3.3.8.2   Cal Tone

Selecting the Cal Tone submenu allows the operator to generate a tone suitable for use as a reference signal. Frequencies between 0 Hz and 50 kHz and FM deviations between 0 and 240 kHz are supported. The operator selects the desired frequency and FM deviation using the soft key keypads. The PASS II defaults to inputting the tone frequencies and deviations in kHz. If the operator desires finer resolution of inputs, press the kHz button on the corresponding keypad to be able to enter values down to increments of ones. Pressing the kHz button a second time returns the keypad input resolution to 1000s. Selecting values which exceed the supported frequencies and FM deviations cause the **Enter** soft key to become grayed out. The operator must select a valid frequency and FM deviation to generate a calibration tone.

Once the desired external modulation has been selected, pressing/clicking the **Enter** soft key will cause the PASS II to transmit the selected calibration tone. Pressing the **Simulation Stop** soft key will halt the transmission of the calibration tone.

5.3.3.8.3   External Mod

Selecting the **External Mod** soft key allows the operator to allow the PASS II to accept either VHF or UHF modulation from an external source through the MOD IN connector.

When the **VHF** soft key is selected, the PASS II routes the input modulation for transmission from the MOD IN connector to the VHF Out connector. A 2 Vrms input signal corresponds to 75 kHz deviation. External VHF modulation signals from 0-4 Vrms are supported.

When the **UHF** soft key is selected, the PASS II routes the input modulation for transmission from the MOD IN connector to the UHF Out connector. A 1 Vrms input signal corresponds to 50% AM modulation. External UHF modulation signals from 0-2 Vrms are supported.

Once the desired external modulation has been selected, pressing the **Enter** soft key will cause the PASS II to transmit the external modulation signal received through the appropriate connector. Pressing the **Simulation Stop** soft key will halt the transmission of the external modulation.
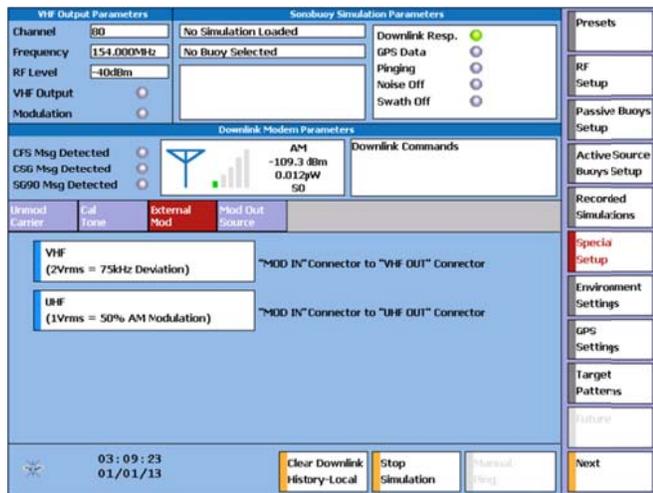
Figure 31: External Mod Screen
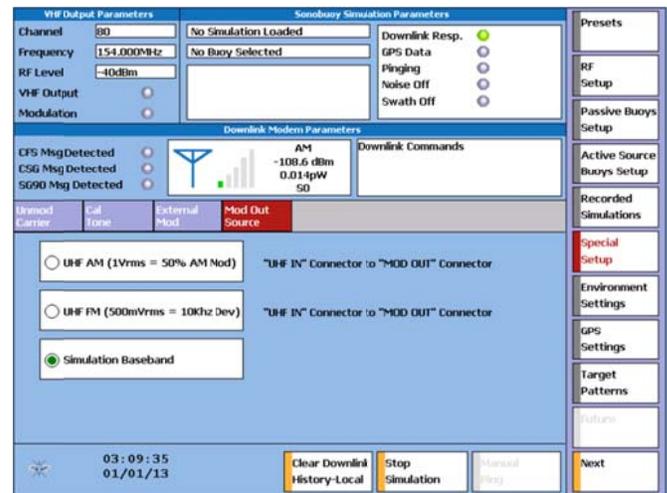
Figure 32: Mod Out Source Screen

5.3.3.8.4 Mod Out Source

Selecting the Mod Out Source submenu allows the operator to receive baseband/demodulated data through the UHF In connector. UHF AM, UHF FM, or simulation baseband inputs are supported by the PASS II.

Selection of the **UHF AM** soft key will cause UHF AM modulated data to be supplied from the Mod Out connector. A 1 Vrms input signal corresponds to 50% AM modulation. External UHF AM demodulated signals from 0% to 100% are supported.

Selection of the **UHF FM** soft key will cause UHF FM modulated data to be supplied from the Mod Out connector. For a UHF FM input signal, 500mVrms corresponds to 10 kHz deviation.

Selection of the **Simulation Baseband** soft key allows Sonobuoy simulation baseband data to be output from the Mod Out connector.

Pressing the **Simulation Stop** soft key will halt the transmission of the data.

5.3.3.9 Environmental Settings

The Environmental settings main menu soft key allows the operator to configure the PASS II to simulate sea state, target strength, magnetic variation, Swath, and DEMON parameters. The PASS II initially defaults to the Sea State submenu.

5.3.3.9.1 Sea State

From the Sea State submenu the operator is able to command the PASS II to simulate 13 different sea states. A sea state of 0 is representative of calm seas, while 6.0 is representative of stormy seas.

The operator is able to use the **Up Arrow** or **Down Arrow** soft keys to either increase or decrease the desired simulated sea state value. Alternately, the operator is able to press on the sea state marker on the screen, and drag the pointer either left or right to the approximate value desired, and then fine tune the marker with the up or down soft keys. Once a sonobuoy simulation is commanded, the currently selected sea state will be simulated. The PASS II defaults to a sea state of 0.
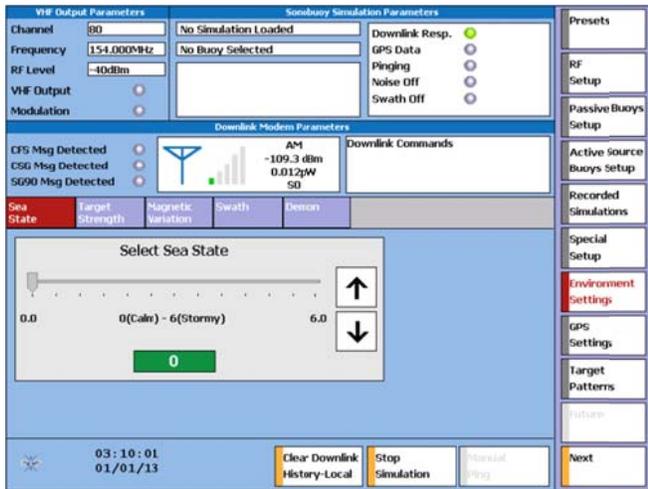
Figure 33: Sea State Screen

5.3.3.9.2   Target Strength

Selecting the **Target Strength** submenu soft key allows the operator to set a desired target strength between 0 and 30 dB.

The operator is able to use the up arrow or down arrows to either increase or decrease the desired target strength value. Alternately, the operator is able to press on the target strength marker on the screen, and drag the pointer either left or right to the approximate value desired, and then fine tune the marker with the ↑ or ↓ soft keys. The Target strength defaults to 0 dBm. Once a sonobuoy simulation is commanded, the selected target strength will be used for generating the target tonals of that simulation.
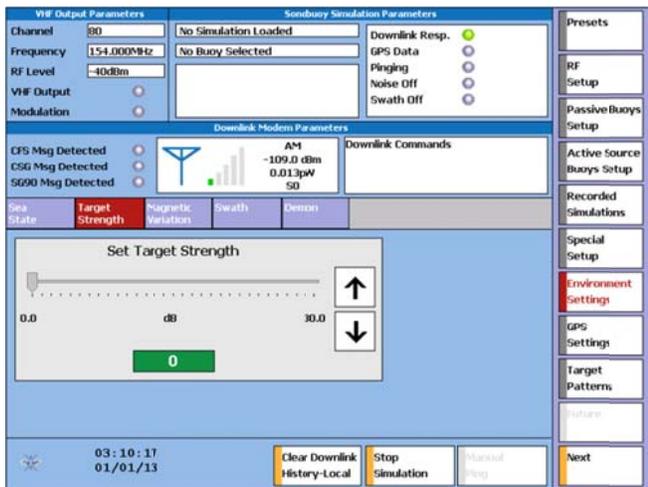
Figure 34: Target Strength Screen

5.3.3.9.3   Magnetic Variation

Selecting the **Magnetic Variation** submenu soft key allows the operator to command the PASS II to simulate a specific magnetic variation for a simulation. Magnetic values between 0 to 90 degrees for both East and West variations are selectable. Invalid magnetic variation parameters (above 90 degrees) will cause the Enter soft key to grey out, and not allow the value to be entered/used in a simulation.

Using the number pad displayed on the screen, enter the desired variation value. Press the **East** soft key to simulate East variation, and the **West** soft key to simulate West variation. A green indicator on the left side of the East & West soft keys is lit when either key is selected.

Once the desired magnetic variation has been selected, press the **Enter** soft key to command the PASS II to enter that value into volatile memory. The Sonobuoy Simulation Parameters section of the display will indicate the currently selected magnetic variation. Once a sonobuoy simulation is commanded, the selected magnetic variation will be simulated.
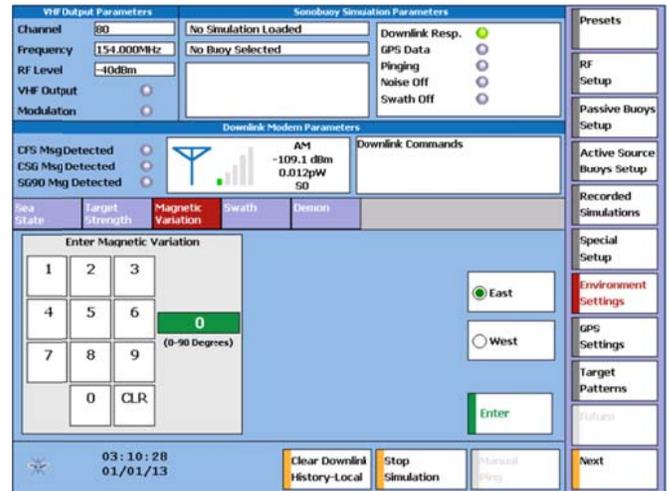
Figure 35: Magnetic Variation Screen

5.3.3.9.4   Swath

The Swath submenu is only accessible when a DIFAR, LOFAR, or DICASS simulation has been commanded. Selecting the Swath submenu allows the operator to specify the frequency, bearing, bandwidth, and target strength of a swath target to be simulated along with the buoy simulation.

Selecting the **FREQUENCY** soft key enables the operator to input a SWATH frequency between 0 Hz

and 3,249 Hz. The soft key numeric keypad is used to select the desired frequency, and is entered via the **Enter** soft key. A default SWATH frequency of 1,500 Hz is commanded on power up.

Selecting the **BEARING** soft key allows the operator to dictate the bearing of the SWATH target. Valid bearing inputs range from 0º to 359º in one degree increments. The operator selects the desired bearing by pressing the appropriate numbers on the soft key number pad, followed by pressing the **Enter** soft key. If a value greater than 359º is selected, the PASS enters the largest valid input (359º). A bearing of 0º is defaulted upon power up.

Selection of the **BANDWIDTH** soft key allows the operator to specify the desired SWATH bandwidth. The bandwidth can be varied between 0 Hz and 1 kHz in 10 Hz increments. The operator selects the desired Swath bandwidth by pressing the appropriate numbers on the soft key number pad, followed by pressing the **Enter** soft key.

Selection of the **TARGET STRENGTH** soft key allows the operator to specify the desired SWATH signal to noise ratio. The signal to noise ratio can be varied from 0 dB to 40 dB in one decibel increments. The operator selects the desired Swath target strength by pressing the appropriate numbers on the soft key number pad, followed by pressing the **Enter** soft key.

The Swath target can be enabled/disabled via the **Swath On/Off** soft key. When enabled, the Swath indicator is displayed as green and shows as Swath On in the Sonobuoy Simulation Parameters portion of the display. When disabled, it is displayed as grey and indicates Swath Off.
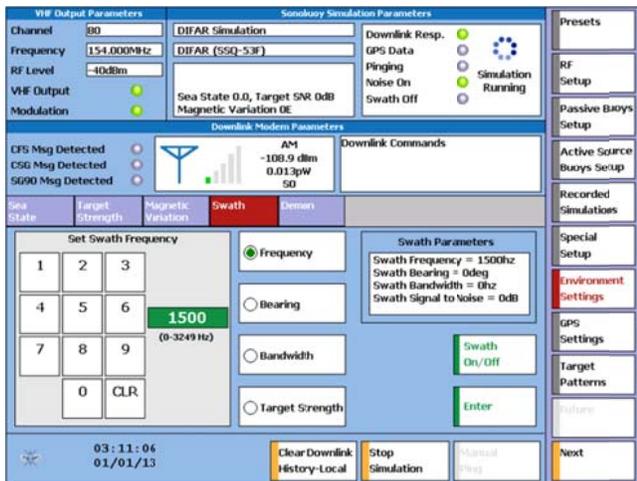
Figure 36: Swath Screen

5.3.3.9.5 DEMON

The DEMON submenu is only accessible when a DIFAR, LOFAR, or DICASS simulation has been commanded. Selection of the **DEMON** soft key permits the operator to select noise and modulation levels desired for PASS II DEMON processing. The operator is able to specify noise level and modulation parameters for both high band and low band DEMON.

The **HighBand DEMON** soft key allows the operator to select the noise level between 0% and 100% in increments of 5% . The PASS II defaults to a high band DEMON noise level of 0%. The high band noise level selection is entered by pressing the appropriate ↑ and/or ↓ soft keys until the desired value is displayed.

Selection of the **HighBand Mod.%** soft key allows the operator to select the desired modulation % for the high band DEMON. High band modulation is supported in 5% increments, with the modulation ranging from 0% to 50%. The PASS II defaults to a high band DEMON modulation of 0%. The high band noise level selection is entered by pressing the appropriate ↑ and/or ↓ soft keys until the desired value is displayed.

The **LowBand DEMON** soft key allows the operator to select the noise level between 0% and 100% in increments of 5% . The PASS II defaults to a low band DEMON noise level of 0%. The low band noise level selection is entered by pressing the appropriate ↑ and/or ↓ soft keys until the desired value is displayed.

Selection of the **LowBand Mod.%** soft key allows the operator to select the desired modulation % for the low band DEMON. low band modulation is supported in 5% increments, with the modulation ranging from 0% to 50%. The PASS II defaults to a high band DEMON modulation of 0%. The high band noise level selection is entered by pressing the appropriate ↑ and/or ↓ soft keys until the desired value is displayed.
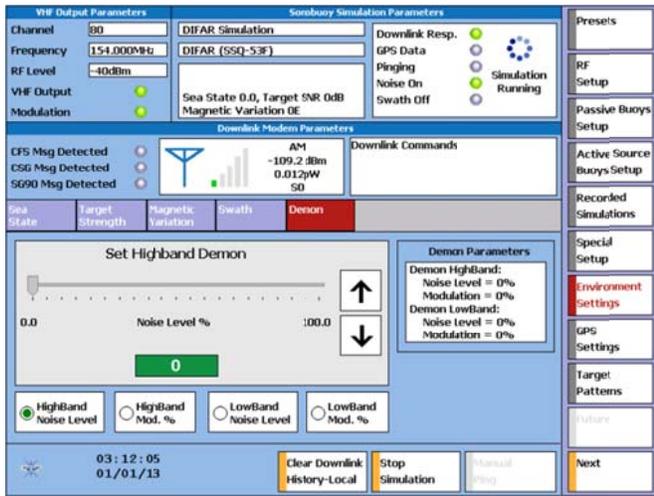
Figure 37: DEMON Screen
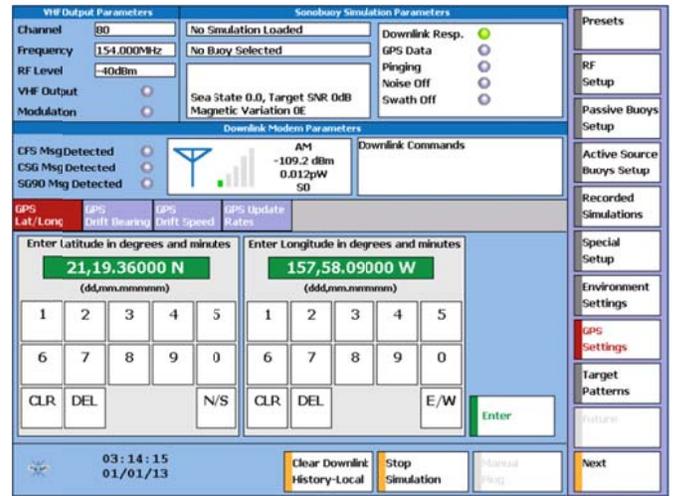
Figure 38: GPS Lat/Long Screen

5.3.3.10 GPS Settings

The **GPS Settings** main menu soft key allows the operator to configure the PASS II GPS simulation parameters, which are included in buoy simulations when GPS is enabled for a GPS capable Sonobuoy. GPS latitude/longitude, drift bearing, drift speed, and update rate parameters are definable by the operator. The PASS II initially defaults to the GPS Lat/Long submenu.

5.3.3.10.1 GPS Lat/Long

The GPS Lat/Long submenu allows the operator to specify the GPS coordinates of the sonobuoy being simulated. The operator is able to enter latitudes between 0 degrees 0 minutes through 90 degrees 0 minutes, and longitudes between 0 degrees 0 minutes through 180 degrees 0 minutes. The Latitude and longitude must be fully defined before the unit allows the operator to enter the coordinates into the unit. Pressing the **N/S** soft key on the latitude keypad will toggle the desired latitude between either North or South values. Pressing the **E/W** soft key will toggle the desired longitude between either East or West values. Pressing the **Enter** soft key commits the latitude and longitude information into the PASS II GPS buoy simulation.

Selecting values in excess of 90 degrees Latitude or 180 degrees Longitude will cause the PASS II to default to 90 degrees latitude or 180 degrees longitude.

5.3.3.10.2 GPS Drift Bearing

The GPS Drift Bearing submenu allows the operator to select the Sonobuoy drift bearing for the Sonobuoy simulation. Valid drift bearings range from 180 degrees to 180 degrees. The bearings are input in degrees and minutes by pressing the appropriate numbers on the soft key number pad, followed by pressing the **Enter** soft key. Values entered in excess of ±180 degrees default to ±180 degrees. If minutes are inserted in excess of 60, the PASS II will automatically default the minutes value to 60.
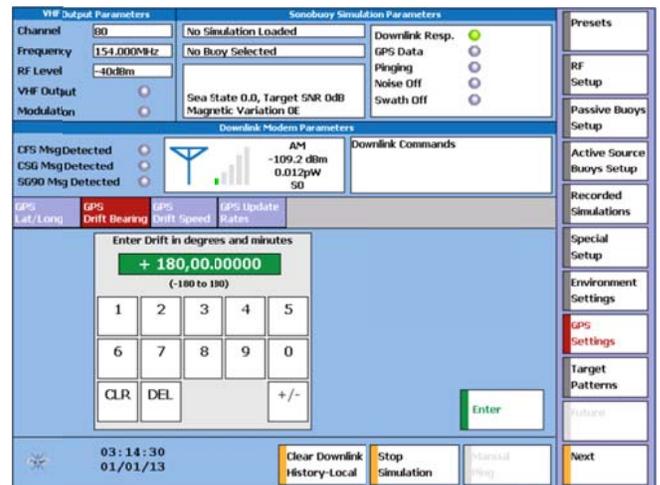
Figure 39: GPS Drift Bearing Screen

5.3.3.10.3 GPS Drift Speed

The GPS Drift Speed submenu allows the operator to specify the drift rate for the simulated GPS capable Sonobuoy. Drift rates from 0 to 2 knots in tenths of a knot increments are selectable by pressing the appropriate ↑ and/or ↓ soft keys until the desired value is displayed.
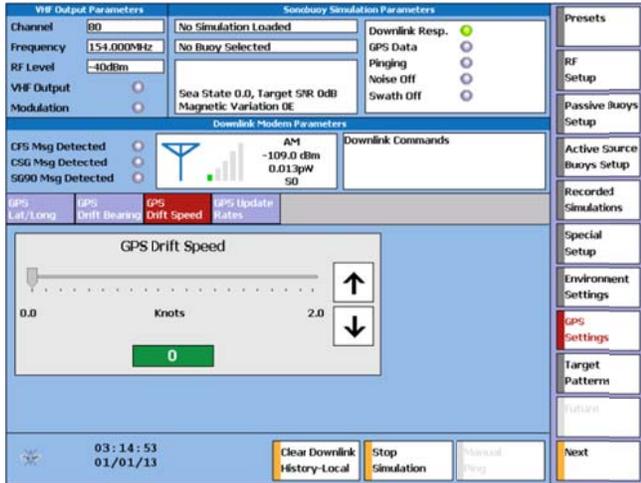
Figure 40: GPS Drift Speed Screen

5.3.3.10.4 GPS Update Rate

The GPS Update Rate allows the operator to update the GPS location update rate (from 0-600 sec) and the Sonobuoy Status update rate (0-600 sec) when simulating a sonobuoy in the Binary Continuous mode. The operator is able to enter in the update rates in whole seconds using the touch keypads, and then pressing the **Enter** soft key.
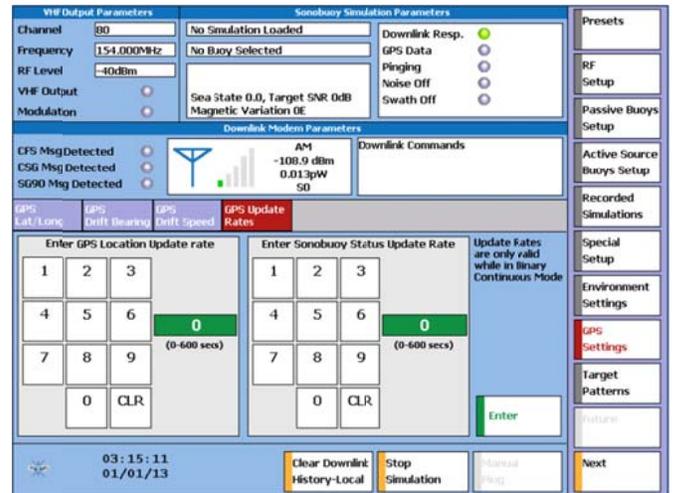
Figure 41: GPS Update Rate Screen

5.3.3.11 Target Patterns

Selecting the **Target Patterns** main menu soft key allows the operator to change the frequency, bearing, or signal-to-noise ratio for simulation targets. This capability is supported for LOFAR, DIFAR (including CO/CSO, and XCO modes), and SSQ-573 (LA mode). Note that the LOFAR sonobuoy does not provide bearings for an operator to modify due to limitations of the sonobuoy. Representative screens for modifying target frequencies, bearings, and signal-to-noise ratio are shown below.
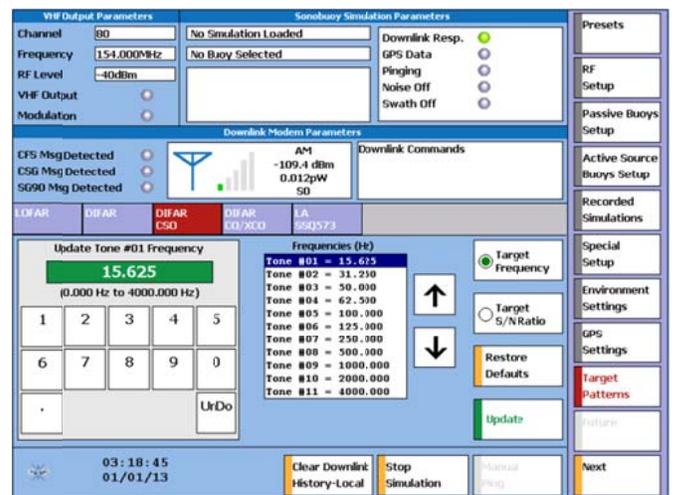
Figure 42: Target Frequency Screen
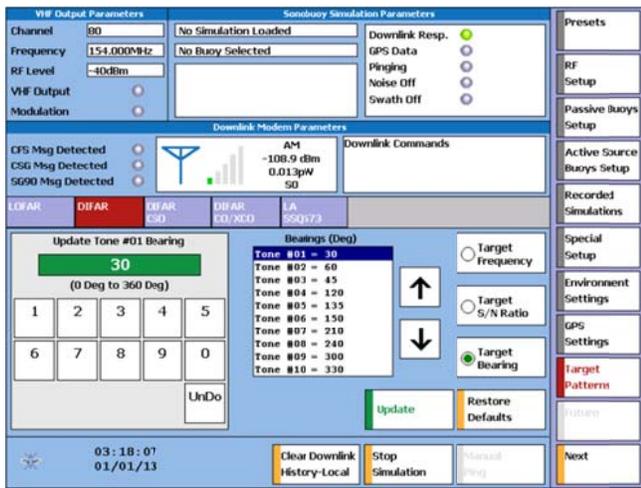
Figure 43: Target Bearing Screen
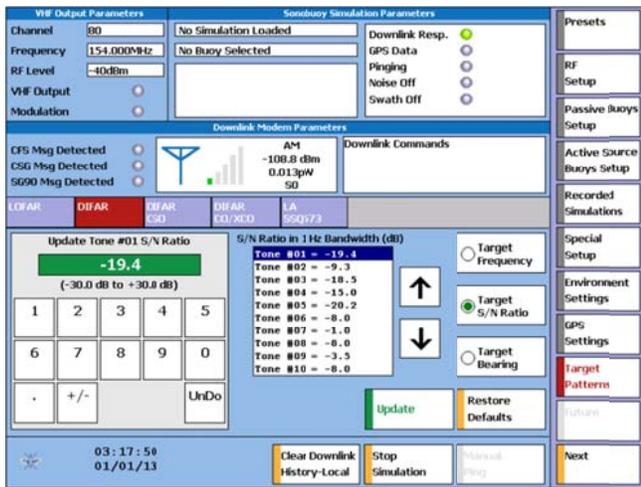
Figure 44: Target Signal To Noise Ratio Screen

5.3.3.12   Downlink History

Selecting the **Downlink History** main menu soft key allows the operator to either view the received downlink commands registered by the PASS II via the **Downlink History** submenu soft key, to gain access to the **Downlink Utilities** submenu, or to access the **Downlink Options** submenu.

Downlink History can also be transferred from the PASS II to a PC by using the **PASS II Utilities** PC Application. This transfer is performed over Ethernet. From the screen below, select the file you wish to save

the data to, then press the "Get Downlink Data From PASS II and save to File" button to retrieve and save the data. The data will be displayed in the scrollable textbox on the PC screen. Alternately, a data file previously downloaded from the PASS II may be displayed by selecting the file and pressing the "Display Downlink Data (Local Copy)" button.
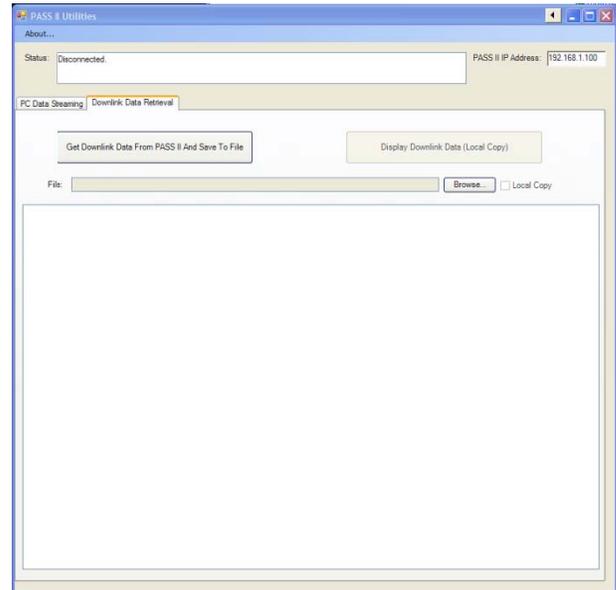
Figure 45: Downlink History Screen

5.3.3.12.1   Downlink History

The Downlink History submenu screen allows the operator to view received CFS/CSG commands since the unit was last been powered on. The PASS II has the capability to store 128 downlink commands. Once the PASS II downlink memory is full, the oldest decoded data is overwritten as new commands are received. The PASS II time stamps all downlink records as they are received.

The operator is able to scroll through all of the CFS/CSG messages retained by the PASS II. The ↑ soft key will gain the operator access to earlier messages, while the ↓ soft key allows the operator to view newer messages.

Selection of the **Local** soft key allows the operator access to downlink history information stored in the PASS II volatile RAM, since the unit was last powered up.

Selection of the **File** soft key allows the operator to access recorded downlink history information stored on the PASS II regardless of power cycles (up to 128 records stored).

The **Local** downlink history record is cleared when the PASS II is turned off, while the **File** option saves up to 128 records regardless of power cycles.
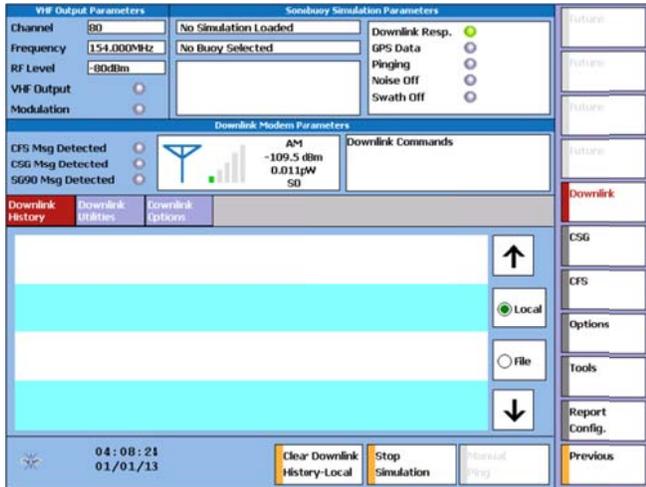
Figure 46: Downlink History Screen

5.3.3.12.2 Downlink Utilities

The Downlink Utilities submenu allows the operator to select the **Clear Downlink History - Local** soft key, which will erase all of the received CFS/CSG messages from the PASS II that were received since the unit was turned on.

The Downlink Utilities submenu also allows the operator to select the **Clear Downlink History - File** soft key, which will erase all of the received CFS/CSG messages from the PASS II regardless of power cycles.
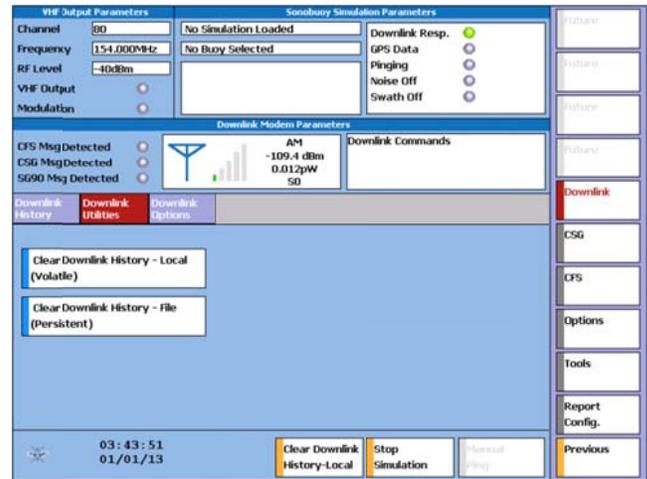
Figure 47: Downlink Utilities Screen

5.3.3.13 Downlink Options

Selecting the **Downlink Options** submenu soft key allows the operator to control how the downlink function of the PASS II operates. Functions controllable are Input, Response, and Attenuator.

The PASS II is capable of accepting input of downlink data in analog form or as modulated RF. When **RF** is selected as the "Downlink Input", amplitude modulated RF signals at 291.4 MHz input into the front panel UHF IN connector will be demodulated, decoded, and displayed. When the **ANALOG** setting is selected, the PASS II unit will decode and display analog data supplied to the front panel MOD IN jack.

Selecting the **Enabled** soft key for Response will cause the PASS II to initiate a simulated echo cycle if the VHF channel designated by the CSG tone pair matches the operating frequency of the PASS II VHF output. It will also cause a CFS command to be acknowledged with an 800 Hz tone, and will cause the uplink content to be modified in accordance with the command, if the correct RF channel of the message matches the current frequency of the PASS II VHF output. No changes to the uplink data will result from downlink commands if the **Disabled** soft key is selected.

The "Attenuator" setting defaults to **Present**. The RF level measurement displayed during RF level testing with **Present** selected is the input level at the attenuator rather than the input level at the PASS II (the Attenuator Correction Value stored in nonvolatile memory is automatically applied to the RF level read by the PASS II). To display the RF level at the PASS II, select **Not Present**.

The PASS II downlink defaults to RF Input, Response enabled, and Attenuator present.
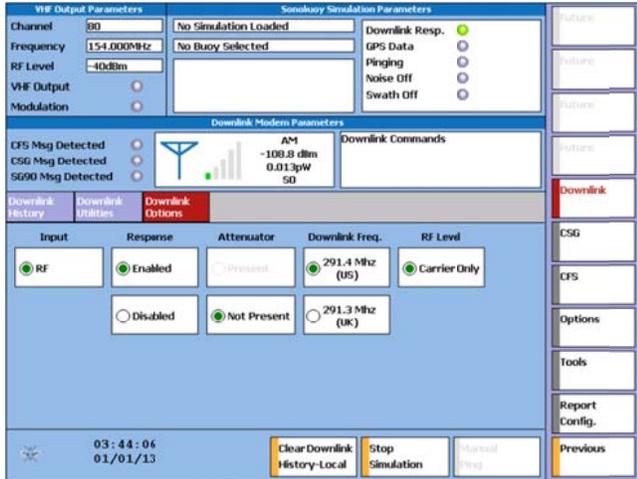
Figure 48: Downlink Options Screen

5.3.3.14   CSG

The CSG main menu allows the operator to generate Command Signal Generation Commands. Command/Ping/Send CSG and Sono/VHF submenus are available to the operator to specify a specific CSG command for generation.

5.3.3.14.1   Command/Ping/Send CSG

The Command/Ping/Send CSG submenu allows the operator to select the specific command type or ping type, and to transmit the command.

Four different CSG commands are supported: Ping, Scuttle, Intermediate Depth, and Deep Depth. The operator is able to select the applicable command by selecting the appropriate soft key. The currently selected soft key will have a green indicator on the left side of the soft key, indicating the button has been selected.

The operator can command a CW short, medium, long, FM Up, or FM Down ping by selecting the appropriate soft key. For descriptions of each PASS II ping type, refer to section 3.2.1.1. The currently selected soft key will have a green indicator on the left side of the soft key, indicating the button has been selected.

The default setting is the Intermediate Depth command. Pressing/clicking on the **Send CSG** soft key will generate the CSG message currently selected.
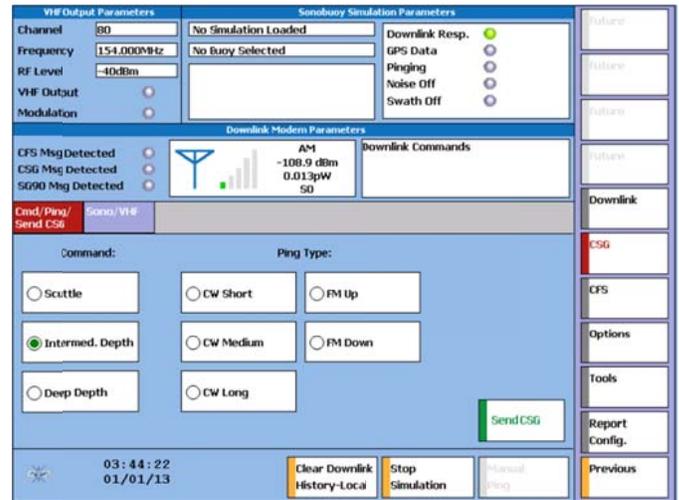
Figure 49: Command/Ping Screen

5.3.3.14.2   Sono/VHF

Selecting the Sono/VHF submenu allows the operator to enter the specific RF channel and sonar channel for the CSG command being generated. The VHF channel input selects the address tone pair used for the CSG command. Valid PASS II inputs for the sonobouy RF channel are 0-101. If an invalid RF channel is entered (102 or higher), the operator will be unable to send the CSG command from the Command/Ping/Send CSG submenu until a valid RF channel is entered (the Send CSG soft Key will be grayed out, and not available).

Once the VHF channel has been selected, the associated default Sonar frequency is also set. The default Sonar frequency soft key (**Sonar A**, **Sonar B**, **Sonar C**, or **Sonar D**) is highlighted. The PASS II allows the operator the ability to change the default Sonar frequency, to support sonobuoys that can use different Sonar frequencies. Press the desired Sonar frequency soft key, should the default frequency not be desired.

Once the RF channel and sonar channel have been selected, return to the Command/Ping/Send CSG submenu to be able to transmit the CSG command.
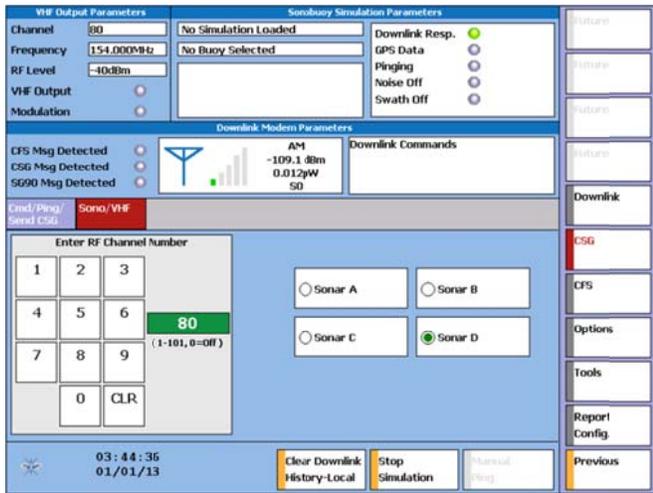
Figure 50: Sono VHF/Send CSG Screen
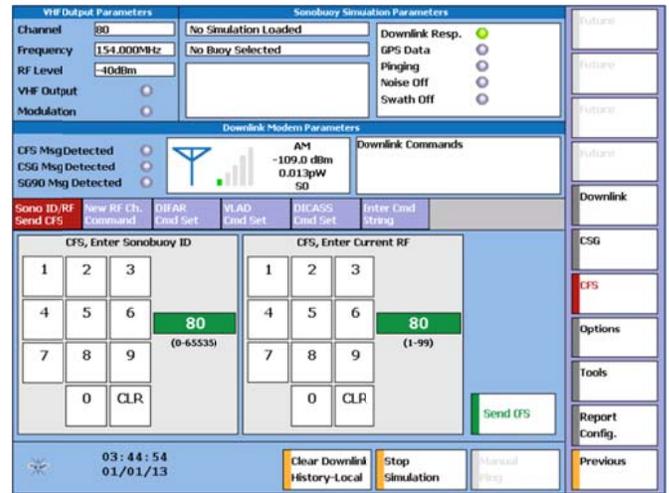
Figure 51: Sono ID/RF/Send CFS Screen

5.3.3.15   CFS

The Command Function Select (CFS) main menu provides the operator the ability to generate CFS commands. The following submenus can be used to generate the desired CFS command: Sono ID/RF/Send CFS, New RF Ch. Command, DIFAR Cmd Set, VLAD Cmd Set, DICASS Cmd Set, and Enter Cmd String.

5.3.3.15.1   Sono ID/RF/Send CFS

The Sono ID/RF/Send CFS submenu allows for specifying the sonobuoy ID and RF channel, as well as transmitting the CFS command once specified.

The desired Sonobuoy ID can be input via the soft key touch pad by selecting the proper numbers. Valid sonobouy ID values are 0-65535. A sonobuoy ID greater than 65535 will grey out the Send CFS soft key, and will not allow the command to be transmitted until a valid value is entered. A default Sonobuoy ID value of 80 is given upon PASS II power up. The entered Sonobuoy ID is shown in the Sonobuoy Simulation Parameters section of the display.

The operator can select the desired Sonobuoy channel (1-99) by pressing the corresponding number on the soft key touch pad. A default Sonobuoy RF channel of 80 is given upon PASS II power up. The entered RF information is shown in the Sonobuoy Simulation Parameters section of the display.

The **Send CFS** soft key will transmit the currently defined CFS command in the PASS II.

5.3.3.15.2   New RF Ch. Command

By selecting the New RF Ch. Command submenu, the operator can select a CFS command to change the RF channel of a CFS capable sonobuoy. This CFS command is valid for any of the CFS capable sonobuoys (DIFAR, VLAD, and DICASS) supported by the PASS II. Once the desired new RF channel has been entered in the soft keypad, press/click the **CMD Set 1** or **CMD Set 2** soft key to include this command as part of the CFS command to be transmitted. The New RF command and the desired channel will be displayed in the Sonobuoy Simulation Parameters display area.

If an invalid RF channel is entered (100 or higher), the operator will be unable to select the new RF command for inclusion in the CFS command (both the CMD Set 1 and CMD Set 2 soft key will be grayed out, and not selectable). Press the CLR button on the keypad and re-enter a valid RF channel to enable the CMD Set 1 and CMD Set 2 soft keys.
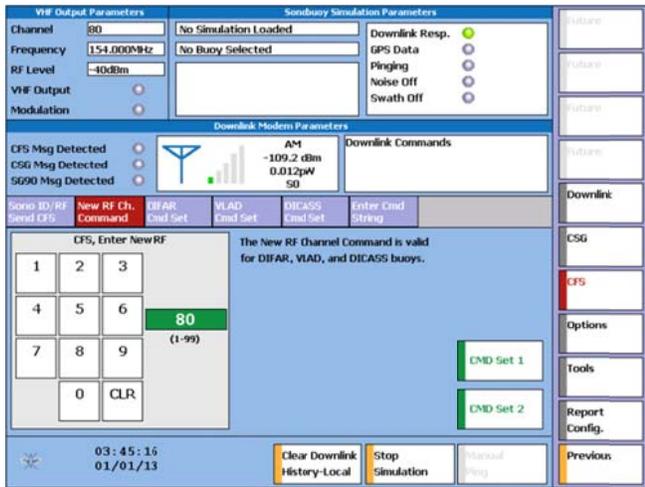
Figure 52: New RF Ch. Command Screen
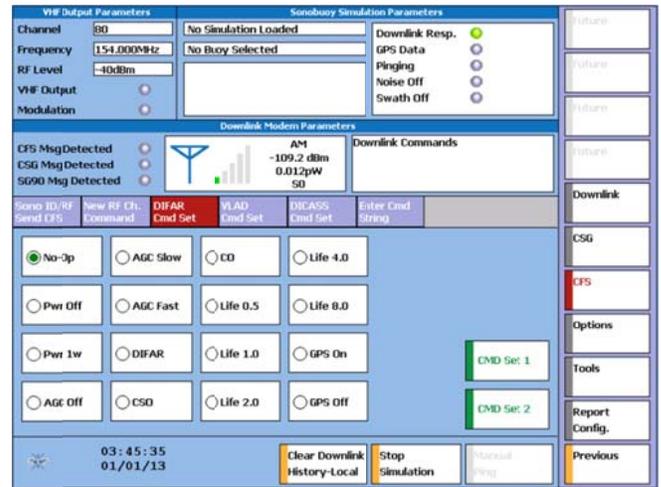
Figure 53: DIFAR Cmd Set Screen

5.3.3.15.3   DIFAR Cmd Set

Selecting the DIFAR Cmd Set will allow the operator to choose any of the valid DIFAR CFS commands for inclusion in the CFS command to be transmitted. DIFAR commands available are:

- No-Op (no operation)
- Pwr Off (power off)
- Pwr 1w (sets the sonobuoy transmit power to 1 watt)
- AGC Off (automatic gain control off)
- AGC Slow (automatic gain control slow)
- AGC Fast (automatic gain control fast)
- DIFAR
- CSO
- CO
- Life 0.5
- Life 1.0
- Life 2.0
- Life 4.0
- Life 8.0
- GPS On
- GPS Off

Any of these commands can be set to CMD Set 1 or to CMD Set 2 by selecting the appropriate soft key. Once the desired command has been selected, press the **CMD Set 1** or **CMD Set 2** soft key to include this command as part of the CFS command to be transmitted. The command selected will be displayed in the Sonobuoy Simulation Parameters display area.

5.3.3.15.4   VLAD Cmd Set

Selecting **VLAD Cmd Set** will allow the operator to choose any of the valid VLAD CFS commands for inclusion in the CFS command to be transmitted. VLAD commands available are:

- No-Op (no operation)
- Pwr Off (power off)
- Pwr 1w (sets the sonobuoy transmit power to 1 watt)
- Life 0.5
- Life 1.0
- Life 2.0
- Life 4.0
- Life 8.0

Any of these commands can be set to CMD Set 1 or to CMD Set 2 by selecting the appropriate soft key. Once the desired command has been selected, press the **CMD Set 1** or **CMD Set 2** soft key to include this command as part of the CFS command to be transmitted. The command selected will be displayed in the Sonobuoy Simulation Parameters display area.
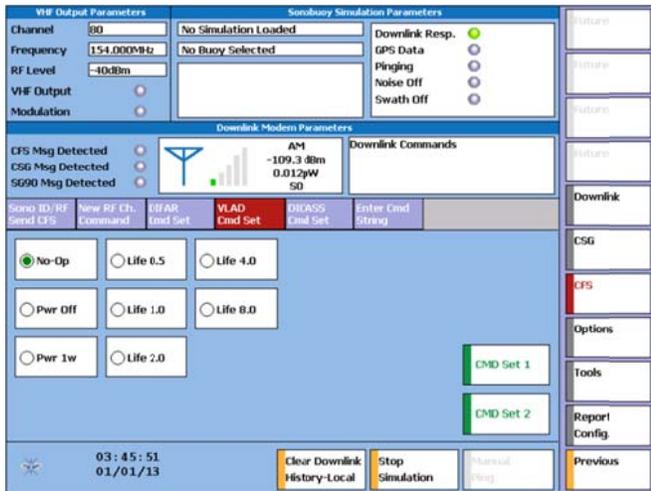
Figure 54: VLAD Cmd Set Screen
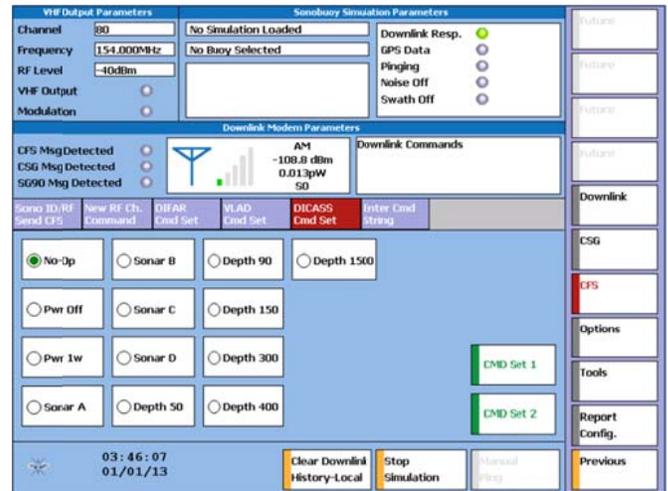
Figure 55: DICASS Cmd Set Screen

5.3.3.15.5   DICASS Cmd Set

Selecting **DICASS Cmd Set** will allow the operator to choose any of the valid DICASS CFS commands for inclusion in the CFS command to be transmitted. DICASS commands available are:

- No-Op (no operation)
- Pwr Off (power off)
- Pwr 1w (sets the sonobuoy transmit power to 1 watt)
- Sonar A
- Sonar B
- Sonar C
- Sonar D
- Depth 50
- Depth 90
- Depth 150
- Depth 300
- Depth 400
- Depth 1500

Any of these commands can be set to CMD Set 1 or to CMD Set 2 by selecting the appropriate soft key. Once the desired command has been selected, press the **CMD Set 1** or **CMD Set 2** soft key to include this command as part of the CFS command to be transmitted. The command selected will be displayed in the Sonobuoy Simulation Parameters display area.

5.3.3.15.6   Enter Cmd String

Selecting the **Enter Cmd String** submenu allows the operator to manually enter a complete specific CFS command in hexadecimal format. Appendix A contains valid hexadecimal codes used to generate valid 12 byte hexadecimal CFS commands. Refer to section 3.4.2 for an explanation of each of the CFS command string bytes.

The **Send CFS** soft key on the Enter Cmd String submenu remains grayed out (is not selectable) until a valid 12 byte command string has been entered. Once a valid command string has been entered, press the **Send CFS** soft key to transmit the CFS command.
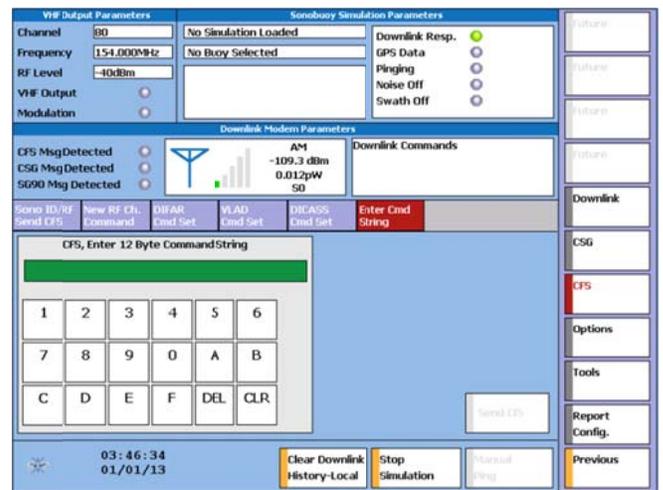
Figure 56: Enter Cmd String Screen

5.3.3.16 Options

The Options main menu allows the operator to select between GUI Style, and Advanced Options submenus.

5.3.3.16.1 GUI Style

The Graphical User Interface (GUI) Style submenu allows the operator to choose between the Factory Default screen display and an Alternate Style screen display by selecting the appropriate soft key. The Factory Default display provides the PASS II with a full color screen display. The Alternate Style screen display format is identical to the default display screen, but presents the information in a limited palate of colors.
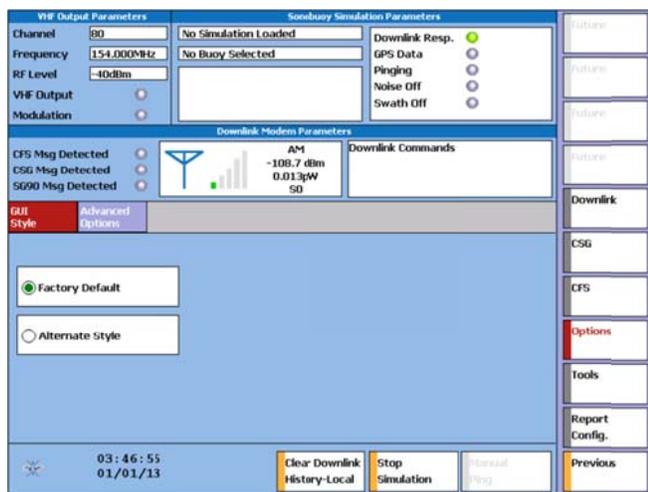
Figure 57: GUI Style Screen

5.3.3.16.2 Advanced Options

Selection of the Advanced Options submenu allows the operator to select between the following options: Display Splash Screen, Set Network Address, and Calibrate Touch Screen.

Selecting the **Display Splash Screen** soft key causes the PASS II to display the initializing screen shown during power up.   Pressing anywhere on the touch screen will cause the PASS II to return to the Advanced Options submenu.

Selecting the **Set Network Address** soft key causes the PASS II to display a Diagnostic Message box in the middle of the display, which states "Double click the PCI-E1Q51CE61 to bring up the IP Address dialog box. Connect keypad, change IP Address, then exit the dialog box as well as the main connection window." Pressing/clicking on the **OK** square in the upper right

section of the Diagnostic Box causes the PASS II to display a Windows screen where the operator can select **PCI-E1Q51CE61** icon. Another icon is displayed as well (**Make New Connection**), but doesn't allow the operator to change any settings.

Selecting the **Make New Connection** icon causes the PASS II to generate a Network Connections box in the middle of the display, which states "Can't rename Make New Connection". Press/click on the **OK** button in the upper right of the Network Connections box to clear the box from the display.

Selecting the **PCI-E1Q51CE61** icon allows the operator to change the IP Address in the PASS II. The PASS II on power up defaults to an IP address of 192.168.1.100. The operator is able to update the IP Address in the PASS II to their network/computer address, to allow them to update the firmware in the PASS II in the event of the availability of new firmware. The Ethernet port is also used for PC Data Streaming as well as Retrieving Downlink Data from the PASS II.

A keyboard will need to be connected to one of the USB ports of the PASS II, to allow the operator to enter the applicable IP address. Once the desired IP address has been input, select the **OK** button in the upper right portion of the message box to return to the Windows screen. Selecting File from the upper left portion of the screen, followed by Close causes the PASS II to revert back to the Advanced Options screen and to display a Diagnostic Message box in the middle of the screen which states "Please power cycle the unit." The operator must cycle the power to the unit, and cause the PASS II to power on again following the selection of the **Set Network Address** soft key, even if the IP address wasn't changed.

Selecting the **Calibrate Touch Screen** soft key allows the operator to recalibrate the touch screen function of the display.

Selecting the **Flip magnetic Variation Direction** soft key will cause the magnetic variation function that is part of the Environmental main menu to reverse East/West magnetic variation values.

Selecting the **Disable HPA** soft key will disable the VHF high power amplifier in the PASS II. The output range of the PASS II High VHF output with the HPA disabled (soft key is displayed with a yellow bar on the left side, and is then displayed as Enable HPA) is 0dBm to -40 dBm. Pressing the soft key when the HPA is disabled will enable the HPA (soft key will be displayed with a blue bar on the left side and indicate Disable

HPA). The High VHF output of the PASS II will be -20 dBm to 20 dBm.
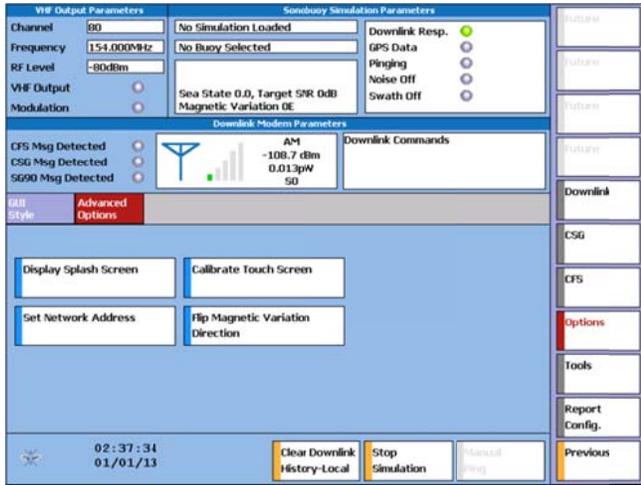
Figure 58: Advanced Options Screen

5.3.3.17 Tools

The Tools main menu allows the operator to select Set Time, Set Date, Set Year, System Log, Diagnostic, and Headphone Volume submenus.

5.3.3.17.1 Set Time

The operator is able to set hours and minutes utilizing the two number pads displayed on the Set Time screen. Hours are selectable from 0-24, while minutes are selectable from 0-59. Invalid inputs (hours greater than 24 and/ or minutes greater than 59) will cause the Enter soft key to become unselectable (grayed out), so that an invalid time is not enterable into the PASS II. Incorrect/invalid entries can be updated by pressing the **CLR** soft keys, and re-entering a valid input. Once valid hours and minutes inputs have been selected by the operator, pressing the **Enter** soft key on the screen will command the PASS II to update the time displayed by the unit accordingly.
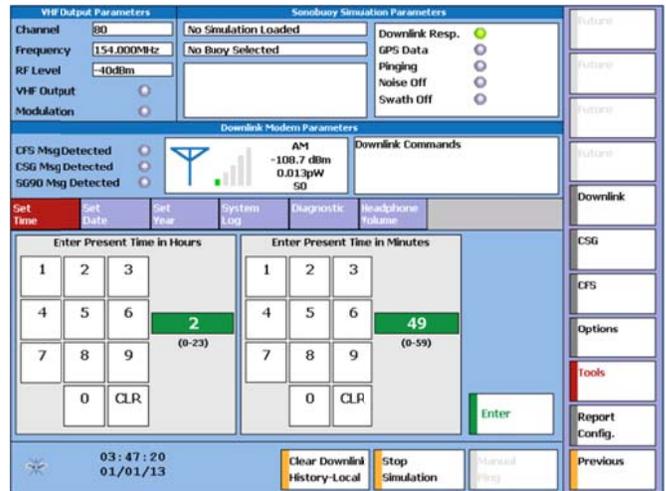
Figure 59: Set Time Screen

5.3.3.17.2 Set Date

The Set Date screen allows the operator to set the month and day information displayed by the PASS II. Number pads (one for the month, and one for the day) are provided. Valid month inputs are 1-12, and valid days are dependent on the month selected (1-28 to 1-31). Invalid inputs (Days greater than 31 and/ or Months greater than 12) will cause the Enter soft key to become unselectable (grayed out), so that an invalid time is not enterable into the PASS II.

Pressing the **Enter** soft key sets the date (if valid) into the PASS II memory. The updated date information is displayed in the Status Parameters section of the display.
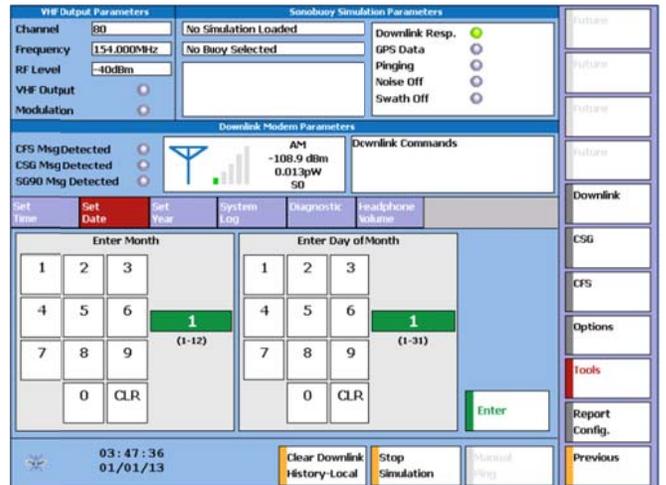
Figure 60: Set Date Screen

5.3.3.17.3 Set Year

The Set Year screen provides a number pad to allow the operator to select any year between 2000 and 2099. The updated year information is displayed in the Status Parameters section of the display. If an invalid (out of range) year is attempted to be input , the Enter soft key becomes unselectable (grayed out), so that an invalid time is not enterable into the PASS II.
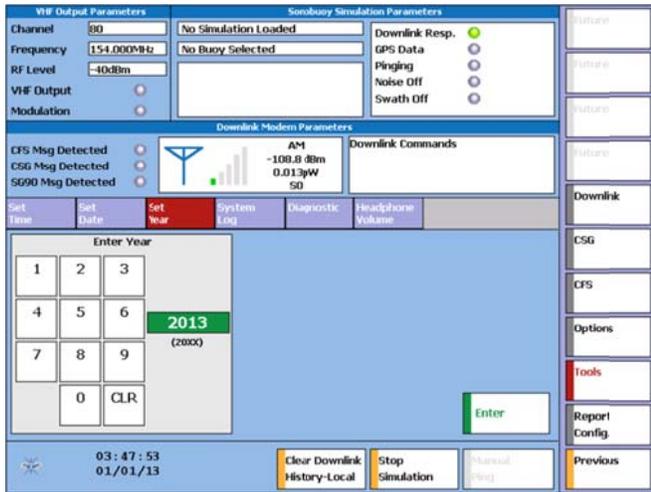
Figure 61: Set Year Screen

5.3.3.17.4 System Log

Selecting the **System Log** soft key from the Tools main menu displays a screen which shows the log actions performed/ files run by the PASS II since power application.
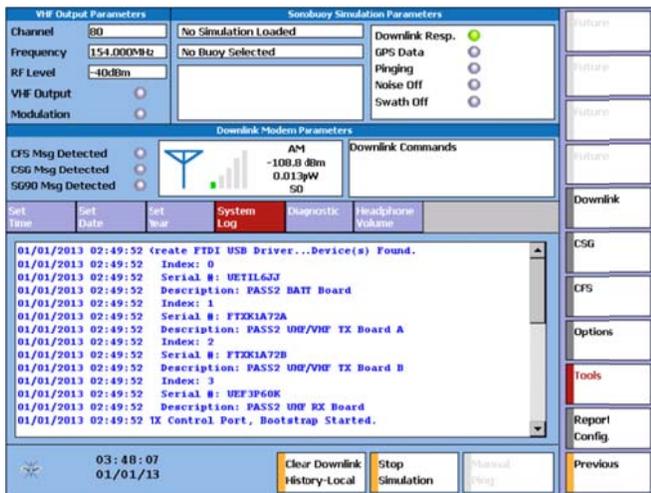
Figure 62: System Log Screen

5.3.3.17.5 Diagnostic

Operator selection of the Diagnostic submenu will display the results of the Power On Self Test (POST) performed by the PASS II. In addition, the operator is able to command either a **Self Test POST** or a **Self Test VHF** test by selecting the appropriate soft key. Refer to section 6.1 for descriptions of each BIT test.

Selecting/clicking the **Self Test VHF** soft key will command the PASS II to check that the internal VHF circuitry is operating properly, by generating a signal on channel 63 (147.675 MHz) and routing this signal into part of the digital receiver internal VHF circuitry.

To verify the UHF circuitry in the PASS II is operating properly, connect the Self Test Cable provided with the unit to the UHF Out and UHF In connectors, and command the PASS II to generate any valid CFS or CSG message. Once the message has been generated, verify that the PASS II has recorded the receipt of the same CFS or CSG message just generated either in the Sonobuoy Simulation Parameters section of the display, or in the Downlink History main menu screen.
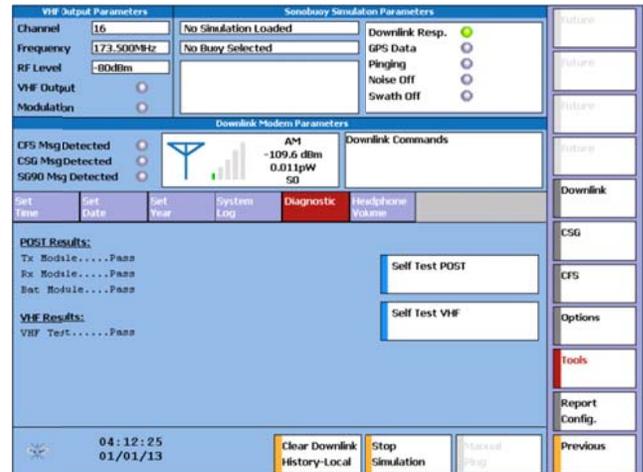
Figure 63: Diagnostic Screen

5.3.3.17.6 Headphone Volume

Selection of the **Headphone Volume** submenu soft key allows the operator to adjust the volume of the PASS II simulations at the headphone jack. The operator can select the desired level by pressing/clicking the ↑ or ↓ soft keys, or by dragging the pointer indicator to the desired setting. A setting of 0.0% is equivalent to no volume (mute), and a setting of 100% equates to 1.5Vp-p into a 16 Ohm load with a 1KHz sine wave deviated at 130 kHz.
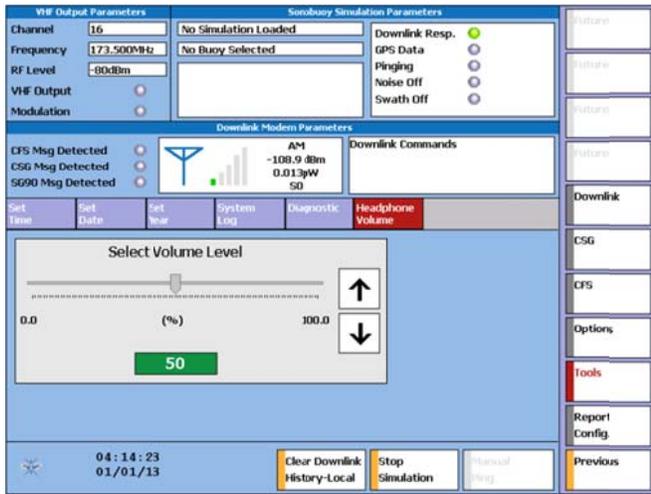
Figure 64: Headphone Volume Screen

5.3.3.18   Report Config.

The Report Config. main menu allows the operator to view the PASS II configuration from the Report Config submenu, or view the status of different PASS II modules through the Unit Status submenu.

5.3.3.18.1   Report Config

Selecting the **Report Config** soft key allows the operator to view the configuration and firmware versions of the PASS II modules. The Identification Register (IDR) software part number and revision, as well as the Simulation Pack part number and revision are also provided.
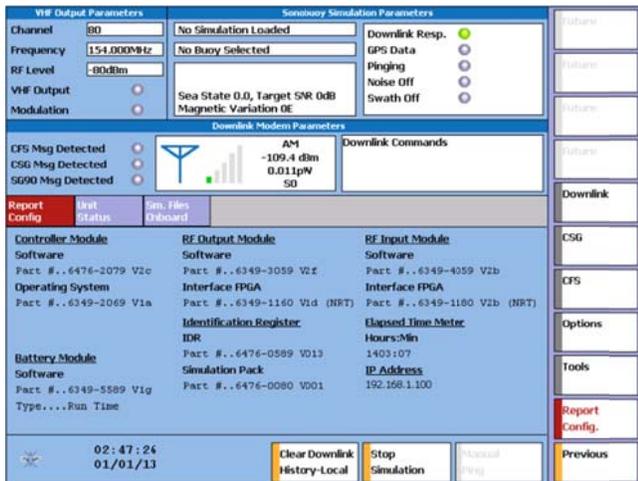
Figure 65: Report Config Screen

5.3.3.18.2   Unit Status

Selecting the **Unit Status** soft key allows the operator to confirm the Boot status of the TX, RX, and Battery modules within the PASS II.
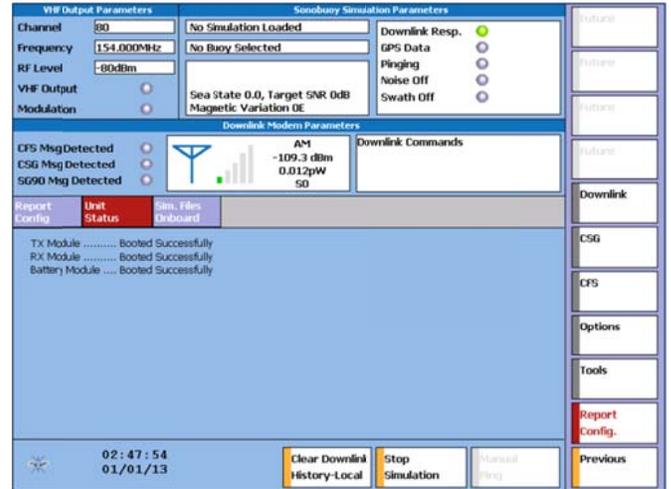
Figure 66: Unit Status Screen

5.3.3.18.3   Sim Files Onboard

Selecting the **Sim Files Onboard** soft key will display the simulation files and their revisions that are loaded into the PASS II unit.
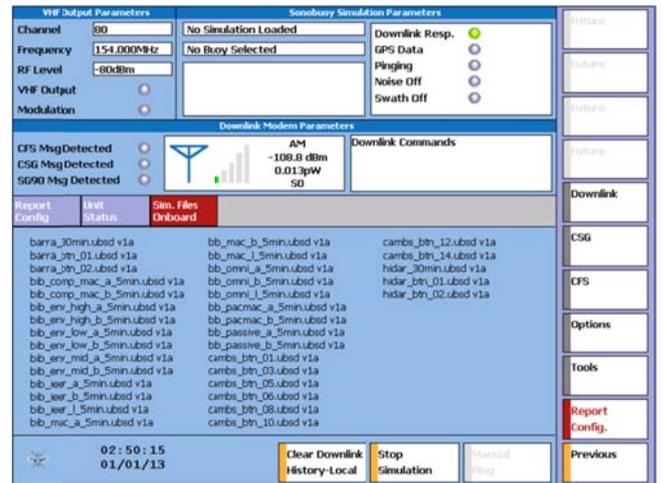
Figure 67: Sim Files Onboard Screen

6 MAINTENANCE

6.1 Built In Test

The PASS II contains Built In Test (BIT) capability, to help verify proper operation of the unit. The BIT supported by the PASS II includes a Power On Self Test (POST), and a VHF internal test.

To access the PASS II BIT status or to command BIT, select **TOOLS** from the main menu, followed by **Diagnostic** from the submenu selection.

6.1.1 Self Test POST

Upon initial power application, the PASS II performs a Power On Self Test. The results of this test are stored in memory, so that the results can be accessed by the operator.

During the Power On Self Test BIT, the PASS II SBC module performs a communication checkout with the TX module, RX module, and Battery Module to verify proper operation.

6.1.2 Self Test VHF

The Self Test VHF checks that the internal PASS II VHF circuitry is operating properly, by tuning the unit to channels 32, 80, and 16, and then routing signals internally to an A/D converter, and verifying the signal is present. This confirms that the PASS II hardware is capable of creating the appropriate VHF signals.

The results of the VHF test are displayed in the MDA text box as either Passed or Failed.

6.1.3 UHF Circuitry Verification

Verification of the UHF circuitry in the PASS II can be performed by connecting the Self Test Cable provided with the unit to the UHF Out and UHF In connectors, and command the PASS II to generate any valid CFS or CSG message. Once the message has been generated, the operator is able to verify proper UHF circuitry operation by confirming that the PASS II has recorded the receipt of the same CFS or CSG message just generated either in the Sonobuoy Simulation Parameters section of the display, or in the Downlink History main menu screen.

6.1.4 BER Verification

The PASS II allows the operator to determine the Bit Error Rate for a Sonobuoy Receiver or an acoustic suite. The digital sonobuoy simulations include soft keys to allow the operator to command the PASS II to generate

pseudo-random polynomial bit patterns. These known patterns can be analyzed by the acoustic suite equipment to validate what they received matched what the PASS II generated/transmitted.

6.2 PASS II Trouble Shooting Guide

In addition to the built in Self Test capability detailed in section 6.1, the following steps are provided to help the operator to determine the operational capability of the PASS II.

6.2.1 Battery Power Operation Check

With no external power applied to the PASS II, momentarily activate the ON/OFF switch to the ON position.
- Does the display activate?
- Does the Unit pass the POST?

If the answer to both questions is yes, continue with the External AC Operation check.

If the answer is no, charge the battery and repeat the above procedures. If the answer to the two questions above is still no after attempting a recharge, the PASS II should have the battery replaced. If required, the PASS II may be operated using external power (AC or DC). Continue with the External DC Operation check to determine reduced capabilities, if a replacement battery isn't on hand.

Note: If the PASS II has IDR-008 or earlier software, the battery may have entered a safe mode where the PASS II is unable to wake the battery out of this mode. In this instance, the battery should be removed and an external charger used to wake the battery out of the safe mode prior to the PASS II being able to charge it.

6.2.2 External DC Operation Check

Attach the 28 VDC power cable to the EXT PWR connector on the PASS II front panel, and plug into a 28 VDC receptacle. Activate the EXT PWR switch to the On (Up) position.
- Does the switch maintain it's On position? If yes, activate the Unit ON/OFF switch to the ON (Up) position.
- Does the Display activate?
- Does the unit pass the POST?

If the answer to the three questions is yes, continue with the External AC Operation check.

If the answer is no, confirm that the external DC power is present. If the external DC power is present and the PASS II fails DC operation, it should be returned to the depot repair facility for repair. Continue with the External AC Operation check to determine reduced capabilities.

6.2.3   External AC Operation Check

Attach the AC power cable to the EXT PWR connector on the PASS II front panel, and plug into an AC receptacle. Activate the EXT PWR switch to the On (Up) position.
- Does the switch maintain it's On position? If yes, activate the Unit ON/OFF switch to the ON (Up) position.
- Does the Display activate?
- Does the unit pass the POST?

If the answer to the three questions is no, confirm that the external AC power is present. If the external AC power is present and the PASS II fails to operate, return the PASS II to the depot repair facility for repairs.

If the answers to the questions are yes, verify the CHARGING LED indication. If the LED is steadily lit, the PASS II external AC operation is ok. If the LED never lights steadily, replace the battery with a known good battery. If the battery LED doesn't light steadily, then the battery operation fails, and the unit should be returned to the depot repair facility for repairs. If the LED lights steadily, the original battery is faulty and should be replaced.

6.3   Periodic Maintenance

The PASS II unit is rugged, and designed to require minimal periodic maintenance. Recommended cleaning procedures, battery replacement, and calibration requirements are discussed below.

6.3.1   Cleaning

Ensure that the PASS II is disconnected from any external power source, and also ensure that the Unit ON/OFF switch is in the off position prior to cleaning the unit.

Remove dust and loose dirt from all exposed PASS II surfaces using a clean, soft, lintless cloth. Remove grease or and ground-in dirt from external surfaces using a clean, soft, lintless cloth dampened with a mild, non-abrasive detergent.

Remove dust and dirt from insert/contact areas of cable assemblies and connectors using a small soft-bristled brush.

It is recommended that the PASS II be cleaned yearly. Based on initial inspections and usage conditions, this maintenance cycle can be adjusted as deemed appropriate.

6.3.2   Battery Failure Indications & Replacement

The PASS II internal battery is designed to last for a minimum of 300 charges. Battery failure indications are increasingly shortened operation on battery power, or a shorting condition that will cause the PASS II circuitry to shut down. If the battery fails, replace the failed battery with a spare.

Note: The PASS II battery may exhibit failure indications (unit won't run off of the battery, and the battery won't charge) if the battery has entered a safe mode due to over-discharge. This can occur if the PASS II unit has IDR-008 or earlier software installed. In this instance, the battery will need to be removed from the PASS II and charged with an external charger to wake it out of its safe mode. Once the battery is out of its safe mode, it can be re-installed in the PASS II and charged normally.

The battery replacement procedure for the PASS II is as follows:

Step	Task
1	Disconnect the PASS II from any external power source, and ensure that the External Power On/Off switch is in the Off position.
2	Ensure that the PASS II is powered off (toggle the Unit On/Off switch to the Off position.
3	Remove the battery cover from the lower-left portion of the PASS II front panel by loosening (counter-clockwise) the four thumb screws holding it in place.
4	Grasp the battery firmly and pull straight out of the PASS II.
5	Insert the replacement battery notched end first, with the notch pointing to the right when facing the front of the unit.
6	Place the battery cover over the exposed end of the battery and re-attach to the front panel by tightening (clockwise) the four thumb screws.
7	Allow the battery to fully charge prior to operating the PASS II from battery power. The unit may be operated from an external power source immediately upon battery replacement.

Table 15: Battery Replacement Procedure

6.3.3   Calibration Requirements

Calibration of the PASS II unit is recommended every two years. Should the user desire to confirm the accuracy of the crystal oscillator of the PASS II unit in between calibrations, a verification procedure is provided to confirm the accuracy of all frequencies generated by the unit.

The PASS II unit develops signals representative of those produced by current tactical sonobuoys from a single crystal oscillator using fully digital synthesis techniques. This crystal oscillator forms the frequency standard for the PASS II, with the accuracy of all output frequency signals directly related to its accuracy.

Since the frequency of the crystal oscillator directly establishes the frequency of the RF output, measurement of the RF output frequency error can be used to verify the actual frequency of the crystal oscillator. To verify the accuracy of the PASS II simulations, perform the verification procedure below.

Step	Task
1	Power on the PASS II unit.
2	Select the Special Setup main menu, and then the Unmodulated Carrier soft key.
3	Select the RF Setup main menu, followed by the RF Channel submenu. Program the PASS II for channel 80 (154.000 MHz).
4	From the RF Setup main menu, select the RF Level submenu. Ensure the PASS II RF level is set to 0 db.
5	Measure the RF output frequency of the PASS II from the VHF Output BNC port on the PASS II front panel. A frequency counter with an accuracy of 1 PPM is required to perform the measurement.
6	The difference between 154.00 MHz and that read by the frequency counter, as a percentage directly relates to the percentage that the crystal oscillator is off from its nominal frequency.
7	The PASS II is considered within calibration tolerance if the frequency read by the frequency counter is within ±10 kHz of 154.00 MHz.

Table 16: Signal Generation Verification Procedure

If the PASS II does not meet the 154.000 ±10 kHz requirement, the unit should be returned to the OEM for repair.

6.4   Software Updates

Software updates and modifications for the PASS II can be loaded into the unit by using a computer connected to the PASS II Ethernet port. Updated software (both IDR and Simulation autoloaders) for the PASS II may be periodically available. The latest IDR and Simulation software for the 6476-0000-001 PASS II will be available from Flightline's FTP site for download.

https://ftp.ultra-fei.com

Login ID: 6476-0000-001

Password: Contact Flightline for the FTP site password.

Download the IDR autoloader software and the Simulation autoloader software from the FTP site to the computer. Connect the PC to the PASS II GigE port. Launch the downloaded IDR software autoloader exe file. The PASS II IDR autoloader program will step the operator through the update process. When the IDR software modification/update is complete, the operator will be notified. If the simulation files for the PASS II also require updating, the operator can launch the downloaded Simulation autoloader exe file. The PASS II Simulation autoloader program will step the operator through the update process. When the Simulation software update is complete, the operator will be notified and can disconnect the PASS II from the computer.

APPENDIX A

CFS Downlink Message String Generation

Message format:

Each Word of the CFS message, except the Preamble (Word 1) is input using hexadecimal codes. CFS messages are comprised of 12 Words, as depicted below:

Preamble/ID	Command Set 1	Command Set 2
Word 1: Preamble	Word 5: Command	Word 9: Command
Word 2: ID Number	Word 6: Subcommand	Word 10: Subcommand
Word 3: ID Number	Word 7: Command data	Word 11: Command data
Word 4: Current RF	Word 8: Command data	Word 12: Command data

Note 1: Word 1, the Preamble, is automatically input by the PASS II. The operator is only required to input words 2 through 12 to generate a valid CFS message.

Valid Hexadecimal Codes:

Preamble (Word 1)

Hex Code	Description
55	CFS message preamble

Sonobuoy ID Number (Words 2 and 3):

The Sonobuoy ID corresponds to the RF channel selected upon Sonobuoy launch, otherwise it is defaulted to RF channel 1. (Word 2 will always be 00)

Hex Code (Word 2)	Description
00	Word 2 is always zero (00)
Hex Code (Word 3)	**Description**
01	Default Sonobuoy ID, if not set by the operator

Current RF Channel (Word 4)

Hex Code	Channel Number	Hex Code	Channel Number	Hex Code	Channel Number
20	32	42	66	1	1
21	33	43	67	11	17
22	34	44	68	2	2
23	35	45	69	12	18
24	36	46	70	3	3
25	37	47	71	13	19
26	38	48	72	4	4
27	39	49	73	14	20
28	40	4A	74	5	5
29	41	4B	75	15	21
2A	42	4C	76	6	6
2B	43	4D	77	16	22
2C	44	4E	78	7	7
2D	45	4F	79	17	23
2E	46	50	80	8	8
2F	47	51	81	18	24
30	48	52	82	9	9
31	49	53	83	19	25
32	50	54	84	A	10
33	51	55	85	1A	26
34	52	56	86	B	11
35	53	57	87	1B	27
36	54	58	88	C	12
37	55	59	89	1C	28
38	56	5A	90	D	13
39	57	5B	91	1D	29
3A	58	5C	92	E	14
3B	59	5D	93	1E	30
3C	60	5E	94	F	15
3D	61	5F	95	1F	31
3E	62	60	96	10	16
3F	63	61	97		
40	64	62	98		
41	65	63	99		

Command (Words 5 and 9)

Hex Code	Description
00	No Operation
11	RF Power
15	RF Channel
17	RF Band/Subchannel
20	Beam Pattern
22	Acoustical Gain
24	Sonic system Response
26	Processing Mode
28	Modulation Input
2A	Bandwidth
42	Depth
44	Life
46	Scuttle
51	Ping
52	Sonic channel
53	Release Payload
60	CCM Mode
71	Load Data
73	Down Load data

Subcommand (Words 6 and 10)

Hex Code	Description
22	Set
23	Set (Manufacturer Only)
00	No Operation

Command Data (Words 7 and 8, or 11 and 12)

Refer to document FSC 5845, Production Sonobuoy Specification for valid codes.

APPENDIX B

Sonobuoy Frequencies for 99 Channel Operation and 3 test signals

32	136.000	66	148.750	*100*	*161.500**
33	136.375	67	149.125	*0,101*	*161.875**
34	136.750	68	149.500	1	162.250
35	137.125	69	149.875	17	162.625
36	137.500	70	150.250	2	163.000
37	137.875	71	150.625	18	163.375
38	138.250	72	151.000	3	163.750
39	138.625	73	151.375	19	164.125
40	139.000	74	151.750	4	164.500
41	139.375	75	152.125	20	164.875
42	139.750	76	152.500	5	165.250
43	140.125	77	152.875	21	165.625
44	140.500	78	153.250	6	166.000
45	140.875	79	153.625	22	166.375
46	141.250	80	154.000	7	166.750
47	141.625	81	154.375	23	167.125
48	142.000	82	154.750	8	167.500
49	142.375	83	155.125	24	167.875
50	142.750	84	155.500	9	168.250
51	143.125	85	155.875	25	168.625
52	143.500	86	156.250	10	169.000
53	143.875	87	156.625	26	169.375
54	144.250	88	157.000	11	169.750
55	144.625	89	157.375	27	170.125
56	145.000	90	157.750	12	170.500
57	145.375	91	158.125	28	170.875
58	145.750	92	158.500	13	171.250
59	146.125	93	158.875	29	171.625
60	146.500	94	159.250	14	172.000
61	146.875	95	159.625	30	172.375
62	147.250	96	160.000	15	172.750
63	147.675	97	160.375	31	173.125
64	148.000	98	160.750	16	173.500
65	148.375	99	161.125		

APPENDIX C

Illustrated Parts List

Nomenclature:	PASS II		
NATO Stock No:	To Be Allocated	**Reference Designator:**	1
Manufacturer's Part No:	6476-0500-001		
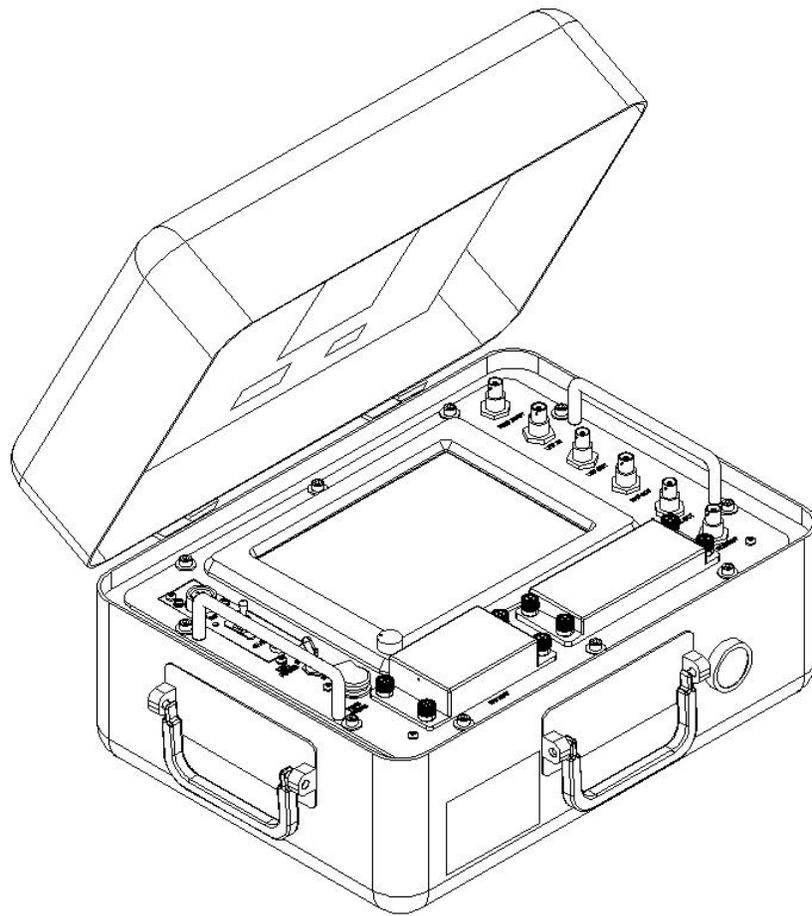
Nomenclature:	Self Test cable		
NATO Stock No:	To Be Allocated	Reference Designator:	2
Manufacturer's Part No:	5171-1160-001		
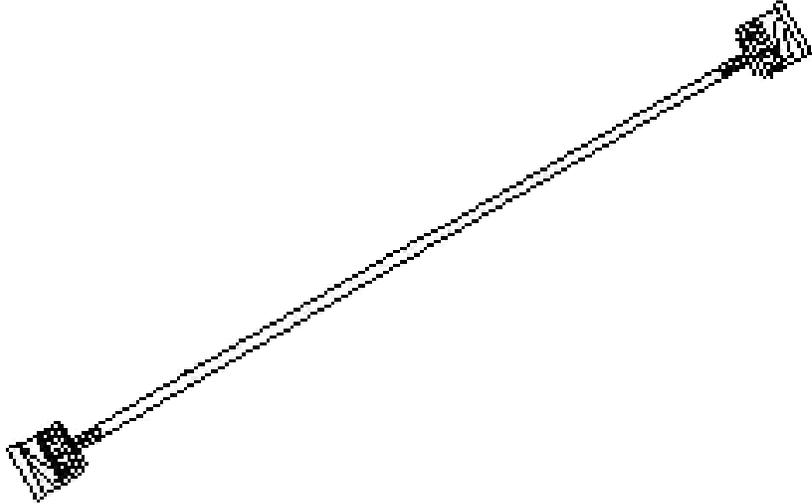
Nomenclature:	AC Power cable		
NATO Stock No:	To Be Allocated	Reference Designator:	3
Manufacturer's Part No:	5171-1017-001, 5171-1018-001, or 5171-1027-001		
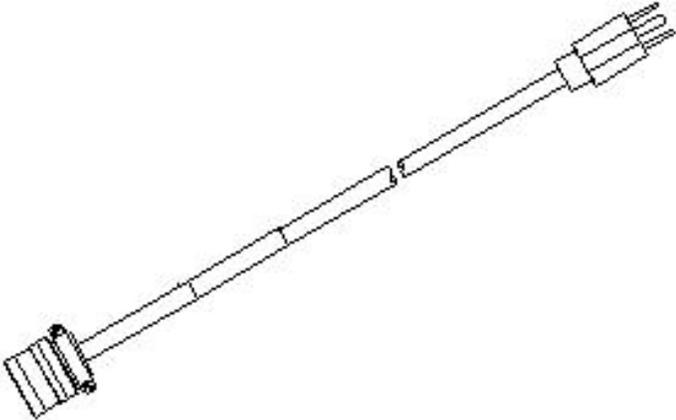
Nomenclature:	DC Power Cable		
NATO Stock No:	To Be Allocated	Reference Designator:	4
Manufacturer's Part No:	5171-1016-001		
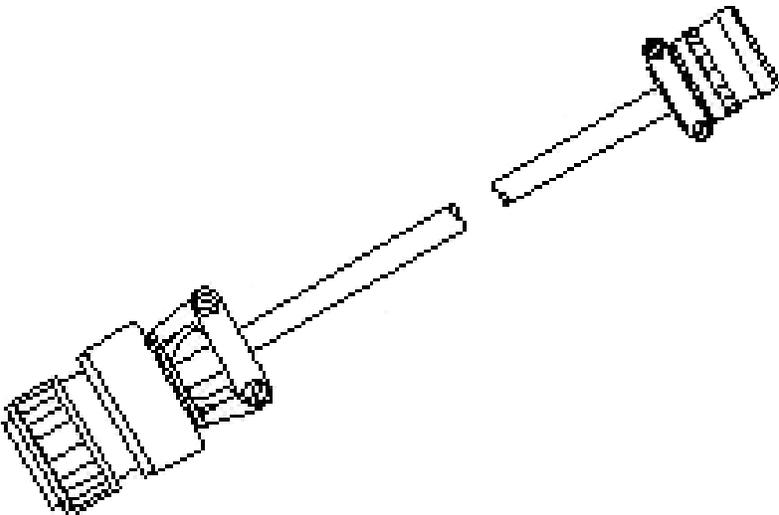
Nomenclature:	UHF antenna		
NATO Stock No:	To Be Allocated	Reference Designator:	5
Manufacturer's Part No:	5171-1022-001		

Nomenclature:	VHF Antenna		
NATO Stock No:	To Be Allocated	Reference Designator:	6
Manufacturer's Part No:	5171-1032-001		
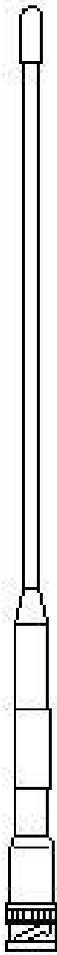
Nomenclature:	Target Pattern Card, PASS II		
NATO Stock No:	To Be Allocated	Reference Designator:	7
Manufacturer's Part No:	6349-0507-001		

5171-0507-001
TARGET PATTERN CARD, PASS
DIFAR SONOBUOY

DIFAR Test Pattern Tones

TONAL NUMBER	FREQUENCY (Hz)	S/N RATIO IN 1 HZ BANDWIDTH (dB)	BEARING (DEG)
1	15.625	-19.4	30
2	31.250	-9.3	60
3	50.000	-18.5	45
4	62.500	-15.0	120
5	100.000	-20.2	135
6	125.000	-8.0	150
7	250.000	-1.0	210
8	500.000	-8.0	240
9	1000.000	-3.5	300
10	2000.000	-8.0	330

DIFAR CSO Test Pattern Tones

Tonal Number	Frequency (Hz)	S/N Ratio in 1 Hz Bandwidth (dB)
1	15.625	-19.4
2	31.250	-9.3
3	50.000	-18.5
4	62.500	-15.0
5	100.000	-20.2
6	125.000	-8.0
7	250.000	-1.0
8	500.000	-8.0
9	1000.000	-3.5
10	2000.000	-8.0
11	4000.000	-9.0

DIFAR CO Test Pattern Tones
AMPLITUDE CORRESPONDS TO 76 dB ABOVE 1µ Pa SOUND PRESSURE LEVEL

Tonal Number	Frequency (Hz)
1	15.625
2	31.250
3	50.000
4	62.500
5	100.000
6	125.000
7	250.000
8	500.000
9	1000.000
10	2000.000
11	4000.000
12	8000.000
13	16000.000
14	32000.000

Ultra ELECTRONICS

Ultra Electronics
FLIGHTLINE SYSTEMS
7625 Omnitech Place
Victor, NY 14564 USA
Tel: 585 924 4000
Fax: 585 924 5732

REV A

Nomenclature:	Battery		
NATO Stock No:	6140-01-580-6190	Reference Designator:	N/A
Manufacturer's Part No:	9999-0762-001		