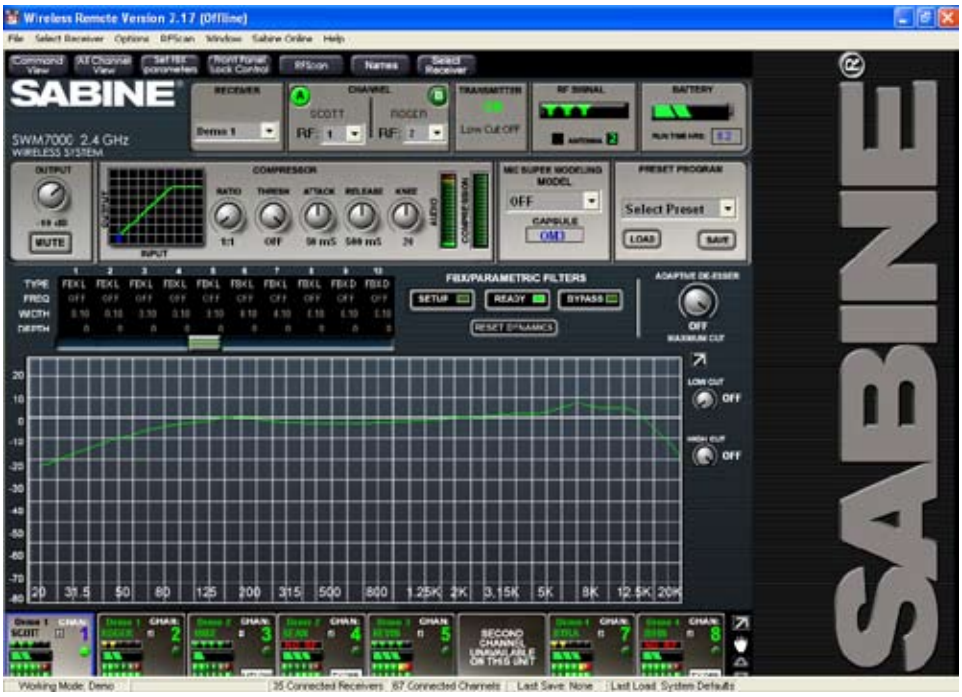
13.4. Remote Control Operation

13.4.1. Two Views, Two Sets of Controls



The default main screen appears as shown in figure 13c.

The top portion of the screen (above the "Active Channels" bar and two arrow buttons) is the Command View, showing details and allowing parameter adjustments for a single receiver channel at a time.

The bottom portion (below "Active Channels") is the All Channel View, capable of simultaneously showing the most important (but less detailed) information for multiple channels. Each audio (RF) channel in the system has its own display box, arranged in rows of eight channels each, organized in order to correspond to the string of receivers in the serial bus.

If you have 8 or fewer RF channels, both View Modes will fit on your monitor. For more than 8 channels, there are quick shortcuts for optimizing your display and switching and mixing View Modes:

- Click and drag the Active Channel bar to pull the All Channel View up or down, partially or completely covering the Command View. You cursor will change to a hand icon.
- Use the up/down arrows flanking "Active Channel" to scroll the rows displayed in the space allocated to the All Channel View.
- Click on the Command View or All Channel View button in the upper left menu bar (or use F2 and F3), to immediately change from one to the other.
- To select a channel to edit in either view, left click on a channel in All Channel View (indicated by a red border around the selected channel). This displays the selected channel's settings in the Command View. A right mouse click on a single channel shown in the All Channel View pops up a menu of parameters (see figure 13d). The value of the parameter selected is displayed in the All Channel View for each RF channel, and also pops up an adjustment screen for the selected channel. You can review and compare settings on all channels, one parameter at a time, and adjust any setting on any unit from the All Channel View.
- Parameter adjustments in the Command View can be made by clicking and turning any knob; or by a right-clicking on a parameter to pop up an adjustment window, and keying in a value.

Fig. 13d - All Channel View (after right-clicking and selecting Ratio).

13.4.2. Menus, Icons & Hot Keys

Quick access to the features described above, plus some additional software control, is available from four pull-down menus (File, Select Receiver, Options, and RF Scan) and five icons (FBX, Lock, Command View, All Channel View, and RF Scan) at the top of the screen. The controls associated with the five icons can also be accessed using function keys F2 through F6, respectively. Figure 13e shows the location of the menus and icons, and describes associated controls which are accessed.

13.4.2.1. FBX Settings (F4)

Allows global settings of FBX filter width and maximum allowed FBX filter depth. As filters are set, they will conform to the global width chosen at the time of setting. It is thus possible to mix filter widths by changing the width value in between setting FBX filters. Maximum depth will be common to all FBX filters, and the value will update if the global setting is changed.

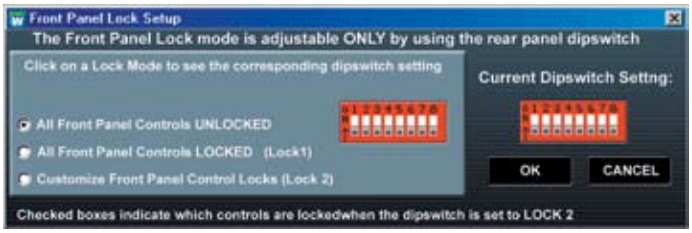
Sensitivity and Persistence are controls that allow the speed and analysis of the FBX algorithm to match the type of audio program. Some audio programs, notably certain types of classical music, produce occasional waveforms that are difficult to distinguish from acoustic feedback. The factory default Sensitivity and Persistence values should work in almost all conditions; however, you may change them if necessary to prevent the possibility of triggering a false filter, or to more quickly set the FBX filters. There is a trade-off between speed of filter placement and how carefully the filter is placed. More demanding audio sources may require higher Sensitivity & Persistence settings, which will slightly slow down the speed of filter placement, but decrease any possibility of mistaking program audio for feedback.

Fig. 13f - FBX Parameters window

FBX Dynamic Filter Time Out This function gives each dynamic filter a time limit, after which the filter automatically resets. A setting of “zero” disables the timer.

13.4.2.2. Lock (F5)

You can customize the mix of functions that will be locked when choosing Front Panel Lock 2 (figure 13g). Front Panel Locking can only be activated using the Dip Switches on the receiver back panel. See Appendix D for more information.



13.4.2.3. All Channel View (F3)

Shows the All Channel View as a (vertically) resizable window (figure 13h).

13.4.2.4. Command View (F2)

Shows the Command View on the screen (figure 13c).

Fig. 13h - Active Channels Window - All Channel View

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13.4.2.5. RF Scan (F6)

Use the RF scan to get a "picture" of the potential RF interference in your location. You should perform a scan before every program so you can see the ambient RF levels on all 70 channels of your system.

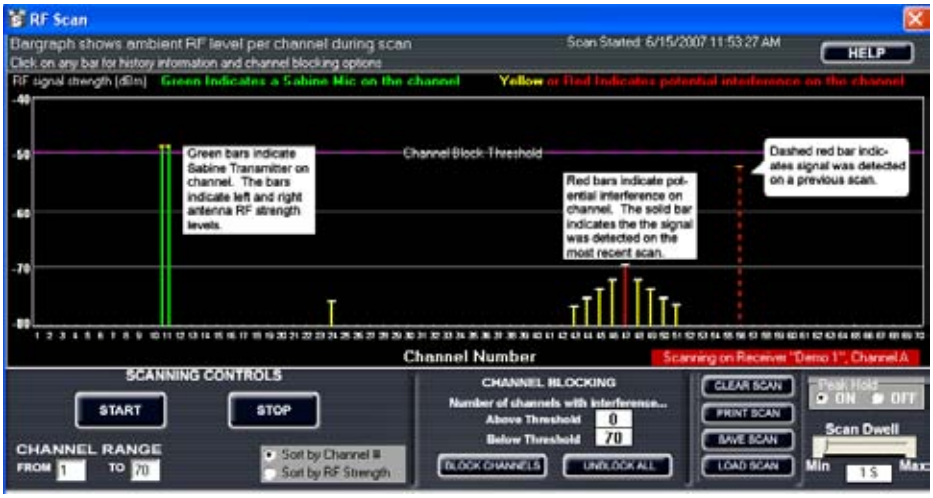


Fig. 13i RF Scanner results: one Sabine Transmitter (will display as a green line) and some low-level RF interference (will display as red lines)

Caution: The RF Scan mutes and takes control of the selected channel. All other functions are disabled on the selected channel. Do not perform an RF scan on a channel you need during your program!

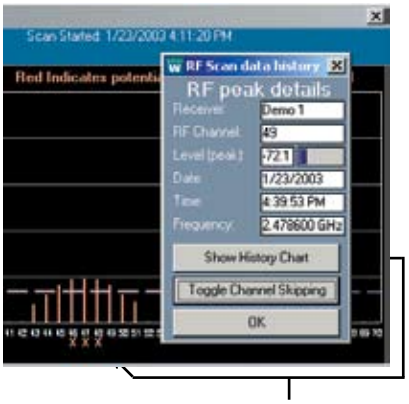
Select RF Scan by using the toolbar button, the F6 hot key, or the RF Scan menu item. You will see the screen shown in Figure 13i. Select Single Scan or Continuous Scan if you want to look at the RF levels over time. The software will take control of the selected receiver, and will step through all 70 channels. You can control the speed of the scan using the Dwell Time adjustment.

Scan results are shown in several ways. A double green line indicates a Sabine transmitter is active on the associated channel. Each green line shows RF signal levels for left and right antennas respectively. This RF Diversity function is especially useful for antenna positioning when using distribution amp. A red line indicates ambient RF is present on the channel, at a level indicated by the scale on the left side of the chart. A dotted red line indicates a previous RF level from an earlier scan, and a small yellow "T" indicates the peak RF level observed over the entire time. Left click on any line or channel number brings up the "RF Scan data history" window, allowing you to disable the specific channel (figure 13J). If you chose Continuous Scan you can also choose to see the Channel Details (figure 13k) and a history of all RF activity on a particular channel for the duration of the Continuous Scan (figure 13k).

Channels with very low RF signals (below -70 dBm) should be considered open channels. We include this low level measurement so you can see the activity in your location, but the Sabine transmitters will overpower and ignore those very low signals.

You can choose to disable all channels with ambient RF levels above a selectable threshold. Click and drag the dotted horizontal purple line to change the threshold (figure 13i). Choose **Block Channels** to disable channels above the threshold. These channels will no longer be available when selecting RF channels from the front panel of the receiver.

Fig. 13j RF Scan data history



Click the channel number to open the Scan Data History window. Click the Toggle Channel Skipping button to turn the channel on/off. Channels "skipped" will have a red "**X**" beneath their channel number.

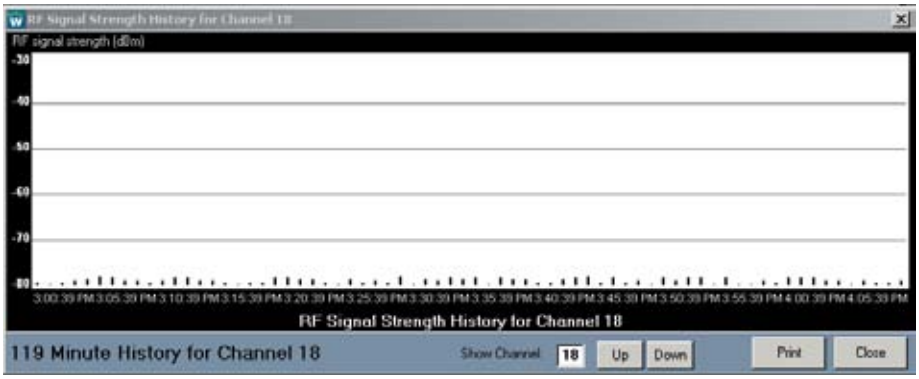


Fig. 13k RF Signal Strength History

RF SCAN CAUTION

Do not perform an RF scan during your program!

13.4.2.6. Options Menu

Copy Parameters. This window allows you to copy your settings for all functions to any number of other channels. Select the channel you want to copy from by first selecting the receiver, then the channel. From the Options Menu, choose Copy Parameters. You will see your selected channel displayed in a red field labeled “Copy Parameters From.” Select the channels you want to copy to from the Available Channels list, then check the boxes of the parameters you wish to copy. Once you are sure of your selections, hit Copy Now and your settings will be pasted to the selected channels. Note that RF channel selections cannot be copied.

Reset Parameters. This window allows you to selectively reset any of the functions in your receiver. Choose Reset Parameters from the Options Menu, then check the boxes of the functions you would like to reset to their default settings. In order to reset FBX filters, use the dedicated button on the Command View. If you wish to load the factory default for the entire receiver, choose Preset 00 from the Program drop-down on the Command View and select the Load button.

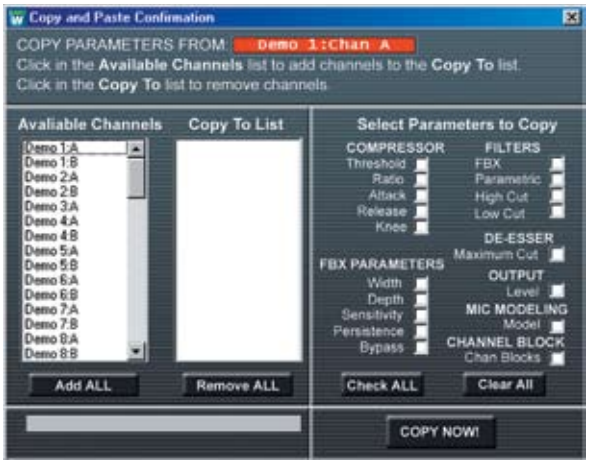


Fig. 13L Copy Parameters window

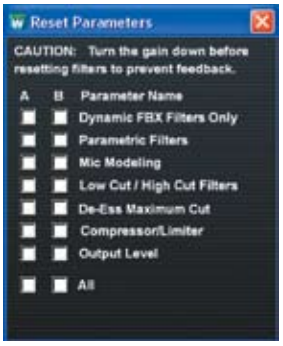


Fig. 13m Reset Parameters window

WARNING:
BEFORE DISCONNECTING RECEIVER FROM COMPUTER

Quit all SWM Software functions and close software BEFORE disconnecting the receiver connection to you computer. Failure to do this may cause the receiver to lock up. In case of receiver lock up, restart receiver.

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14. TIPS & TROUBLESHOOTING

14.1. Tips for Maximum Performance

- Keep a clear and unobstructed path between transmitter and receiver.
- Position receiver antennas at least one meter off the performance floor level.
- Avoid placing receiver antennas near large metallic or other dense materials.
- Keep receiver antennas away from RF signal generating equipment (computers, high-voltage equipment, etc.).
- Position dipole antennas perpendicular to each other.
- Use a Sabine Antenna Distribution System (SWA6SS) for multiple system installation.
- Return transmitters to a charger when not in use.
- Use a Sabine SWASS-EXT Extension Antenna to extend range and/or improve reception.

14.2. Troubleshooting

Problem: Receiver and transmitter power are on, receiver RF Signal meters and Input Level meters are lighting up, but there is no sound from system.

Solution: Check connection between receiver and mixer/amp. Adjust receiver Output Level control. Check for MUTE status in Remote Control Software. Make sure RF scanner is OFF.

Problem: Receiver and transmitter power are on, but receiver RF Signal meters and Input Level meters are not lighting up.

Solution: Check transmitter On/Battery Indicator. Recharge transmitter if necessary. Check transmitter and receiver frequency Channel settings (make sure they match). Check receiver antenna connections. Check distance between transmitter and receiver antennas and possible obstructions in path.

Problem: Transmitter is on, but sound is noisy.

Solution: Check transmitter On/Battery Indicator. Replace weak battery with fresh battery from charger unit if necessary. Check for other sources of RF interference (high voltage equipment, lighting equipment, etc.). Check distance between transmitters and receiver antennas.

Problem: Transmitter is off, but noise still coming from receiver.

Solution: Check for other sources of RF interference (high voltage equipment, lighting equipment, trolley cars, etc.). Select another frequency. Check connection and position of the receiver antennas. Utilize a Sabine Extension Antenna.

Problem: Noise or humming.

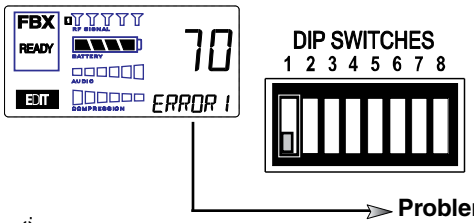
Solution: Check for fluorescent lights — bad ballasts may cause noise or hum in your system.

Problem: Ticking sounds, interference, dropouts, or reduced distance?

Solution: First, try another channel at least 10 channels away from the one you are trying. Keep moving the channel selection until you find an RF channel with better performance. Or, better yet, use the included SWM Remote Software to perform an RF scan which will clearly display available clear channels. If symptoms persist, check antenna orientation on the receiver and make sure the antennas are mounted on the side facing the transmitters (front or rear).

Check your RF Scan and make sure the RF levels of both antennas are approximately equal when displaying a Sabine transmitter. If the levels are radically different, then you may not have true diversity. In this case, check your antenna connections for a bad cable or connector.

Are there any wireless local area networks (LAN) in the vicinity? Are there any microwave ovens in the vicinity? Try turning these items off and see it the problem persists. Your scan should also expose potential interference from these items. Choose channels without potential interference.



Problem: "ERROR 1" message displays on receiver:

Solution: Make sure that the #1 dip switch (located on the rear panel of the receiver) is in the down (OFF) position. **See page 55 for a complete chart of DIP switch settings.**

14.3. Common Sources of RF Interference

The typical sources of interference for conventional wireless mics can be high-powered broadcasters such as radio stations and TV transmitters, or other short-range wireless devices, including multiple radio microphones operating at the same location (either by design, or by coincidence), that operate in proximate (or harmonically related) bands. Less commonly, interference may arise from spurious outputs emitted by electronic equipment (notably computers, printers, or similar devices with digital clocks), faulty electrical equipment, neon signs, dimmers and lighting controllers, and so forth.

Many UHF and VHF mics are especially vulnerable because they share the RF spectrum with the very high-powered transmitters for television. The coming conversion to digital and high-definition broadcast will increase the problems for UHF and VHF.

The 2.4 to 2.4835 GHz frequency band is not only well above the fundamental (nominal) transmission frequencies of such strong analog and digital broadcasts, but also high enough to escape interference problems occurring at the strong first harmonic of even the highest digital television broadcast. The band is approved worldwide for a variety of uses, including such diverse transmitters as baby monitors, garage door openers, wireless LANs, amateur satellite, cordless telephones, etc. Compared to RF broadcast sources like television and radio stations, these low power devices produce very localized, short range interference; furthermore, many of the devices working in the 2.4 GHz range use spread spectrum transmission and reception. Both of these facts mean such uses of the RF spectrum are less likely to cause interference with, or suffer from interference from the use of, Sabine's systems.

14.3.1 RF Sources

Your first step in checking for interference should be utilizing the Scan function in the SWM Remote Control Software. See **Section 13.4.2.5 RF Scan** for a complete discussion of the benefits of scanning, which will reveal any potential RF sources in your location and allow you to make an informed choice of channels to use. The scanner can scan for long periods of time and will give you a report of RF activity over time for each of the 70 channels available on your Smart Spectrum system.

1. Microwave ovens

In the vast majority of situations, interference from microwave ovens will not affect performance of your SWM series microphone systems. Since barriers such as walls work to block interference, a microwave oven will likely present a problem only when located in fairly close proximity within the same room as the wireless receiver (or reception antenna). See caution below.

Commercial quality microwave ovens present a bigger potential problem. They sweep over a wider band of frequencies than the limited band affected by consumer units, and use two magnetron tubes which alternate to avoid inactivity during a power cycle. Fortunately, Sabine systems are only affected by such ovens in close proximity to receiver antennas. That protection, plus the availability of 70 different RF channels to choose from, makes serious interference problems arising from microwave ovens avoidable and unlikely. See caution below.

Antenna Placement Caution

As a general precaution, keep 2.4 GHz cordless telephones, microwave ovens, WLAN antennas and 2.4 GHz wireless video camera transmitters twice the distance from your Sabine wireless microphone system antennas as that of your Sabine 2.4 GHz transmitters.

Cautions for 915 MHz?

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2. **Wireless Local Area Networks (WLANS)**

   These computer network devices allow computers to connect via wireless devices that act as both receivers and transmitters. These low-powered transceivers often have selectable channels and can utilize the entire 2.4 GHz band. In general, Sabine microphones should not be affected by these WLANS because their spread spectrum technology does not present a problem for the Sabine Smart Spectrum™ system. The Sabine wireless system will not interfere with the WLAN. See caution below.

3. **Cordless phones**

   These home telephones broadcast at very low power and should not present interference problems for your Sabine wireless. This is especially true if the telephone uses spread spectrum technology. See caution below.

4. **Wireless Video Cameras**

   Certain wireless video cameras (X10, for example) use the 2.4 GHz band. These devices are also very low power and, in general, should not present a problem when using the SWM system. See **Section 5 Receiver Operation** for methods of optimizing clear reception and minimizing interference. See caution below.

In the event problems still arise, see **Section 5 Receiver Operation** for methods of optimizing clear reception and minimizing interference.

Antenna Placement Caution

As a general precaution, keep 2.4 GHz cordless telephones, microwave ovens, WLAN antennas and 2.4 GHz wireless video camera transmitters twice the distance from your Sabine wireless microphone system antennas as that of your Sabine 2.4 GHz transmitters.

15. FBX THEORY & PRACTICE

15.1. Introduction to FBX®

WHY FBX? Feedback is certainly the most pervasive challenge to the audio industry. The potential appearance of sudden, loud, out-of-control feedback is every sound engineer's and musician's nightmare. Unlike more subtle audio quality problems or shortcomings, feedback is embarrassingly obvious — it disturbs the performer, the audience, and the technician, and can damage equipment and just generally ruin your day.

Feedback is a potential problem in any amplified sound system that places a microphone or pickup in proximity to a loudspeaker. Poor acoustical conditions or misguided use by unsophisticated sound system operators only aggravate the situation. To make matters still worse, a non-Sabine variety of wireless microphone adds yet another level of feedback danger to the picture. Since feedback erupts whenever the distance, location, and gain relationships between a speaker and a microphone reach a critical combination, a mic that can move anywhere results in an ever changing potential for feedback. A step in the wrong direction may change a clear sound to a piercing shriek in less than a second.

This enhanced potential for feedback with a wireless system gets worse if lavalier microphones are used. Such microphones are usually placed farther from the mouth than handheld or head set microphones, thus requiring more gain. Also, the polar pattern of a lavalier microphone is frequently omnidirectional. Thus, the likelihood of feedback increases, due to the microphone's increased off-axis sensitivity to the sound emanating from the loudspeakers.

The Sabine True Mobility® SWM wireless systems solve feedback problems by precise attenuation of very narrow bands of feedback-prone frequencies. The process is automatic, simple to use, adaptable to changing acoustical conditions and relationships, powerful in its application, and has minimal consequences to the audio fidelity of the signal. We call this automatic filter an FBX Feedback Exterminator® filter, or FBX filter for short.

15.2. The Advantages of FBX Filters

Before the invention of FBX, the most common device for controlling feedback was the 31-band graphic EQ. However, an FBX filter offers three distinct advantages over graphic filters.

1. First and most obvious is the automatic nature of FBX filters. When feedback occurs, FBX responds more quickly than even the most experienced engineer. Automatic FBX placement works even in the presence of audio program material, intelligently distinguishing feedback from music or speech.
2. A second advantage is that FBX micro-filters are precisely placed anywhere feedback occurs (with 1 Hz resolution), while graphic EQ filters are limited to 31 fixed center points. An FBX filter represents a direct hit on feedback! In contrast, a graphic EQ filter can only approximate the exact frequency of the feedback, and the filter (or filters) with the closest center frequency must be pulled down. Such filters are deepest at their centers, and such imprecise attenuation takes a big (and unnecessary) chunk out of your sound (see Fig. 15a).
3. Increased clarity and gain-before-feedback are further accomplished by the third and most important advantage of FBX: Sabine's micro-filters are ten times narrower than 31-band EQ filters. Using FBX micro-filters will return up to 90 percent of the power removed by EQ filters.

Here's a good place to make a very important distinction. Graphic EQ filters are typically called "1/3-octave," but it's important to understand that this term refers to the spacing of the filter centers (1/3-octave apart), and not the width of the filter (usually a full octave). Graphic filters thus overlap one another, and affect frequencies well above and below the center point frequency, including frequencies of adjacent bands. This makes graphic equalizers very practical tools for shaping sound "with broad strokes," such as dialing in overall system EQ, but results in destructive audio quality overkill when they are used to eliminate feedback. A graphic equalizer would need more than 10,000 narrow-band sliders to be as precise and powerful as your FBX.

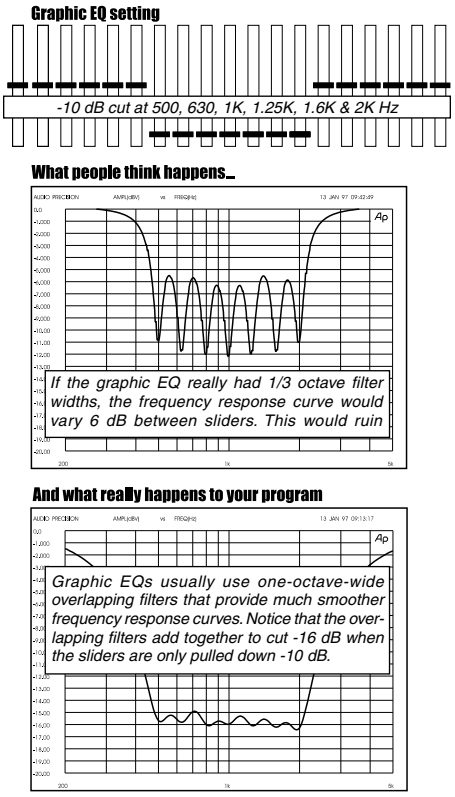

Fig. 15a What a Graphic EQ does to your Program

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As an example of the power of FBX, figure 15b shows test results measured with a PA set up consisting of a microphone, mixer, FBX Feedback Exterminator®, power amp and two speakers. The system's gain was first raised until the FBX removed nine feedback points. Next, the FBX was replaced with a graphic EQ. The EQ was adjusted while the system gain was raised to the same level achieved with the FBX. The frequency response curves of each device were then plotted and are compared in figure 15b. Note how much more of the program (the "good audio") is eliminated using an EQ — whereas only feedback is eliminated using FBX filters.

15.3. Parametric Filters and FBX

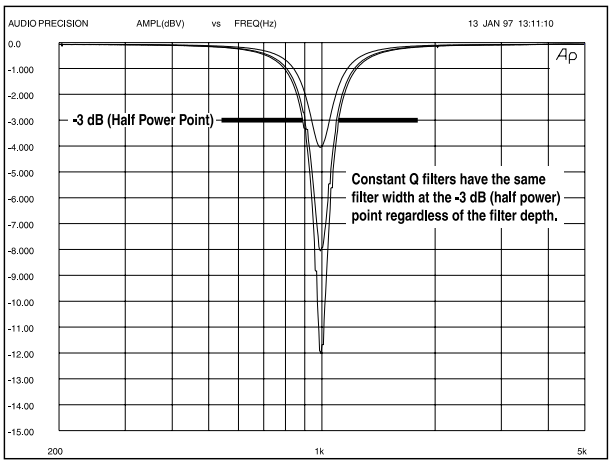

Fig. 15b - Constant Q Filter

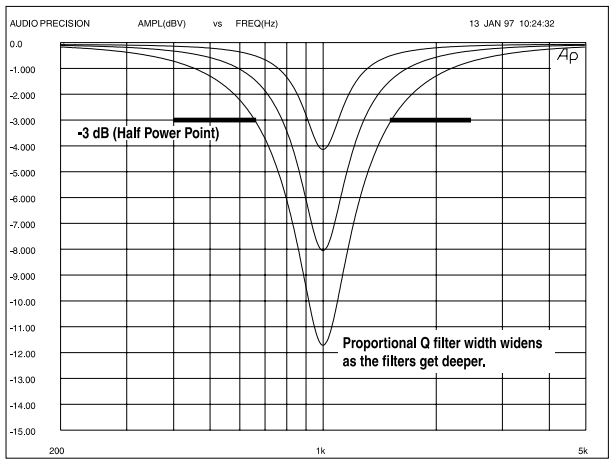

Fig. 15c - Proportional Filter

Sabine Constant Q Filters

It is common to describe a filter's quality factor, or "Q," as the center frequency of the filter divided by the filter width (in Hertz) measured at the -3dB point. Filters that have the same Q, or width, at the -3dB point regardless of the filter's cut or boost are called Constant Q filters (see Fig. 15b). Filters that get wider as the filter gets deeper are called Proportional Q filters (see Fig. 15c). Lately, however, the definition of Constant Q is becoming less distinct. Many equalizer manufacturers claim their equalizers have Constant Q filters, when in fact they get substantially wider as they get deeper. The only way to know for sure if the filters are truly Constant Q is to inspect their frequency response curves. Sabine FBX Filters are true Constant Q filters.

Of course, many savvy sound engineers, realizing the limitations of graphic equalizers in removing problem feedback, prefer to use a different type of equalizer, called a parametric EQ, for such applications. If you're one such audio engineer, you'll be comforted to know that FBX filters share much in common with parametrics.

Compared to graphic filters, parametrics allow more precise adjustments — specifically, control of filter width, the amount of boost or cut, and the mid-band frequency of the filter. This greater precision, however, comes at a price, as parametric filters are not nearly as intuitive or simple to use as graphic equalizers.

Nothing, however, is easier to use than an FBX filter, which enjoys the precision of a parametric filter, yet deploys instantly and automatically whenever feedback is detected. Effectively, an FBX filter is a parametric filter set to a tenth-octave width, restricted to cut-only activity, and automatic in its choice of frequency band. If you want hands-on control, use the Sabine True Mobility® Remote Software to change FBX filters to parametrics, and tweak frequency, width, and depth to your liking.

15.3.1. The FBX & True Mobility® Advantage

After inventing FBX technology and refining it for over a decade, Sabine has brought our patented automatic feedback control to its fullest realization with the Sabine SWM True Mobility® wireless systems. Our latest advance in maintaining the highest quality audio signal is due to the placement of the signal processing in the input chain of the microphone signal. Many times signal processing (compression and equalization) is placed after the output stage of a mixer, meaning it is applied to a combination of inputs mixed together into one output and passed through the processor. Particularly in the case of equalization and feedback control, one consequence of such placement is that filtering appropriate to only one microphone may be applied to all mics in the same mix bus. In other words, unnecessary filtering may be applied to microphones that, due to variations in position and microphone characteristics, will feedback at a different set of frequencies. Although the filters are very transparent, why add filtering if you can avoid it? And why divide your processing power among multiple signals?

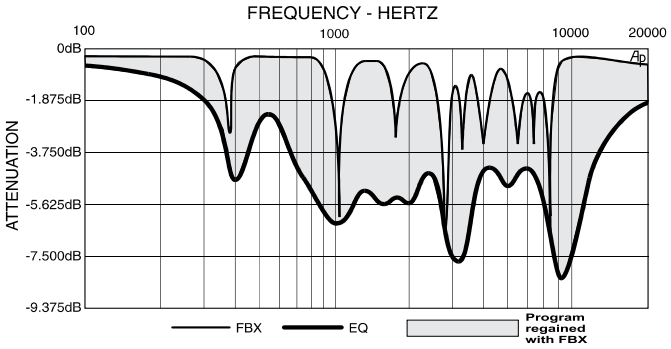

Fig. 15d - FBX at Work: What FBX Gives Back to your Program

Placing the filtering and other signal processing in the input signal path is a concept called Targeted Input Processing. It means each microphone so equipped will have customized, unique signal processing applied — and no unnecessary processing.

With FBX technology, your microphone will finally sound loud enough, everyone in the audience will understand each word, and feedback will be far less likely to make an unwelcome and unexpected visit—and you'll be comfortable knowing that protection is extended to anywhere a wireless microphone might be taken.

14.3.2. FBX Fixed & Dynamic Filters

FBX filters come in two flavors, fixed and dynamic. Both operate automatically. There is no audible difference between fixed and dynamic filters in terms of sonic purity; the difference arises in their application.

14.3.2.1. Fixed FBX Filters

Once they set automatically (see Section 7 for information on setting filters), fixed FBX filters will NOT change frequency. You can think of fixed filters as cures for problem frequencies (the "first-to-feedback" frequencies encountered during normal system operation), common to most locations in the room.

14.3.2.2. Dynamic FBX Filters

Dynamic FBX filters also set automatically, but can change frequency, on a rotating basis, as the need arises. To help distinguish dynamic from fixed filters, consider the example of a speaker using a wireless lavalier microphone, who walks under a ceiling speaker for the first time. In so doing, he enters a location-specific feedback zone, where it's possible that a problem frequency may have escaped detection and notching by a fixed filter. If all fixed filters have been deployed, a dynamic filter will be set automatically as soon as feedback appears, solving the problem. Great! But what happens when the speaker then moves away from the ceiling speaker, and close to a floor monitor? Feedback from the ceiling speaker is no longer a problem, but a new frequency starts to squeal. If all fixed and dynamic FBX filters are already set, a dynamic filter will change, to adjust to the new location. An FBX dynamic filter thus stands guard if new problem feedback arises after all available filters have been set, providing a deeper and more flexible level of protection against the dreaded surprise of feedback.

Other than the ability to change frequency, a dynamic filter is equivalent to a fixed filter.

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14.3.2.3. Balancing Fixed & Dynamic Filters

Each channel of your SWM wireless receiver offers a total of 10 FBX filters (combined fixed and dynamic), which can be used as needed to exterminate feedback. After years of experience and experimentation, Sabine has settled upon a default balance of 7 fixed and 3 dynamic filters, set at the factory. This default condition can be changed to 8 fixed and 2 dynamic, by changing a DIP switch on the back of your receiver (see Appendix D FBX Configuration DIP Switch), or to any configuration using the Remote Control software (see Section 13).

If you follow setup instructions for setting FBX filters (see Section 7), your receiver will automatically exit SETUP mode (enter READY status) after all fixed filters, and the first dynamic filter, have set. In the default condition, this means you will have set eight filters (seven fixed and one dynamic), with two dynamic filters still unset and remaining on standby alert. If you wish to set fewer filters, press the READY button before SETUP automatically exits, after you have set enough filters to safely achieve your desired gain level. In that case, in the factory default condition, you will reserve three unset dynamic filters for standby.

14.3.3. FBX Filter Width

Sabine's experience and testing with filters and sound quality along led us to decide upon a default FBX filter width of .10 (one-tenth) octave as the optimal notch width, able to eliminate feedback without affecting music programs. If, with all filters properly set, feedback is still a problem, FBX filters may be set to .20 (one-fifth) octave width. This wider filter setting will help to better eliminate feedback trouble areas, but may also affect music programs slightly. Therefore, the wider setting is generally considered to be appropriate where speech (less demanding than music) is the primary application of the Sabine Wireless system. You can globally change FBX filter width by repositioning a rear panel DIP switch, to change from .10 to .20 octave (see Appendix D FBX Configuration DIP Switch), or by adjusting filter width using the True MobilityTM Remote Software (which allows a range of widths from .01 to 1.0 octave). You may also mix filter widths, either by adjusting individual filter widths using the Remote Software, or by changing the DIP switch position during setup. The width of any set filter will always be determined by the position of the switch at the time the filter is created.

14.3.4. Who Benefits from FBX?

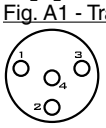
Virtually every sound system will be improved with the Sabine True Mobility® Wireless System. Singers and speakers who do not have sound technicians can now increase their monitor or house system volume so they can hear themselves clearly and with full fidelity, without worrying if their microphones will suddenly squeal if they move to the wrong place.

Auditoriums and churches of all sizes will enjoy reliable feedback control. Hotels and conference centers around the world can offer meeting rooms with microphones that won't howl during programs. The Sabine True Mobility® Wireless System can be installed in theaters, schools, sports arenas, courtrooms, teleconferencing, intercoms or interactive remote classrooms — anywhere one or multiple microphones are used.

15. APPENDICES

Appendix A: Beltpack Connector Wiring Diagrams

Fig. A1 - Transmitter Input Connector Wiring Diagram



1: GND
2: +3.3 VDC
3: AUDIO SIGNAL INPUT (50K OHM IMPEDENCE)
4: 20K TO GND

Fig. A2 - 2-conductor Electret Wiring Diagram

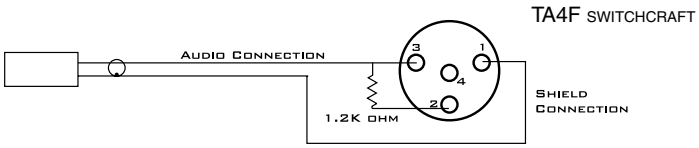


Fig. A3 - 3-conductor Electret Wiring Diagram

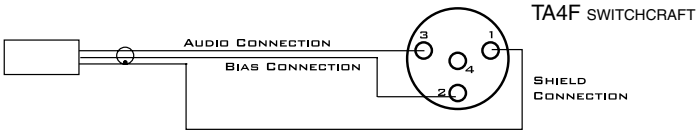


Fig. A4 - Beltpack Instrument Cable

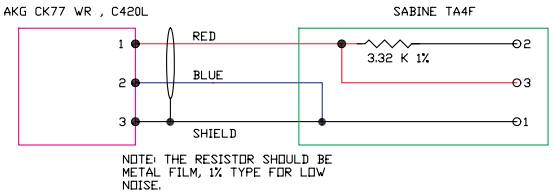
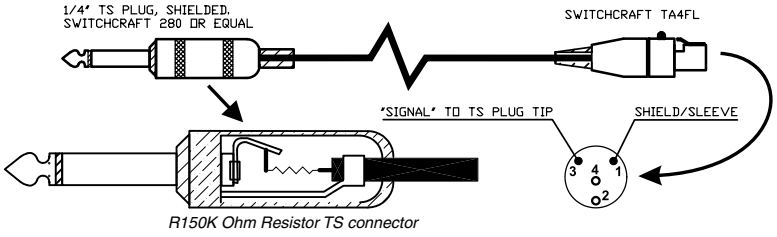


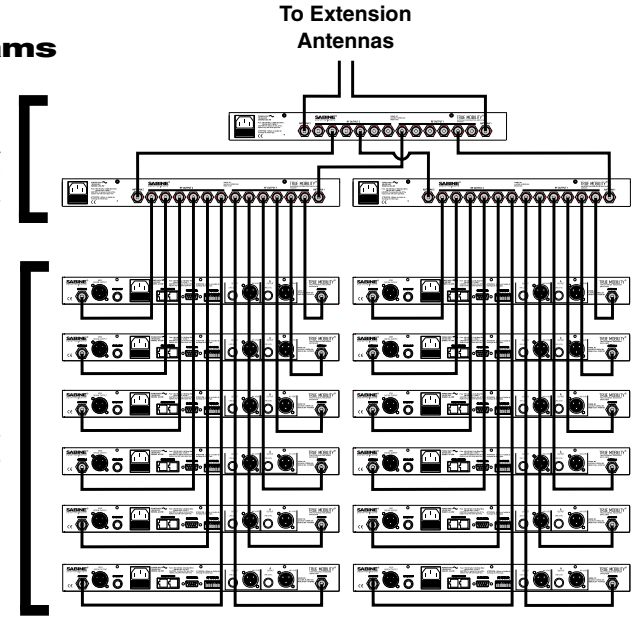
Fig. A5 - AKG CK77 WR, C420L to Sabine SW70-T



R150K Ohm Resistor TS connector

Appendix B: Antenna System Diagrams

NOTE: Connect receiver Antenna 1 input to any RF Output 1 connector on the SWA6SS. Likewise, connect any receiver Antenna 2 to any RF Output 2 connector on the SWA6SS.



Appendix C: Specifications: SWM6000 Series

SW70 Series Receivers, 1- or 2-channel

Carrier Frequency Range: ISM Band 2400 - 2483.5 MHz
Frequencies: 70 pre-programmed
Oscillation Mode: PLL synthesized
Receiving Mode: True diversity
Sensitivity: 6 dBV at S/N over 70 dB
Image Rejection: >63 dB
Spurious Rejection: >76 dB
Stability: < 5 ppm
Maximum Deviation: +/- 150 KHz
Dynamic Range: > 100 dB
S/N Ratio: 95 dB (Typical)
THD: <0.1%
Frequency Response: 20 Hz - 20 KHz +/- 1 dB
Antennas: 2, ¼ wavelength, 50 Ohm
Power Supply: 100-240 VAC 50-60 Hz
Rack-Mount case
Working Range: > 100 meters
Outputs: Balanced XLR and TRS, mic or line level
RS232 & RS485** Serial Interface
Digital Audio Output with Sync Input**
Maximum Undistorted Sinewave Output:

- TRS balanced +20 dBV, +22 dBu, 300 Ohm source impedance
- XLR balanced +2 dBV, +4 dBu, 200 Ohm source impedance
- TRS UN-balanced +14 dBV, +16 dBu, 150 Ohm source impedance
- XLR UN-balanced -4 dBV, -2 dBu, 100 Ohm source impedance

NOTE: Both outputs are available simultaneously. Excessive loading of one of the outputs may affect the output of the other. The XLR output is protected against inadvertent application of Microphone Phantom Power

SW70-H1 Series Handheld Microphones

Dynamic Mic Capsule: Audix OM3 or Audix OM5
Condenser Mic Capsule: Voice Technologies
Antenna: Internal Fixed
Maximum FM Deviation: +/- 100 KHz
RF Frequency Stability: < 5 ppm
RF Output: < 25 mW
Spurious output: < -50 dB of rated output
Telemetry: Battery Voltage, Mute Status, Capsule Type
Programmable LCD
Programmable On/Off switch
Battery: Sabine Rechargeable or two 1.5V Alkaline AA cells
Rechargeable Battery Life: 9 hours per charge,
500 charge cycles (typical)
Alkaline Battery Life: 12 hours (typical)

SW75 Series BeltPack Transmitter

Maximum FM Deviation: +/- 150 KHz
RF Frequency Stability: < 5 ppm
Spurious output: < -50 dB of rated output
RF Output: < 25 mW
Telemetry: Battery Voltage, Mute Status
Programmable LCD
Programmable On/Off switch
Mic input impedance: 47 K Ohms
Mic bias: 3.3V
Mic connector: TA4
Antenna type: Internal Fixed
Battery: Sabine Rechargeable or two 1.5V Alkaline AA cells
Rechargeable Battery Life: 10 hours per charge,
500 charge cycles (typical)
Alkaline Battery Life: 12 hours (typical)

Digital Signal Processing

FBX Filters
Ten independent digital filters per channel, controlled automatically from 20 Hz to 20 KHz
Filter depth: 3 dB steps from 0 dB to -40 dB
Filter width: .1 or .2 octave*
Resolution: 1 Hz from 20 Hz to 20 KHz
Time required to find and eliminate feedback: typically 0.3 seconds @ 1 KHz

Digital Compressor/Limiter
Threshold: -30 dB to 0 dB
Ratio: 1:1 through infinity
Knee: soft to hard
Attack: 1-99 msec
Release: 10 to 1000 msec

Automatic De-Esser
Cut range: 0 to -30 dB

Microphone SuperModeling

Dynamic Capsules***
Shure SM-58
Shure Beta 58A
Audio Technica ATM 41a
AKG D3800

Condenser Capsules***
Shure Beta 87A
AKG C535 EB
Audio Technica ATM 89R
Crown CM200A

Presets

10 User Presets – Saves all configurations

Mechanical

Dimensions: 1-U rack-mount, 19 x 1.75 x 9 in.
(48.3 x 4.5 x 21.6 cm)
Weight: 5.3 lb. (2.4 kg)

Operating Temperature

Safe Operating Temperature: 0 - 50 degrees centigrade ambient temperature (32-129F)

Power

Power input rating: 100 – 240 VAC 50/60 Hz 0.4 A 35 W
Fuse: 100 – 140 VAC 0.5A 250V SLOW BLOW
or
200 – 240 VAC 0.315A 250V TYPE T

SWA6SS Antenna Distribution Amplifier (SWA6SS)

Two antenna inputs
Six outputs per antenna to receivers
Filter Bandwidth: 2.40 - 2.483 GHz +/- 3 dB
1 dB Compression Input Level: -20 dBm
Noise Figure: < 3.7 dB (Center Band)
Input/Output Gain: (+)1.6dB (Center Band)
Input/Output Impedence: 50 Ohm
Output Port Isolation: 30 dB minimum
Connector: TNC type, 50 Ohm
Power Supply: 100-130 VAC or 200-240 VAC 50/60 Hz
Safe Operating Temperature: 0 - 50 degrees centigrade ambient temperature (32-129F)

(SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE)

**Below approximately 200 Hz the feedback filters become slightly wider to increase the feedback and rumble capture speed at these low frequencies.*

***ND Series Receivers Only*

****Company names, product names, and trademarks listed here are the property of their respective owners and are used only to identify evaluated microphones used to develop digital processing; they in no way imply association, endorsement, or approval by any named manufacturer.*

Appendix C: Specifications: SWM7000 Series

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Oscillation Mode: PLL synthesized
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Sensitivity: 6 dBV at S/N over 70 dB
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Stability: < 5 ppm
Maximum Deviation: +/- 150 KHz
Dynamic Range: > 100 dB
S/N Ratio: 95 dB (Typical)
THD: <0.1%
Frequency Response: 20 Hz - 20 KHz +/- 1 dB
Antennas: 2, ¼ wavelength, 50 Ohm
Power Supply: 100-240 VAC 50-60 Hz
Rack-Mount case
Working Range: > 100 meters
Outputs: Balanced XLR and TRS, mic or line level
RS232 & RS485** Serial Interface
Digital Audio Output with Sync Input**
Maximum Undistorted Sinewave Output:

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- XLR UN-balanced -4 dBV, -2 dBu, 100 Ohm source impedance

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Dynamic Mic Capsule: Audix OM3 or Audix OM5
Condenser Mic Capsule: Voice Technologies
Antenna: Internal Fixed
Maximum FM Deviation: +/- 100 KHz
RF Frequency Stability: < 5 ppm
RF Output: < 25 mW
Spurious output: < -50 dB of rated output
Telemetry: Battery Voltage, Mute Status, Capsule Type
Programmable LCD
Programmable On/Off switch
Battery: Sabine Rechargeable or two 1.5V Alkaline AA cells
Rechargeable Battery Life: 9 hours per charge,
500 charge cycles (typical)
Alkaline Battery Life: 12 hours (typical)

SW75 Series BeltPack Transmitter

Maximum FM Deviation: +/- 150 KHz
RF Frequency Stability: < 5 ppm
Spurious output: < -50 dB of rated output
RF Output: < 25 mW
Telemetry: Battery Voltage, Mute Status
Programmable LCD
Programmable On/Off switch
Mic input impedance: 47 K Ohms
Mic bias: 3.3V
Mic connector: TA4
Antenna type: Internal Fixed
Battery: Sabine Rechargeable or two 1.5V Alkaline AA cells
Rechargeable Battery Life: 10 hours per charge,
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Filter width: .1 or .2 octave*
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Digital Compressor/Limiter
Threshold: -30 dB to 0 dB
Ratio: 1:1 through infinity
Knee: soft to hard
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Release: 10 to 1000 msec

Automatic De-Esser
Cut range: 0 to -30 dB

Microphone SuperModeling

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AKG D3800

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AKG C535 EB
Audio Technica ATM 89R
Crown CM200A

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10 User Presets – Saves all configurations

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Dimensions: 1-U rack-mount, 19 x 1.75 x 9 in.
(48.3 x 4.5 x 21.6 cm)
Weight: 5.3 lb. (2.4 kg)

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Safe Operating Temperature: 0 - 50 degrees centigrade ambient temperature (32-129F)

Power

Power input rating: 100 – 240 VAC 50/60 Hz 0.4 A 35 W
Fuse: 100 – 140 VAC 0.5A 250V SLOW BLOW
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SWA6SS Antenna Distribution Amplifier (SWA6SS)

Two antenna inputs
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Noise Figure: < 3.7 dB (Center Band)
Input/Output Gain: (+)1.6dB (Center Band)
Input/Output Impedence: 50 Ohm
Output Port Isolation: 30 dB minimum
Connector: TNC type, 50 Ohm
Power Supply: 100-130 VAC or 200-240 VAC 50/60 Hz
Safe Operating Temperature: 0 - 50 degrees centigrade ambient temperature (32-129F)

(SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE)

**Below approximately 200 Hz the feedback filters become slightly wider to increase the feedback and rumble capture speed at these low frequencies.*

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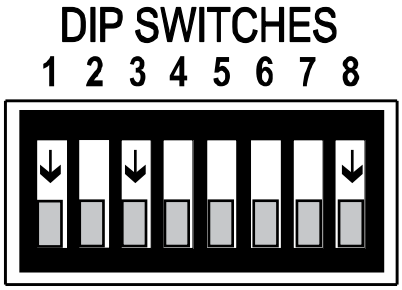
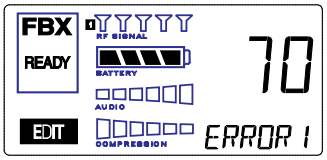
Appendix D: Dip Switch Settings

(Located on the receiver back panel)

Front Panel Lock Status: LOCK 1 indicates all front panel controls are locked to prevent intentional tampering, or accidental programming. LOCK 2 indicates a subset of controls are locked, allowing selected others to be adjusted with software only. Default LOCK 2 setting locks out all functions except FBX and Program Load. In addition, the LCD contrast control is not locked in Lock 2.



IMPORTANT: Dip Switches 1, 3, 4, & 8 must always be in **down** position! The error message to the right will display on the receiver if the #1 dip switch is not in the **down** position.



NOTE 1: LOCK 1 overrides LOCK 2.

NOTE 2: Down is the default position.

NOTE 3: Lock settings are saved with the Presets.

Networking: The first receiver connected to the PC must have dip switch #7 set to the **down** position (default). All other receivers connected within a network must have dip switch #7 set to the **up** position.

DIP SWITCH STATUS CHART

#	SERIES	DESCRIPTION	UP STATUS	DOWN STATUS
1	ALL	(Always Down)	*Error*	OK
2	ALL	**FBX Filter Width**	1/5 Octave	1/10 Octave
3	ALL	(Always Down)	*Error*	OK
4	ND ONLY	**Digital Output Clock Source**	External Word Clock Input	(Default) Internal Clock Source
5	ALL	**Lock 1**	Lock	Unlock
6	ALL	**Lock 2**	Lock	Unlock
7	ND ONLY	**Network Enable**	Networked receivers other than 1st.	No networking, or 1st receiver in network.
8	ALL	(Always Down)	*Error*	OK

Appendix E: Frequency Chart

915 MHz - SWM6000 Series

Channel Number	Center Frequency	Channel Number	Center Frequency	Channel Number	Center Frequency
1	2400.840000	25	2429.404898	49	2457.969796
2	2401.633469	26	2430.198367	50	2458.763265
3	2403.220408	27	2431.785306	51	2460.350204
4	2404.013878	28	2432.578776	52	2461.143673
5	2405.600816	29	2434.165714	53	2462.730612
6	2406.394286	30	2434.959184	54	2463.524082
7	2407.981224	31	2436.546122	55	2465.111020
8	2408.774694	32	2437.339592	56	2465.904490
9	2410.361633	33	2438.926531	57	2467.491429
10	2411.155102	34	2439.720000	58	2468.284898
11	2412.742041	35	2441.306939	59	2469.871837
12	2413.535510	36	2442.100408	60	2470.665306
13	2415.122449	37	2443.687347	61	2472.252245
14	2415.915918	38	2444.480816	62	2473.045714
15	2417.502857	39	2446.067755	63	2474.632653
16	2418.296327	40	2446.861224	64	2475.426122
17	2419.883265	41	2448.448163	65	2477.013061
18	2420.676735	42	2449.241633	66	2477.806531
19	2422.263673	43	2450.828571	67	2479.393469
20	2423.057143	44	2451.622041	68	2480.186939
21	2424.644082	45	2453.208980	69	2481.773878
22	2425.437551	46	2454.002449	70	2482.567347
23	2427.024490	47	2455.589388		
24	2427.817959	48	2456.382857		

Need correct list here

2.4 GHz - SWM7000 Series

Channel Number	Center Frequency	Channel Number	Center Frequency	Channel Number	Center Frequency
1	2400.840000	25	2429.404898	49	2457.969796
2	2401.633469	26	2430.198367	50	2458.763265
3	2403.220408	27	2431.785306	51	2460.350204
4	2404.013878	28	2432.578776	52	2461.143673
5	2405.600816	29	2434.165714	53	2462.730612
6	2406.394286	30	2434.959184	54	2463.524082
7	2407.981224	31	2436.546122	55	2465.111020
8	2408.774694	32	2437.339592	56	2465.904490
9	2410.361633	33	2438.926531	57	2467.491429
10	2411.155102	34	2439.720000	58	2468.284898
11	2412.742041	35	2441.306939	59	2469.871837
12	2413.535510	36	2442.100408	60	2470.665306
13	2415.122449	37	2443.687347	61	2472.252245
14	2415.915918	38	2444.480816	62	2473.045714
15	2417.502857	39	2446.067755	63	2474.632653
16	2418.296327	40	2446.861224	64	2475.426122
17	2419.883265	41	2448.448163	65	2477.013061
18	2420.676735	42	2449.241633	66	2477.806531
19	2422.263673	43	2450.828571	67	2479.393469
20	2423.057143	44	2451.622041	68	2480.186939
21	2424.644082	45	2453.208980	69	2481.773878
22	2425.437551	46	2454.002449	70	2482.567347
23	2427.024490	47	2455.589388		
24	2427.817959	48	2456.382857		

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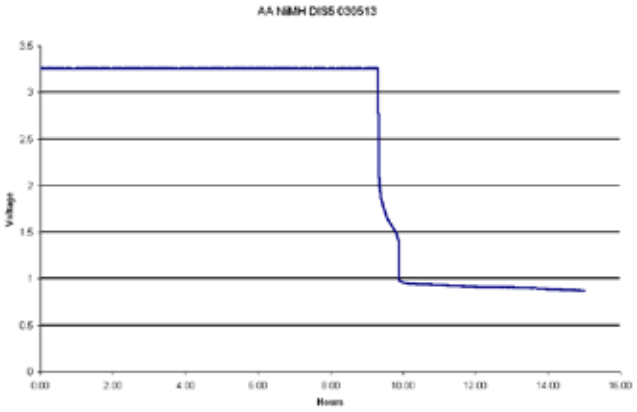
Appendix F: Battery Endurance Test (Typical)



NiMH AA Battery (SWAA2, Typical)

Appendix G: Changing Mic Capsules (SW70-H)

Sabine's Mic SuperModeling™ function requires a baseline characteristic for the capsule in use. Therefore, after changing capsules, you will need to "tell" the transmitter which capsule is now attached. NOTE: this is only necessary when the capsule is changed.

1 Open the handheld mic's battery door.

2 While holding down the SELECT button, turn on the mic. Continue to hold the select button for about 3 seconds, then let go.

3 One of the screens at right will appear in the transmitter LCD — showing the currently assigned capsule.

4 Using the transmitter control up/down buttons, select the capsule you now have attached. Wait a few seconds until the LCD cycles through the transmitter firmware version numbers and returns to the default display (channel number).

5 IMPORTANT: In order for the new capsule selection to be saved, you must now edit the RF channel selection. To do this, press the Select button, then use the up/down buttons to change the RF channel. Wait a few seconds to allow the transmitter screen to return to the default display. NOTE: you can return to the original channel by repeating the channel selection process.

Audix OM-3

Audix OM-5

Voice Technologies

16. CAUTIONS & WARRANTY

Warning! This equipment must be earthed.
Caution! Risk of electric shock. Do not open.
Caution! Shock hazard. Do not remove covers. No user serviceable parts inside. Refer servicing to qualified service personnel.
Warning! To reduce the risk of fire or electric shock, do not expose this product to rain or moisture.
Attention! Cet appareil doit être relié à la terre.
Attention! Risque de choc électrique; ne pas ouvrir.
Attention! Risque de choc; ne pas oter les capots. Aucune pièce accessible à l'intérieur. S'addresser à un technicien qualifié.
Attention! Pour réduire le risque d'incendie ou de choc électrique, ne pas laisser l'appareil sous la plouie ou à l'humidité.
Achtung! Dieses Gerät muss schutzgeerdet sein.
Achtung! Gefar eines elektrischen Stormschlags. Gehause nicht öffnen.
Achtung! Gefar eines elektrischen Stormschlags. Gehäuse nicht öffnen. Keine con Benutzer zu bedienenden Teile im Geräteinneren.
Überlassen Sie das Gerät zu Servicezwecken nur geschultem Fachpersonal.
Um Brandgefar oder das Risiko eines elektrischen Schlags auszuschließen, das Gerät vor Nässe und Feuchtigkeit schützen.
Advertencia! Este equipo debe estar conectado a tierra.
Precaución! Reisgo de descarga eléctrica. No abrir.
Precaución! Riesgo de descarga eléctrica. No desmontar las tapas. Piezas interiores no reparables por el usuario. Reparable sólo por personal cualificado.
Advertencia! Para reducir el riesgo de incendio o de descarga eléctrica no exponga este producto a la lluvia o humedad.

FCC Statements

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference; and (2) This device must accept any interference received, including interference that may cause undesired operation. Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

SW60 and 70-H & SW65 and 75-T Transmitters

The Sabine handheld and beltpack transmitters comply with the FCC part 15 section 249 requirements for frequency and field strength: 2400 – 2483.5 MHz.

- Field strength of Fundamental: 50 millivolts per meter when measured at 3 meters distance
- Field strength of Harmonics: 500 microvolts per meter when measured at 3 meters distance

Canadian Compliance Statement

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

Japanese EMI Compliance Statement

この装置は、第二種情報装置
（住宅地域又はその隣接した地域において使用されるべき情報装置）
で住宅地域での電波障害防止を目的とした情報処理装置等電波障害
自主規制協議会（VCCI）基準に適合しております。
しかし、本装置をラジオ、テレビジョン受信機に近接してご使用に
なると、受信障害の原因となることがあります。
取扱説明書に従って正しい取り扱いをして下さい。

WARNING!

The True Mobility is designed to operate from standard AC power. Please be sure the power in your area is compatible with the power requirements marked on the rear of the unit. Using the wrong input voltage may cause permanent damage to the unit and will void the warranty.

Power input rating: 100 – 240 VAC 50/60 Hz 0.4 A 35 W
Fuse: 100 – 140 VAC 0.5A 250V SLOW BLOW - *or* -
200 – 240 VAC 0.315A 250V TYPE T

The True Mobility Wireless Microphone system is supplied with one of the following AC power cords:

Japan	100 VAC	United Kingdom	240 VAC
U.S./North America	120 VAC	Australia	240 VAC
Continental Europe	230 VAC		

Battery Caution

DO NOT BURN OR PUNCTURE BATTERY. DOING SO COULD RELEASE TOXIC MATERIALS WHICH COULD CAUSE INJURY.

DO NOT SHORT CIRCUIT

MUST BE RECYLED OR DISPOSED OF PROPERLY.

1. Read all safety and operating instructions before using this product.
2. All safety and operating instructions should be retained for future reference.
3. Obey all cautions in the operating instructions and on the unit.
4. All operating instructions should be followed.
5. Use only shielded audio and data cables.
6. This product should not be used in the presence of moisture or rain, or near any water, i.e., a bathtub, sink, swimming pool, wet basement, etc.
7. This product should be located so that its position does not interfere with proper ventilation. Do not use in direct sunlight. Do not place flat against a wall or in a built-in enclosure that will impede the flow of cooling air.
8. This product should not be placed near a source of heat such as a stove or radiator.
9. Connect only to a power supply of the type marked on the unit adjacent to the power entry module.
10. Never break off the ground pin on the power supply cord.
11. Power supply cords should always be handled carefully. Never walk or place equipment on power supply cords. Periodically check cords for cuts or signs of stress, especially at the plug and the point where the cord exits the unit.
12. The power supply cord should be unplugged when the unit is to be unused for long periods of time.
13. Care should be taken so that objects do not fall and liquids are not spilled into the unit through the ventilation holes or any other openings.
14. This unit should be checked by a qualified service technician if:
    A. The power supply cord or plug has been damaged.
    B. Anything has fallen or been spilled into the unit.
    C. The unit does not operate correctly.
    D. The unit has been dropped or the enclosure damaged.
15. The user should not attempt to service this equipment. All service work should be done by a qualified service technician.

CAUTION - Implanted cardiac pacemakers or AICD devices:
Any source of RF (radio frequency) energy may interfere with normal functioning of the implanted device. All wireless microphones have low-power transmitters (less than 0.05 watts output) that are unlikely to cause difficulty, especially if they are at least a few inches away. However, since a beltpack transmitter typically is placed against the body, Sabine suggests attaching it at the belt, rather than in a shirt pocket where it may be immediately adjacent to an implanted medical device. Note also that any medical-device disruption will cease when the RF transmitting source is turned off. Please contact your physician or medical-device provider if you have any questions, or experience any problems with the use of this or any other RF equipment.

Need correct spec here for 915 MHz

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CAUTION!

EXPOSURE TO EXTREMELY HIGH NOISE LEVELS MAY CAUSE A PERMANENT HEARING LOSS. INDIVIDUALS VARY CONSIDERABLY IN SUSCEPTIBILITY TO NOISE INDUCED HEARING LOSS, BUT NEARLY EVERYONE WILL LOSE SOME HEARING IF EXPOSED TO SUFFICIENTLY INTENSE NOISE FOR A SUFFICIENT TIME. THE U.S. GOVERNMENT'S OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) HAS SPECIFIED THE FOLLOWING PERMISSIBLE NOISE LEVEL EXPOSURES:

DURATION/DAY IN HOURS SLOW RESPONSE	SOUND LEVEL IN dBA	DURATION/DAY IN HOURS SLOW RESPONSE	SOUND LEVEL IN dBA
8	90	1-1½	102
6	92	1	105
4	95	½	110
3	97	¼ or less	115
2			
100			

ACCORDING TO OSHA, ANY EXPOSURE IN EXCESS OF THE ABOVE PERMISSIBLE LIMITS COULD RESULT IN HEARING LOSS. EAR PLUGS OR PROTECTORS IN THE EAR CANALS OR OVER THE EARS MUST BE WORN WHEN OPERATING THIS DEVICE IN ORDER TO PREVENT A PERMANENT HEARING LOSS, IF EXPOSURE IS IN EXCESS OF THE LIMITS AS SET FORTH ABOVE. TO ENSURE AGAINST POTENTIALLY DANGEROUS EXPOSURE TO HIGH SOUND PRESSURE LEVELS, IT IS RECOMMENDED THAT ALL PERSONS EXPOSED TO EQUIPMENT CAPABLE OF PRODUCING HIGH SOUND PRESSURE LEVELS SUCH AS THIS DEVICE BE PROTECTED BY HEARING PROTECTORS WHILE THIS UNIT IS IN OPERATION.

THIS LIMITED WARRANTY VALID ONLY WHEN PURCHASED AND REGISTERED IN THE UNITED STATES OR CANADA. ALL EXPORTED PRODUCTS ARE SUBJECT TO WARRANTY AND SERVICES TO BE SPECIFIED AND PROVIDED BY THE AUTHORIZED DISTRIBUTOR FOR EACH COUNTRY.

Ces clauses de garantie ne sont vaiables qu'aux Etats-Unis et au Canada. Dans tous les autres pays, les clauses de garantie et de maintenance sont fixees par le distributeur national et assuree par lui selon la legislation en vigueur.

Diese Garantie ist nur in den USA and Kanada gultig. Alle Export-Produkte sind der Garantie und dem Service des Importeurs des jeweiligen Landes untervorfen.

Esta garantia es valida solamente cuando el producto es comprado en E.U. continentales o en Canada. Todos los productos que sean comprados en el extranjero, estan sujetos a las garantias y servicio que cada distribuidor autorizado determine y otrezca en los diferentes paises.

ONE-YEAR LIMITED WARRANTY/REMEDY

SABINE, INC. ("SABINE") warrants this product to be free from defects in material and workmanship for a period of one (1) year from date of purchase PROVIDED, however, that this limited warranty is extended only to the original retail purchaser and is subject to the conditions, exclusions and limitations hereinafter set forth:

CONDITIONS, EXCLUSIONS AND LIMITATIONS OF LIMITED WARRANTIES

1. These limited warranties shall be void and of no effect if:

   a. The first purchase of the product is for the purpose of resale; or

   b. The original retail purchase is not made from an AUTHORIZED SABINE DEALER; or

   c. The product has been damaged by accident or unreasonable use, neglect, improper service or maintenance, or other causes not arising out of defects in material or workmanship; or

   d. The serial number affixed to the product is altered, defaced or removed; or

   e. The power supply grounding pin is removed or otherwise defeated. In the event of a defect in material and/or workmanship covered by this limited warranty, Sabine will repair the defect in material or workmanship or replace the product, at Sabine's option; and provided, however, that, in any case, all costs of shipping, if necessary, are paid by you, the purchaser.

2. NiMH batteries included with the original purchase are warranted for ninety (90) days from date of purchase.

THE WARRANTY REGISTRATION CARD SHOULD BE ACCURATELY COMPLETED, MAILED TO AND RECEIVED BY SABINE WITHIN FOURTEEN (14) DAYS FROM THE DATE OF YOUR PURCHASE.

In order to obtain service under these warranties, you must:

a. Bring the defective item to any Authorized SABINE DEALER and present therewith the ORIGINAL PROOF OF PURCHASE supplied to you by the AUTHORIZED SABINE DEALER in connection with your purchase from him of this product. If the DEALER is unable to provide the necessary warranty service, you will be directed to the nearest other SABINE AUTHORIZED DEALER which can provide such service. OR:

b. Ship the defective item, prepaid, to:

   SABINE, INC.
   13301 NW US HIGHWAY 441
   ALACHUA, FL 32615-8544

Include therewith a complete, detailed description of the problem, together with a legible copy of the original PROOF OF PURCHASE and a complete return address. Upon Sabine's receipt of these items:

If the defect is remedial under the limited warranties and the other terms and conditions expressed have been complied with, Sabine will provide the necessary warranty service to repair or replace the product and will return it, FREIGHT COLLECT, to you, the purchaser.

Sabine's liability to the purchaser for damages from any cause whatsoever and regardless of the form of action, including negligence, is limited to the actual damages up to the greater of $500.00 or an amount equal to the purchase price of the product that caused the damage or that is the subject of or is directly related to the cause of action. Such purchase price will be that in effect for the specific product when the cause of action arose. This limitation of liability will not apply to claims for personal injury or damage to real property or tangible personal property allegedly caused by Sabine's negligence. Sabine does not assume liability for personal injury or property damage arising out of or caused by a non-Sabine alteration or attachment, nor does Sabine assume any responsibility for damage to interconnected non-Sabine equipment that may result from the normal functioning and maintenance of the Sabine equipment.

UNDER NO CIRCUMSTANCES WILL SABINE BE LIABLE FOR ANY LOST PROFITS, LOST SAVINGS, ANY INCIDENTAL DAMAGES OR ANY CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT, EVEN IF SABINE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

THESE LIMITED WARRANTIES ARE IN LIEU OF ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR USE; PROVIDED, HOWEVER, THAT IF THE OTHER TERMS AND CONDITIONS NECESSARY TO THE EXISTENCE OF THE EXPRESS LIMITED WARRANTIES, AS HEREINABOVE STATED, HAVE BEEN COMPLIED WITH, IMPLIED WARRANTIES ARE NOT DISCLAIMED DURING THE APPLICABLE ONE-YEAR PERIOD FROM DATE OF PURCHASE OF THIS PRODUCT.

SOME STATES DO NOT ALLOW LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS, OR THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU. THESE LIMITED WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

THESE LIMITED WARRANTIES ARE THE ONLY EXPRESS WARRANTIES ON THIS PRODUCT, AND NO OTHER STATEMENT, REPRESENTATION, WARRANTY OR AGREEMENT BY ANY PERSON SHALL BE VALID OR BINDING UPON SABINE.

In the event of any modification or disclaimer of express or implied warranties, or any limitation of remedies, contained herein conflicts with applicable law, then such modification, disclaimer or limitation, as the case may be, shall be deemed to be modified to the extent necessary to comply with such law.

Your remedies for breach of these warranties are limited to those remedies provided herein, and Sabine gives this limited warranty only with respect to equipment purchased in the United States of America.

INSTRUCTIONS-WARRANTY REGISTRATION CARD

1. Mail the completed WARRANTY REGISTRATION CARD to:
   SABINE, INC.
   13301 NW US HIGHWAY 441
   ALACHUA, FLORIDA 32615-8544 USA
   OR: **Register online at www.Sabine.com**
   a. Keep the PROOF OF PURCHASE. In the event warranty service is required during the warranty period, you will need this document. There will be no identification card issued by Sabine, Inc.
2. IMPORTANCE OF WARRANTY REGISTRATION CARDS AND NOTIFICATION OF CHANGES OF ADDRESS:
   a. Completion and mailing of WARRANTY REGISTRATION CARDS - Should notification become necessary for any condition that may require correction, the REGISTRATION CARD will help ensure that you are contacted and properly notified.
   b. Notice of address changes - If you move from the address shown on the WARRANTY REGISTRATION CARD, you should notify Sabine of the change of address so as to facilitate your receipt of any bulletins or other forms of notification which may become necessary in connection with any condition that may require dissemination of information or correction.
3. You may contact Sabine directly by telephoning (386) 418-2000.
4. Please have the Sabine product name and serial number available when communicating with Sabine Customer Service.

Manufactured by: Sabine, Inc.
13301 NW US Highway 441
Alachua, Florida 32615-8544 USA
Phone: +USA (386) 418-2000
Fax: +USA (386) 418-2001

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WIRELESS SYSTEMS

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