Operating Guide

SWM6000 915 MHz Systems
SWM7000 2.4 GHz Systems

SMART SPECTRUM®
WIRELESS MICROPHONES

SABINE®
WIRELESS SYSTEMS

the sound of innovation™

EC - DECLARATION OF CONFORMITY

CE MARKING

We, the Manufacturer

SABINE, INC.
13301 NW US HIGHWAY 441
ALACHUA, FLORIDA USA

declare that the products

Receiver: **SABINE MODEL SWM7000**

Is in conformity with

Council Directive: 73/23/EEC and 89/336/EEC (EMC Directives)

Standards to which conformity is declared:

EN 60065: 2001
EN 55022: 1998 Class B
EN 50082-1: 1998

Transmitters: **SABINE MODEL SW70-H and SW75-T**

Is in conformity with

Council Directive: 73/23/EEC and 89/336/EEC (EMC Directives)

Standards to which conformity is declared:

EN 300422-1, 2
EN 300440-1
EN 301489-9

Manufacturer Signature: _____

Date: 28 April, 2003 Name: Doran Oster, President

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This operating guide written for receivers using Sabine SWM Remote Control Software version 2.0 and above.

1. INTRODUCTION

Congratulations on purchasing your Sabine Smart Spectrum True Mobility™ Wireless System. True Mobility™ Wireless Systems give you all the built-in processing you need on every microphone, and offer unique and powerful features unavailable with any other wireless microphone.

1.1. Section Contents

Section 2 **Product Views** — illustrates system components (front & back panel views, transmitters, accessory lists and part numbers).

Section 3 **Quick Setup** — gives the Quick Setup procedures for Receiver & Transmitter Operation and using the FBX Feedback Exterminator®. Note that there is also a quick-start label on top of your True Mobility receiver for the Sabine FBX Feedback Exterminator®, Compressor/Limiter and De-Esser functions.

Section 4 **Transmitter Operation** — details transmitter setup and operation.

Section 5 **Receiver Operation** — details receiver installation and setup.

Section 6 **Mic SuperModeling™** — explains the use of the Sabine Mic SuperModeling™ and lists the microphones modeled.

Section 7 **FBX Feedback Exterminator®** — explains how to set up your FBX filters.

Section 8 **Compressor/Limiter** — explains the use of the Compressor.

Section 9 **De-Esser** — details operation of the adaptive De-Esser.

Section 10 **Program Save & Recall** — explains how to save and recall individual program settings.

Section 11 **Multiple Systems** — how multiple systems interface, computer control of multiple systems, suggestions for maximizing the number of collocated systems.

Section 12 **Extension Antennas** — how to get maximum performance using a Sabine Extension Antennas (Antenna Distribution Amplifier also available for multi-receiver installations).

Section 13 **Sabine Remote Control Software** — how to control up to 70 channels from one PC.

Section 14 **Tips & Troubleshooting** — gives tips on how to get the best performance from your Sabine Wireless, and describes some possible operating problems and their solutions.

Section 15 **Appendices** — wiring diagrams, frequency charts, specifications, typical system diagrams and dip switch settings for Sabine Wireless systems.

Section 16 **Cautions & Warranties** — states caution and warranty information for your True Mobility™ Wireless system.

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Important note about using this Operating Guide

This guide covers the operation of both the SWM6000 and SWM7000 Wireless Systems. The basic operating procedures for these two series are the same. The crucial differences are the frequency bands each of these series uses, and the number of available channels.

SWM6000: Offers 34 channels, and uses the 915 MHz band. All transmitters and receivers include the number “6” or the designation “M9” in the part number to denote this series.

SWM7000: Offers 70 channels, and uses the 2.4 GHz band. All transmitters and receivers include the number “7” or the designation “M1” in the part number to denote this series.

These products may be used together in the same location, but remember that transmitters and receivers must always work together. For example, in order for an SWM6000 Series system to work, the transmitters and receivers must both be from that series.

Other components in your system can be mixed between these two series. These include lavalier and headworn mics, mic clips and chargers, cables and adaptors, and anything that is not involved in the transmission or reception of the wireless signal.

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2. PRODUCT VIEWS

2.1. Receivers

2.1.1. Front panel views

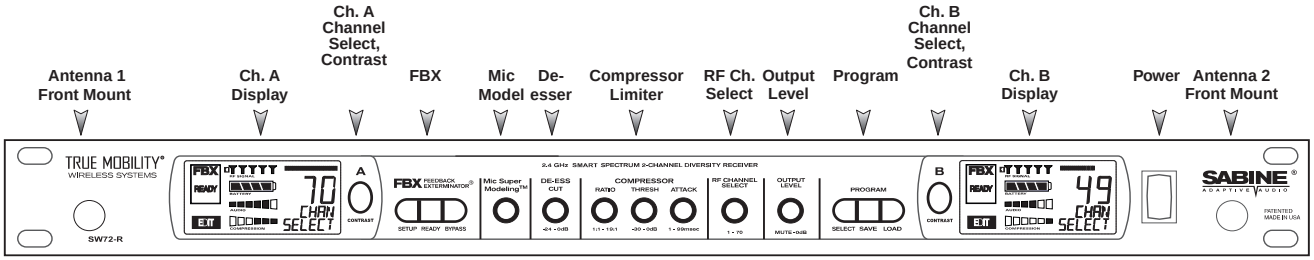

Fig. 2a - SW72-NDR & SW72-R (SW62-NDR & SW62-R) Two-channel Receivers

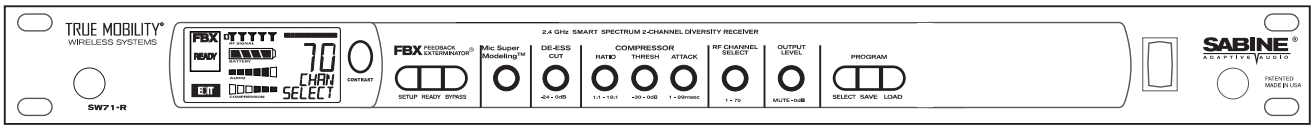

Fig. 2b - SW71-R (SW62-R) One-channel Receiver

2.1.2. Back panel Views

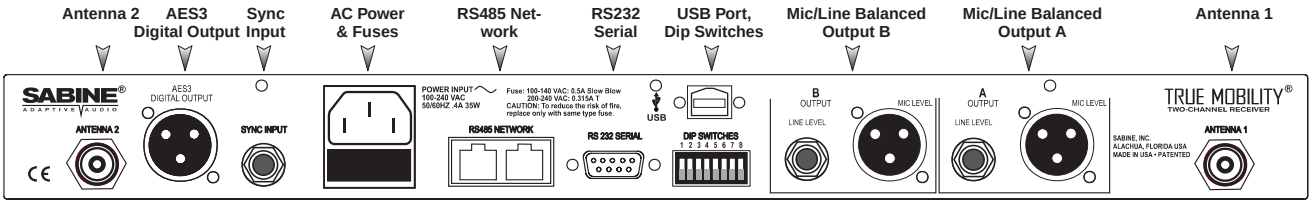

Fig. 2c - SW72-NDR (SW62-NDR) Two-channel Receiver w/Network & Digital Interface

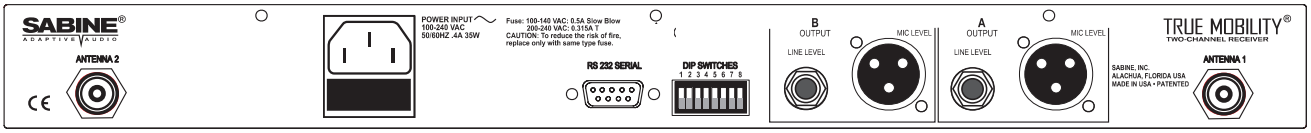

Fig. 2d - SW72-R (SW62-R) Two-channel Receiver

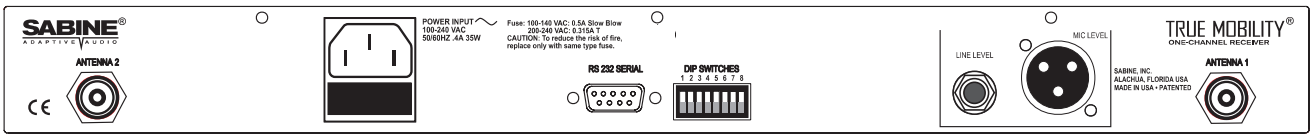

Fig. 2e - SW71-R (SW61-R) One-channel Receiver

See Page 55 for the chart of DIP Switch Settings

2.2. Transmitters

2.2.1. Handheld

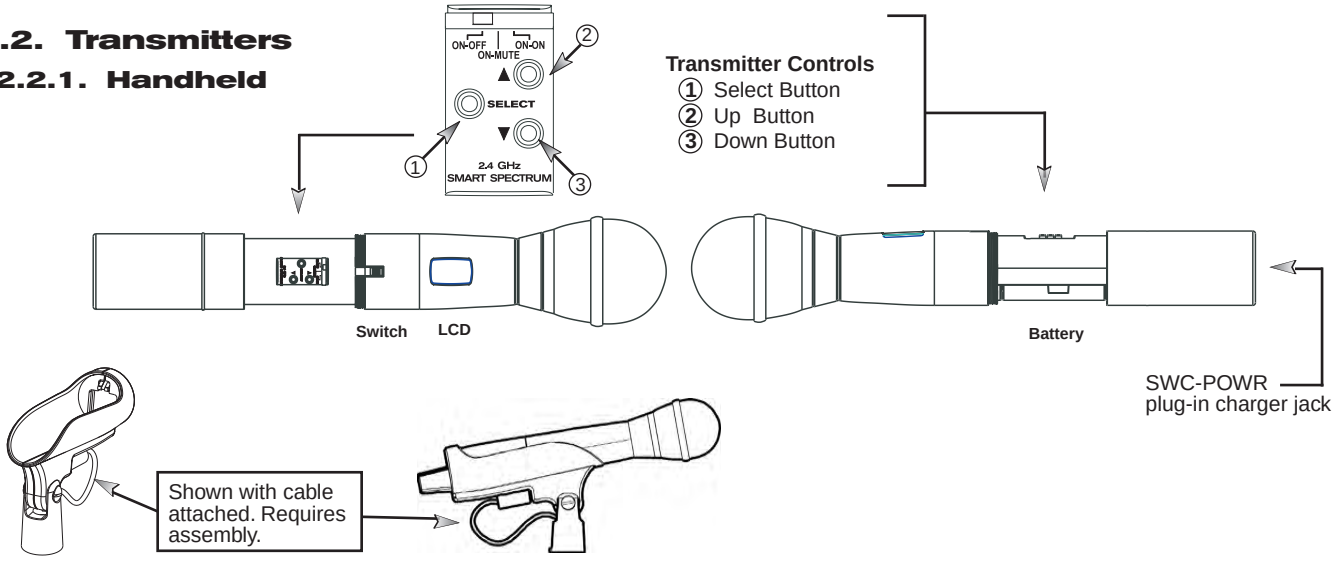

Fig. 2h - SWC70CL - SW70-H13 (SW60-H13), SW70-H15 (SW60-H15) & SW70-H19 (SW60-H19) Mic Clip with Built-in Charger

2.2.2. Beltpack

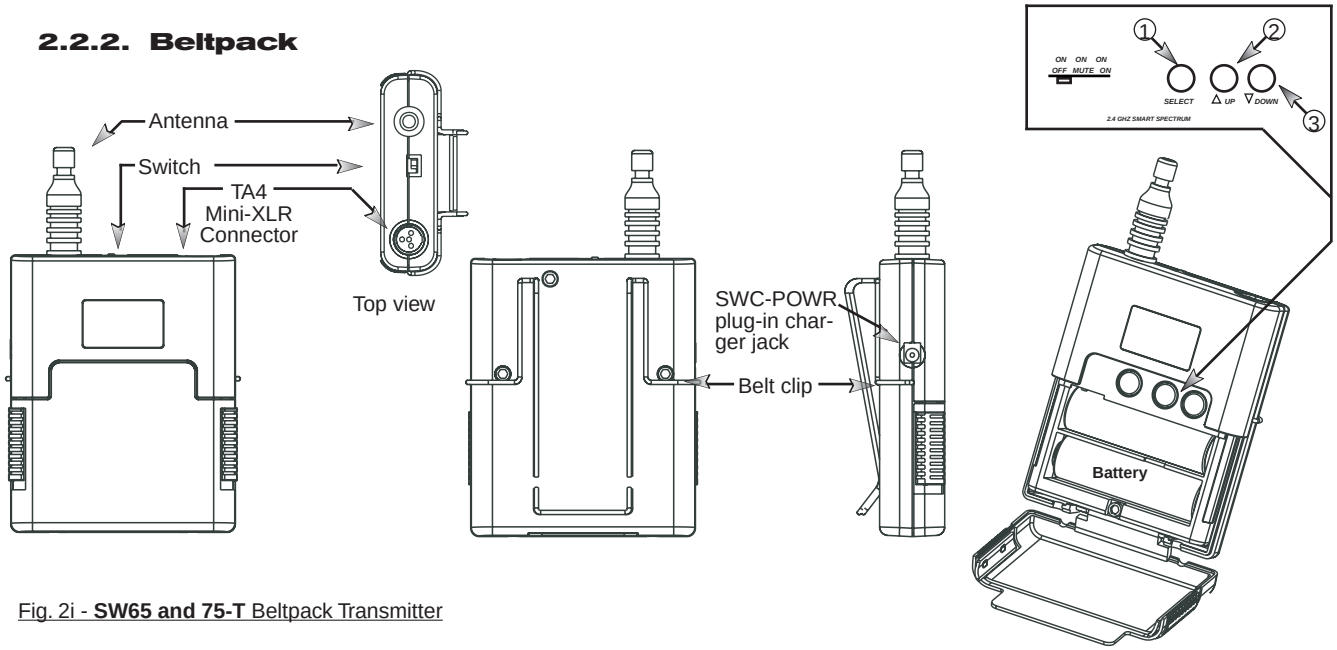

Fig. 2i - **SW65 and 75-T** Beltpack Transmitter

2.3. Components

(for a complete list see the Sabine Catalog)

Receivers

SW62 and 72-NDR: 2-Ch. Receiver w/Network & Digital Interface
SW62 and 72-R: 2-Ch. Receiver
SW61 and 71-R: 1-Ch. Receiver

Microphones

SWT31L-TA4: Cardioid Lavalier Mic
SWT56W-TA4: Headworn Mic
SVT70BW-TA4: Voice Technologies Omni Headworn Mic (Black)
SVT70LW-TA4: Voice Technologies Omni Headworn Mic (Tan)
SVT80BW-TA4: Voice Technologies Cardioid Headworn Mic (Black)
SWTVT50-TA4: Voice Technologies Miniature Omni Lavalier
SVT40L-TA4: Voice Technologies Sub-Mini Omni Lavalier
SWT70G-TA4: Instrument Input w/cable

Transmitters

SW65 and 75-T: Beltpack Transmitter
SW60 and 70-H13: Handheld Mic w/Dynamic Element (Audix OM3)
SW60 and 70-H15: Handheld Mic w/Dynamic Element (Audix OM5)
SW60 and 70-H19: Handheld Mic w/Condenser Element (VT)

Antennas

SWA700: TNC Front to Rear Converter Kit (Set of 2)
SWA6SS: Antenna Distribution Amp for 6 systems
SWASS-EXT: Extension Antenna Kit (Set of 2)
SWAANT: Dipole Antennas (2)
SWATNC-N: RF Adaptor cable, Set of 4, TNC to NB
SWATNC-MCA: TN C Male Crimp Connector 2.4 GHz
SWACA15(or 30)-TNC: RF Cables, RG58, TNC, One Pair

Batteries

SWBAA2: Rechargeable NiMH AA set for SW75-T & H1

Mic & Transmitter Accessories

SWCRJ45: RS485 Serial Cable for ND Receivers
SWC70CL-1: SW60/70-H Mic Holder w/Built-in Charger
SWC70CL-12: Stage clip for SW70-H
SWCPOWR-EXT: Charger extension cable (3 meters)
SWCPOWR: Plug-in charger for SW60/70 Series Transmitters
SWC4P-TA4: Standard Mini-XLR Connector

⚠ ALKALINE BATTERY CAUTION ⚠ Alkaline batteries must be one of following types:	NEDA: 14A	ANSI: 14A	IEC: LR14
— DO NOT USE RECHARGEABLE ALKALINE BATTERIES —			

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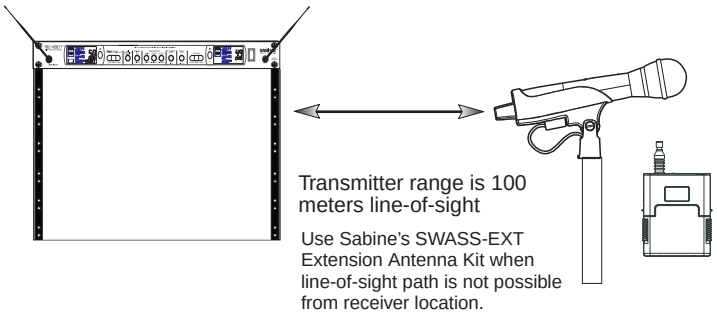
(for a complete list see the Sabine Catalog)

3. QUICK SETUPS

3.1. Receiver & Transmitter Quick Setup

*Please read **Section Four Transmitter Operation** and **Section Five Receiver Operation** for a complete understanding of how to set up your Sabine Smart Spectrum True Mobility™ System.*

1 **Selecting RF Channels:** It is best **to keep the system's channels close together at the low or high end of the spectrum**, i.e. channels 1, 2, 3, 4, 5 or channels 65, 66, 67, 68 (31, 32, 33, 34 on SWM6000 series). If there is another 915 MHz or 2.4 GHz source in the room, grouping the channels reduces the chances of an overlap. Do not start by spreading your channels throughout the full channel range of the system – you are more likely to encounter interference this way.

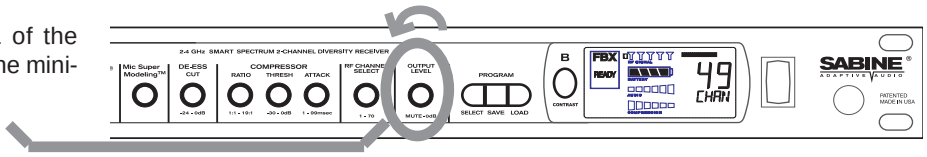


Transmitter range is 100 meters line-of-sight

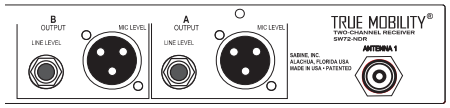
Use Sabine's SWASS-EXT Extension Antenna Kit when line-of-sight path is not possible from receiver location.

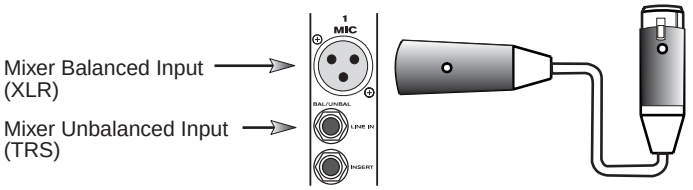
Be sure that all transmitters are off. Position receiver so that the antennas are within visual range of the intended transmitter locations. Transmitter range is about 100 meters, but structural objects in the transmission path can reduce that range. For best results, maintain a line-of-sight path between receiver antennas and transmitters (see Section 12). Use the **TNC Rear-to-Front Kit** (SWA700) included with the receiver to move antennas to front if necessary. See Appendix B for more information on multiple-system connection.

2 Turn the OUTPUT LEVEL of the receiver and mixer gain to the minimum settings.



3 Connect the output (¼-inch or XLR jack) of your receiver to the mic or line input of your mixer or amplifier (the receiver output gain can be adjusted to match the mixer input).

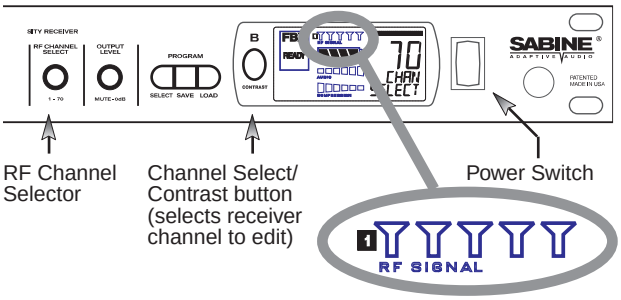




4

1. Turn on the receiver.
2. Tap the **Channel Select/Contrast button** to edit a receiver channel. (Not necessary on 1-channel SW71-R & SW61-R receivers).
3. Turn the **RF Channel Selector knob** to the desired channel.

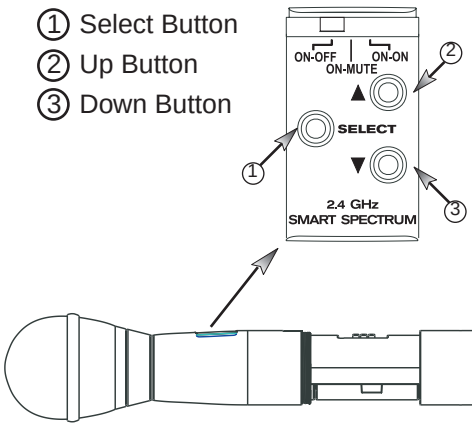
NOTE: Dual channel receivers will not allow you to select the same RF channel for both channels.



NOTE: Front panel RF Signal display will only register Sabine transmitters. It will not show RF interference. Use the RF Scan function in the software to scan for potential RF interference.

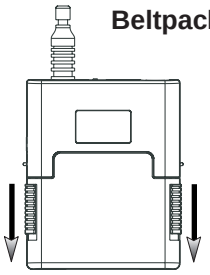
Transmitter Controls

① Select Button
② Up Button
③ Down Button



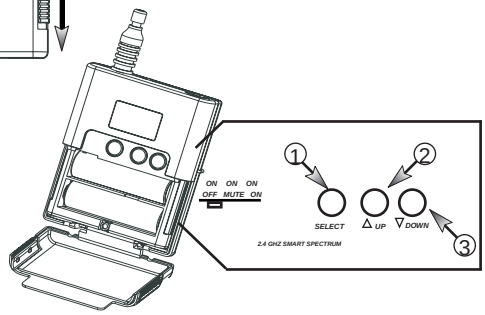
To Open: Unscrew lower portion of microphone. Pull down as you continue to turn the housing.
To Close: Turn the housing and push up until it meets the threads, then screw on.

Beltpack Opening/Closing Instructions



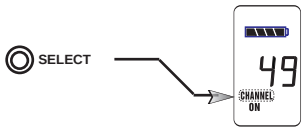
To Open: Pull down on both battery door releases and then pull door open.

To Close: Push door up and snap closed.

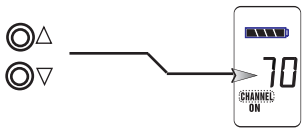


5

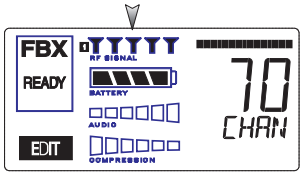
1. Turn on the transmitter.
2. Use the **SELECT** button until **CHANNEL** appears in the LED. NOTE: the transmitter is **muted during editing**.



3. Use the **UP** or **DOWN** button until the desired channel appears above **CHANNEL**.



4. Check that the receiver's **RF SIGNAL** display now indicates a strong signal (at least 3 bars).



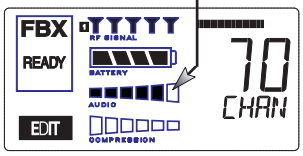
6

Gain Adjustment Settings

1. Transmitter (PAD Adjustment). *Adjust the Transmitter PAD setting if last segment of the Transmitter or Receiver Audio Level Meter lights up often, or remains on when mic or beltpack is used.*

1. Use the **Transmitter Select** button to scroll through functions until **PAD** flashes in the Transmitter LCD.
2. Use the **Up** or **Down** buttons to select the desired setting. Selection is stored after 3 seconds of inactivity.
3. Check to see if **Audio Level Meter** stays out of **Clipping Zone**

Adjust PAD setting so that Receiver Audio Level Meter stays out of the clipping zone (last segment)



2. Receiver. Adjust the receiver **Output Level** to supply a strong input level to the mixer, amplifier or active loudspeaker. If your receiver output is connected to a microphone level input on the mixer, keep the receiver output gain lower than when connecting to a line level mixer input. NOTE: -10 is a good place to start.

3. Mixer. Adjust the output gain of the mixer so that the mixer output meters approach clipping when all the inputs to the mixer are active, and the audio program reaches its peak level.

4. Amplifier/active loudspeaker/crossover. Finally, adjust the amplifier gain control (and/or crossover gain, if one is used) to provide the desired level of sound pressure in the auditorium or listening area.

See Section **4.2.3 Adjusting Transmitter Settings** for more information.

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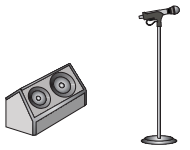
3.2. FBX Quick Setup



1 Place microphone and speakers in primary position.

2 Press and hold the **SETUP button** (Fig. 3d) on the receiver until the LCD **SETUP indicator** (Fig. 3e) flashes 4 times and SETUP stays lit — then release it.

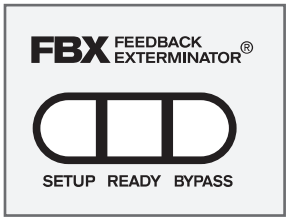


Fig. 3d - FBX: SETUP

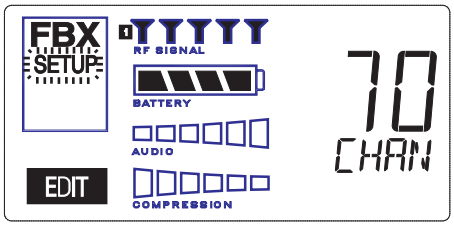
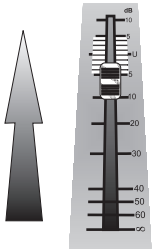


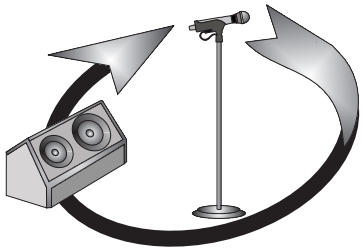
Fig. 3e - SETUP indicator flashing

3 **NOTE: DO NOT TALK INTO YOUR SYSTEM while in Setup Mode.**

Slowly raise the gain on the mixer or amp until FBX eliminates the first few feedback tones. With each new feedback frequency, you will hear a short, quiet burst of feedback that will disappear immediately as a filter is set.



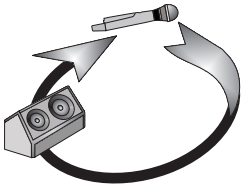
Mixer Channel



Location #1

4 Pause raising the gain, and move the microphone to another area where it will be used. Resume slowly raising the mixer gain, until FBX eliminates a few more feedback tones.

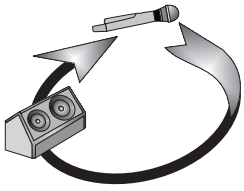
NOTE: When choosing microphone setup locations, try to anticipate likely areas where the microphone will be positioned or moved to, or areas that may be especially prone to feedback problems (e.g., under an overhead speaker).



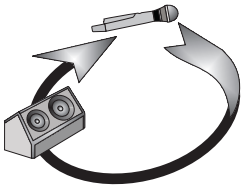
Location #2

5 Repeat until the **SETUP** indicator automatically turns off and the **READY** indicator comes on.

NOTE: You may quit **SETUP** mode at any time prior to its automatic exit by simply pressing the **READY** button. This will enable ready-to-operate status, but with fewer fixed FBX filters in place. In the default factory setting, dynamic FBX filters will still be held in reserve to catch and eliminate new feedback, regardless of how or when SETUP mode is exited. (See **Section 14.3.2** for details on the differences between fixed and dynamic FBX filters and **Section 13.4.2.1** for instructions on changing the balance of fixed versus dynamic FBX filters using the Remote Control Software or **Appendix D** for using the Dip Switches on the back of the receiver).



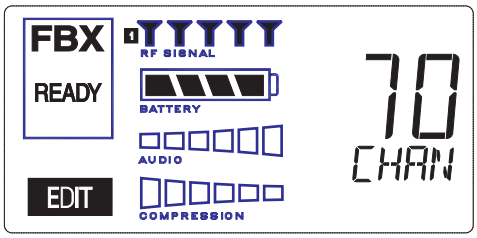
Location #3



Location #4
(if necessary)

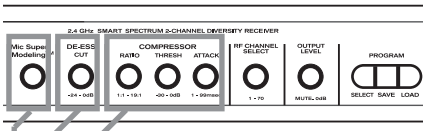
3.2.2. FBX Bypass

The **BYPASS button** (Fig. 3d) bypasses only the FBX filters, and not the additional signal processing (de-essing, compression and Mic SuperModeling™) available on the True Mobility™ Wireless Receiver. This is a useful button that allows comparison of the sound quality when FBX filters are in place, to the sound with no filters (the quality should be very similar). **Before pressing BYPASS, take care to reduce your overall system gain so that you do not release suppressed feedback!**



FBX BYPASS CAUTION

Bypassing FBX filters may allow suppressed feedback to be released!



COMPRESSOR/LIMITER

Vocal Settings

RATIO A soft voice could be set to 2:1, whereas a loud voice might require a ratio setting of 6:1.

THRESH The higher the threshold setting, the more signal is required to initiate compression. Ideally this should be set to reign in peak levels, and allow signals of lower gain to pass uncompressed. Threshold settings will depend on the nature and variety of the signal source.

ATTACK Short attack times usually work well for voice. However, too strong a compression ratio, too low a threshold, and too fast an attack may attenuate speech consonants, which provide important intelligibility cues to the audience, thus compromising clarity.

Guitar Settings

RATIO A high compression ratio (with gain makeup) will add sustain to held notes and chords.

THRESH Moving the threshold will change the audible thick/thinness of the guitar tone, but generally you want to compress all the notes played.

ATTACK Be wary of too quick an attack, which may reduce the percussive attack of the guitar notes.

In general, be wary of too much gain makeup, and too high a compression ratio, which may make a noisy guitar amplifier more objectionable. Ratio settings might range from 6 to 19:1, threshold variable, slower attack, soft knee, output gain boosted slightly to significantly depending on amount of compression.

Bass Guitar Settings

RATIO Set to 4:1

THRESH Set to compress peaks only.

ATTACK Quick attack, medium release, hard knee; (try various release settings, depending on the speed of notes played).

GAIN Output boosted slightly.

Vocals

RATIO

THRESH

ATTACK

Short attack is better for vocals. Be careful not to over attenuate speech consonants.

Guitar

RATIO

THRESH

ATTACK

Be wary of too quick an attack, which may reduce the percussive attack of the guitar notes.

DE-ESSER

DE-ESSER

MIC SUPERMODELING™

MIC SUPERMODELING

Scroll through available microphone settings. See website for additional downloadable microphones.

NOTE: Mic SuperModeling™ is not available using beltpack transmitters.

NOTE: ***Use these settings as a place from which to start, then adjust to your own satisfaction.***

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3.3. Tips for Good RF Performance

- It is best **to keep the system's channels close together at the low or high end of the spectrum**, i.e. channels 1, 2, 3, 4, 5 or channels 65, 66, 67, 68 (31, 32, 33, 34 on the SWM6000 series). If there are other 2.4 GHz or 915 MHz sources in the room, grouping the channels reduces the chances of overlap. Do not start by spreading your channels throughout the full channel range of the system -- you are more likely to encounter interference this way.
- Avoid potential sources of RF interference by performing a scan using Sabine's Remote Control Software., which will reveal the ambient RF level in your area on each channel of your system. Please refer to Section 13.4.2.5. for information on the RF Scan function, which will automatically determine the best RF channels to use.
- If you cannot perform a scan then proceed to use your system, beginning with Channel 1. If you hear any RF "hits" or dropouts, then move to another of the available channels. If you have multiple mics keep all your channels grouped together.
- For best results, maintain line-of-sight from transmitter to receiver. Use either front or rear panel antenna mounting to maintain line-of-sight.
- Mount receiver antennas at 90 degrees to one another, leaning away at 45 degree angles, in the same plane.
- When using multiple receivers, try to maintain at least 1 foot (30 cm) distance between antennas from different units. When such antenna spacing proves difficult or impossible, we recommend using Sabine's SWA6SS Antenna Distribution Amplifier. The SWA6SS works with up to six receivers, or 12 channels.
- Maximize the distance between the receiver and light sources, such as fluorescent bulbs or neon signs, which may emit very short-range, broadband interference.
- Maximize the distance between transmitters and receivers and potential sources of RF interference.
- Maintain a minimum distance of at least 3 meters (10 feet) between transmitters and receivers or extension antennas. This can solve many anomalies.
- Turn on your system one component at a time, beginning with the first receiver.
- Be careful not to set more than one transmitter to the same channel; each paired transmitter and receiver should be set to unique corresponding channels, until all channels are receiving clearly and cleanly.

Antenna Placement Caution

As a general precaution, keep 2.4 GHz or 900 MHz 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 transmitters.

3.4. Common Sources of RF Interference

- **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 at left.
- **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 at left.

- **2.4 GHz or 900 MHz 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 at left.
- **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 at left.

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

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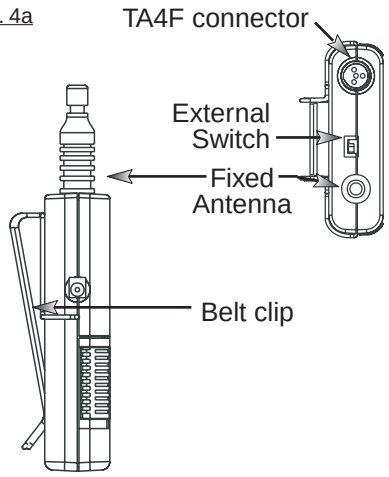
Fig. 4a



4. TRANSMITTER OPERATION

4.1. First step

Before you begin, let's look at a few basics regarding your transmitters. The handheld mic is ready to go — the microphone and transmitter are combined in one unit. To use the belt pack transmitter, however, you will have to connect a lavalier or headworn microphone (or instrument pickup) to its input. Sabine lavalier and headworn mics, and Sabine's guitar/instrument connector (SW70G-TA4) come equipped with the proper TA4F connector, and are ready to plug right in. Be sure to line up the pins properly — do not force the connector into the belt pack.

If you are using a different microphone with the Sabine belt pack, please refer to the **Appendix A** for the required wiring plan. Failure to use the proper wiring scheme may damage your mic or the belt pack, and void your warranty.

Use the clip on the back of the belt pack transmitter to attach it to your belt or clothing. The spring clip can be removed and reversed, to allow the transmitter and antenna to point either up or down in its clipped-on position. You can also remove the clip if you choose to keep the transmitter in your pocket. NOTE: it is essential that transmitters retain a line-of-sight relationship with the receiver antennas.

4.2. Displays and Settings

Your Sabine Smart Spectrum handheld microphone and belt pack transmitter have many powerful features, all of which are easily monitored (using the transmitter LCD display) and adjusted. The controls and displays for both handheld and belt pack transmitters are almost identical in function, though positioning differs (compare figures 4b & 4c). The LCD display and one control switch are located on the exterior of the transmitters. A more powerful set of recessed controls is located under the hinged access panel, to prevent accidental or inappropriate alteration of settings.

4.2.1. LCD Display

When the transmitter is first turned on, it shows an initial test screen (Fig. 4f), followed by the default screen (Fig. 4g). The LCD also reverts to this default display within a few seconds after any programming changes are made with the recessed controls. The default LCD display always shows transmission channel, audio level, and battery voltage level; additional information will appear to indicate important changes caused either by user adjustments, or automatically as transmitter status changes.

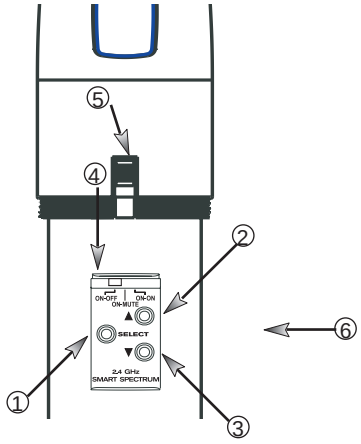


Fig. 4b SW-H series Handheld Control Setting Buttons

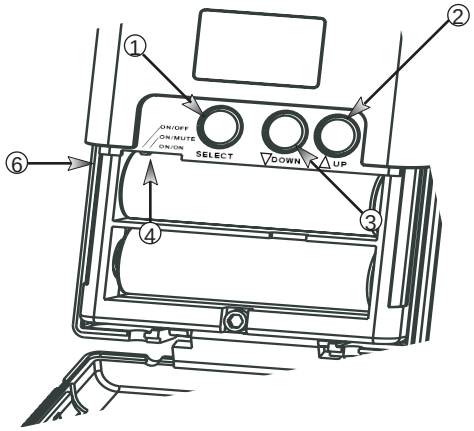


Fig. 4c SW65 & 75-T Transmitter Control Setting Buttons

1. Select Button
2. Up Button
3. Down Button
4. Programmable Control of External Switch
5. External Switch
6. Recessed control and battery compartments

4.2.2. Accessing Transmitter Controls

Control of all your transmitter functions is made using the **Select** button and the **Up/Down** buttons. These control buttons are located inside the access compartment on the beltpack or handheld transmitters.

Opening the Beltpack Transmitter Access Compartment:

1. Using your thumb and forefinger, grab both tabs and simultaneously pull down toward the bottom of the beltpack. This releases the locks.
2. Gently pull the door open.

Closing the Beltpack Transmitter Access Compartment:

3. Swing the door back up and close it by firmly pushing the top part of the door in until you hear the locks click.

Opening the Handheld Transmitter Access Compartment:

1. Unscrew lower portion of the case. Continue turning as you pull down.

Closing the Handheld Transmitter Access Compartment:

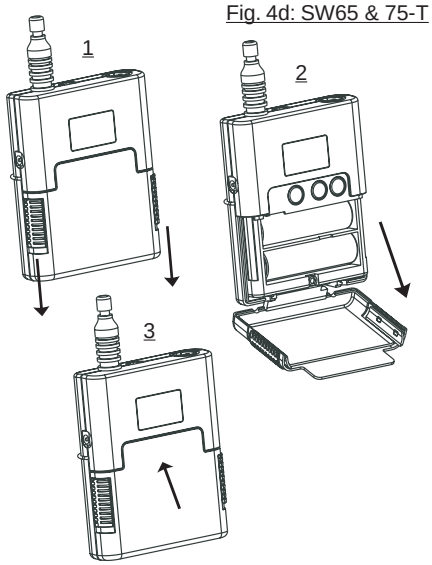
2. Begin by turning the lower portion of the case as you push up. When threads meet screw on until snug.

NOTE: Do NOT attempt to unscrew the mic capsule from the body. This will void your warranty!

BEFORE CHANGING BATTERY

Turn off transmitter before changing battery(s).

Fig. 4d: SW65 & 75-T



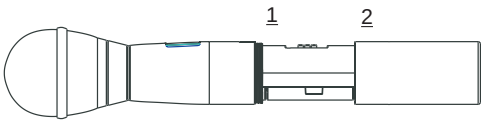
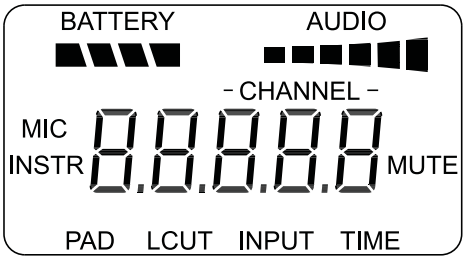


Fig. 4e: SW60 and 70-H

Transmitter LCD Display Indicators

SW-H Series



SW65 & 75-T

Fig. 4f: Start up Transmitter LCD displays

CHARGE: Illuminates when the transmitter battery is being charged (i.e., when the charger is connected, either by direct plug-in or by placing the handheld mic in the Sabine charging clip).

BATTERY VOLTAGE LEVEL METER: Indicates measured battery voltage; the more segments illuminated, the higher the voltage, and the greater the remaining battery life.

AUDIO LEVEL METER: Shows the audio output level of the transmitter (affected by the pad setting).The last and largest segment indicates clipping.

PARAMETER VALUE: In default mode this indicates the RF TRANSMISSION CHANNEL chosen for the transmitter. In conjunction with the Select button (see figures 4b & 4c), this field will also display battery run-time hours, or when a low frequency roll-off filter or an attenuation (pad) is active (see Fig. 4g).

"**TIME**": Displays when battery run-time hours are being displayed.

"**MUTE**": Indicates output is currently muted.

"**PAD**": Illuminates when the microphone pad is turned on. Use this if the audio meter shows clipping.

"MIC" INSTR": Indicates SW65 & 75-T beltpack (only) is set to accept either mic or intrument input.

"**ON**": Illuminates when either the audio and RF transmission, or the RF transmission only, are turned on. (SW-H Series only)

"**CHANNEL**": Illuminates in default mode to display transmission channel.

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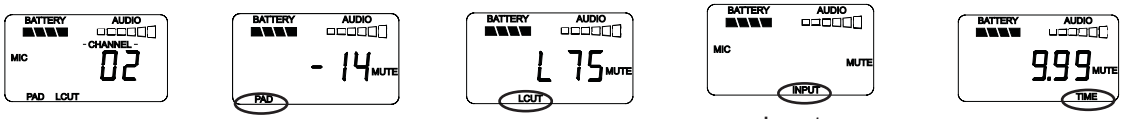
Transmitter LCD Display Cycle

Pressing the Parameter Select button cycles the LCD through each of the editable functions on the transmitter. Individual screens appear for approximately 4 seconds, during which the function is editable. The LCD for the SW65 & 75-T is shown. The LCD for the SW-H Series displays the same information in a different layout. See the previous page for a comparative look at both LCDs.



Channel Select | PAD Select | Low Cut | Input Select *(SW75-T only)* | Battery Run-Time Display

Fig. 4g

Handheld Microphone PAD Settings

Your new Sabine wireless handheld microphone is designed to accept a wide range of input levels, from spoken word all the way up to screaming vocals. In order to accommodate this broad range of inputs, the transmitter has a PAD setting. Handheld mics are set to a factory default of -14 dB, which is the preferred setting for concert vocal performance.
If you need more output out of a microphone (the receiver LCD audio meter shows the mic output level) then change the PAD settings as described below. When any level of attenuation is programmed, the default screen will illuminate PAD.

Transmitter PAD Adjustment
(See Fig. 4b, 4f & 4g)

1. Use the Transmitter Select button to scroll through functions until PAD flashes in the Transmitter LCD.
2. Use the Up or Down buttons to select the desired setting. Selection is stored after 3 seconds of inactivity.
3. Check to see if the receiver's Audio Level Meter stays out of the Clipping Zone.

Suggested PAD Settings

Venue	PAD
Speech	0 dB
Loud speech & vocal performance	-6 dB
Strong vocal performance (default)	-14 dB
Very strong vocal performance	-20 dB

Programmable External Switch

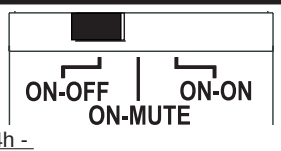


Fig. 4h - Programmable Control of External Switch

4.2.3. Adjusting Transmitter Settings

DEFAULT/CHANNEL: Press the Select button to enter Edit Mode, and repeat until the CHANNEL indicator flashes. In this mode, the Up/Down buttons will adjust Transmission Channel.

INPUT: (SW65 & 75-T Beltpack Transmitter only) Either "MIC" or "INSTR" for microphone or instrument. You are required to choose the input in order to program both the transmitter and the receiver to optimize the input settings. Choosing MIC automatically selects the 75 Hz roll-off filter. You can choose to remove that but the extended low frequency response of the SW65 & 75-T may reproduce too much low energy for your system, so beware. Choosing INSTR automatically removes the 75 Hz roll off filter for that added bottom end in your instruments. NOTE: You can manually change that filter setting as needed.

NOTE

Electric Guitar/Bass & FBX: For best results, when using the SW65 & 75-T Beltpack Transmitter for **electric guitar** or **bass**, put your receiver's FBX Feedback Exterminator into **BYPASS** mode. FBX **BYPASS** is accessible via the receiver front panel or Remote Software control.

NOTE

Guitar Cord Simulator *(Beltpack Transmitter Only)*
This feature allows you to fine tune the sound of your instrument while it is patched into your Sabine wireless beltpack. For instructions please refer to page 22.

PAD: Transmitter PAD setting. Press the Select button until the PAD indicator flashes. The Up/Down buttons will adjust attenuation (**SW-H Series**) 0, -6, -14, -20 dB; **SW65 & 75-T**: 0, -3, -6, -10, -14, -17, -20, -23, -26, -30, -34, -37, -40 dB). When any level of attenuation is programmed, the default screen will illuminate PAD. See margin notes on this page and p.15 for settings instructions.

TIME: Battery Run-Time Hours. Selecting this option changes the display to indicate the length of power-on time (hours and minutes) since the last battery change or recharge.

NOTE: Battery run-time hours will reset when the transmitter (with battery in place) is connected to a charger. In the case of the charger, run-time hours will not start again until the charger is disconnected. You can manually reset the run-time hours by pressing both the up and down arrows. Use this to count hours when you use alkaline batteries.

LOW FREQUENCY ROLL-OFF: Selecting this option adds a 12 dB/octave low frequency roll-off filter, starting at 75 Hz, to the audio output of the transmitter. A roll-off filter may help reduce microphone handling noise, or other unwanted low frequency content. Pressing the Up or Down button toggles between the conditions of no filter (indicated in the display as L 0) or low roll-off (indicated by L 75).

INTERNAL CONTROL OF EXTERNAL SWITCH: The recessed controls include a 3-position switch, which in turn determines how the transmitter's external two-position switch behaves (see figures 4a, 4b & 4h). From left-to-right, the 3 positions of the internal switch correspond to the following external switch operations:

1. **ON/OFF**. In internal position #1, the external switch acts as a typical on/off switch. Use this setting if you trust the microphone user to switch the microphone on and off as needed, and/or wish to conserve transmitter battery life during down times. In the ON position the transmitter LCD will display ON. Both audio and RF are on. In the OFF position the LCD ON is no longer illuminated. Both RF and audio are off, and the battery run-time hours meter is off. Note that Sabine's squelch system prevents any "popping" when switching the transmitter on and off. However, this protection causes a very short "power-on" delay in the reactivation of the audio when the external switch is turned from OFF to ON.
2. **ON/MUTE.** In internal position #2, the external switch acts as a typical mute switch. Use this setting if you trust the microphone user to switch the microphone audio output on and off as needed; it will not conserve battery life in MUTE condition, but will allow the receiver to monitor and display the RF signal strength in either switch position. In the on position the default LCD will display ON. Both audio and RF are on. In the off position the word MUTE is displayed in the LCD. The audio is muted but the transmitter is still transmitting the RF signal, and the battery run-time meter is running. There are no audible pops when switching the transmitter between MUTE and ON. Switching from MUTE to ON will instantaneously pass audio signal (there will be NO delay as with internal position #1).
3. **ON/ON.** In internal position #3, the external switch is disabled. The transmitter (both RF and audio) is always on, and the word ON is always displayed in the transmitter LCD screen. Use this setting if you do not want to allow the speaker or performer to turn off the transmitter, or are worried that a transmitter may be accidentally turned off. Caution: When your program is over we suggest you move this switch to another setting so you can turn off the transmitter and save your battery. You may also elect to remove the battery (though replacing the same one will restart the run-time meter and affect its accuracy accordingly).

Once you have completed the transmitter setup, you are ready to work with your receiver (see Section 5). First, however, let's talk about the issues and solutions concerning the source of transmitter power: the battery.

4.2.4. Transmitter Battery Management

4.2.4.1. Battery problems and Sabine solutions

Rechargeable Battery memory. Batteries that are repeatedly recharged prior to a complete discharge may fail more quickly in subsequent uses. This problem is usually referred to as "battery memory." Fortunately, Sabine's innovative Tireless Wireless™ Charger takes steps to avoid this problem, by automatically reconditioning the battery whenever its intelligent diagnostics determine this is appropriate. Sabine's Tireless Wireless™ Charger will insure maximum life per battery charge, and also prolong the useful multiple-charge life span of rechargeable batteries.

Battery life. Both handheld and beltpack transmitters can work with disposable alkaline, disposable heavy-duty (manganese dioxide-carbon zinc), or rechargeable Nickel Metal Hydride (NiMH) batteries. We specifically caution against using NiCad rechargeables due to well-known battery memory problems, and specifically recommend using the Sabine-supplied SWBAA2 (AA for the H1 Series handhelds and beltpack) batteries. The rechargeable SWBAA2 batteries will last about 8 hours per recharge (typically, alkaline AA batteries will last about 10 hours). NOTE: Heavy-duty batteries will fall somewhere in the middle, between rechargeables and alkalines.

Beltpack Transmitter PAD Settings

The SW65 & 75-T beltpack transmitter has a broad range of PAD settings, which allow you to use it with almost any microphone or instrument. As in all audio equipment, the setting of the input level is crucial to achieving the best sound quality. Setting minimal PAD levels (-3, -6, or -10 dB) may produce a distorted sound if you are using a high output microphone or instrument. Conversely, setting a more extreme PAD level (-40, -37, or -34 dB) may require you to raise your system gain unnecessarily, resulting in a noisier output. Watch the input meter on either the transmitter or the receiver (see illustrations) and set your level so there are at least three indicators illuminated for normal program level, with an occasional move to the fourth indicator. The fifth and biggest indicator denotes clipping – watch out! If you see clipping, choose a lower pad setting (for example, from -10 to -14 dB).

Transmitter PAD Adjustment

(See Fig. 4c, 4f & 4g)

1. Use the Transmitter Select button to scroll through functions until PAD flashes in the Transmitter LCD.
2. Use the Up or Down buttons to select the desired setting. Selection is stored after 3 seconds of inactivity.
3. Check to see if the receiver's Audio Level Meter stays out of the Clipping Zone.

Suggested PAD Settings

Venue	PAD
Low output microphones	-10 dB
Standard mics; acoustic instruments with low-gain pickups	-17 dB
Electric guitars with low-gain pickups & mics with higher gain	-23 dB
Most standard electric guitars	-26 to -34 dB
Instruments with high-gain pre-amps	-37 dB

See the Transmitter Quick Guide that came with your transmitter for a complete look at the suggested pad settings. Default pad setting is -30 for SW65 & 75-T.

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IMPORTANT BATTERY INFORMATION

Acceptable Batteries for use with Handheld & Beltpack Transmitters

SW70-H1, SW65- & 75-T Transmitters

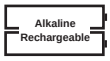
2 "AA" size (14.5x50.5mm)

- **NiMH Rechargeable (Sabine part #: SWBAA2)**
- **Alkaline: NEDA 14A - ANSI 14A - IEC LR14**
- **Heavy Duty batteries (NOT recommended)**

Alkaline batteries must be one of following types:

NEDA: 14A ANSI: 14A IEC: LR14

WARNING! DO NOT USE Alkaline Rechargeable Batteries



Alkaline "AA" Rechargeable Batteries

FIRST-TIME BATTERY CHARGING

Your Sabine True Mobility® transmitter comes with one or more rechargeable NiMH batteries. **For best results, charge the battery for at least 8 hours before using it for the first time.** Please note that the full charging potential of the battery will be achieved after the first 5 charging cycles have been completed.

NiMH rechargeable batteries are highly resistant to "memory effect," which affects some other rechargeable batteries. The included NiMH batteries will provide more lifetime charges and longer battery life for each charge than many other rechargeable batteries.

BEFORE CHANGING BATTERY

Turn off transmitter before changing battery(s).

Sabine rechargeable battery advantages. Here are several more good reasons why you can feel more confident about using rechargeable batteries:

1. All transmitters report two types of battery status information. The first report is the all-important voltage the battery is supplying. Second, you'll know how long the battery has been in use (battery run time hours). Each receiver channel also receives telemetry information from its associated transmitter, regarding the battery voltage, and displays the information in the receiver LCD (see figure 5b). When the voltage reaches a level indicating an estimated 30 remaining minutes of useful battery life, both transmitter and receiver automatically flash warnings in their LCD displays. As an alternative means of anticipating battery depletion, you can check the number of hours of use, by checking the transmitter LCD display (see Section 4.2.2 and figure 4g), or the Remote Control Software.
2. The handheld microphone clip that we provide with each handheld transmitter not only holds the microphone — it also can double as an unobtrusive charger housing. Anytime the mic is parked in the clip (and the clip is connected to the charger power supply), the mic is being charged. As an additional safety margin against battery failure, the mic placed in the powered clip gets its power from the charger, not the battery, so it will work perfectly even if the battery is completely dead.
3. Sabine's intelligent charger circuitry detects the type of battery in place within the battery compartment, and automatically turns off the charger if the battery is not compatible with the charger.
4. The Tireless Wireless™ Charger detects when a battery is fully charged, and turns off the charging cycle.
5. The Tireless Wireless™ Charger prevents futile attempts to resuscitate dead batteries — if the battery is unresponsive, the charging cycle is stopped.
6. Beltpack and handheld batteries can be recharged without removing them from the transmitters. Just connect charger plug to the transmitter jack (see Fig. 4l).

NOTE: In the "most discharged" battery condition, a full recharge may take up 8 to 12 hours depending on the mA value of the AA batteries used with the handheld and beltpack transmitter. The charging system will charge a batteries with a mA value of up to 2500. When in doubt, charge the batteries overnight. Sabine's battery-protection circuit will shut the charger down when charging is completed.

4.2.4.2. Charging Your Batteries

Equipment Connections. Each SW65- & 75-T or SW-H Series transmitter comes equipped with an SWC-POWR Tireless Wireless™ plug-in charger (see Fig. 4l). In addition, each SW-H comes with its own battery-charging mic clip (SWC70-CL). The SWC-POWR charger can be plugged directly into either the transmitter or into the clip. A Sabine rechargeable battery (SWBC1) will charge whenever the mic clip is connected to the Sabine SWC-POWR charger and the handheld is properly placed within the mic clip.

Charging Indicators. Much like your cell phone, the transmitters will let you know the charging status of the battery. When the battery is charging, the battery meter will flash to indicate the relative level of the charge — one, two, three or four elements will flash (see Fig. 4i).

Once the battery is fully charged, all four elements in the battery meter will flash. This indicates that the charging circuit is no longer on (see Fig. 4j).

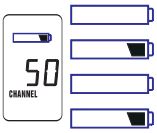
NOTE: The right-side indicator segment will flash for several minutes when charging is first attempted (see Fig. 4h). The lower the battery level, the longer this initial "testing/not charging" flashing sequence will continue. During this time, the Tireless Wireless battery circuit is evaluating the suitability and charge status of the battery in place. When it has completed its evaluation, it will either commence the progressive flashing depicted in figure 4i (CHARGING), or continue to flash (TESTING/NOT CHARGING). All segments flashing in unison signifies that the battery is fully charged (see Fig. 4j).

These same indications will also be displayed on the receiver LCD, and on the Remote Control Software screen.

NOTE: The Tireless Wireless battery charger will only charge NiMH rechargeable batteries. If you place any other kind of battery in the transmitter, and then attempt to charge it by connecting the charger, the Tireless Wireless circuit will detect the type of battery and will not begin charging. Again, the battery indicator on the transmitter will flash the right-side element indicating testing/no charging (see Fig. 4h).

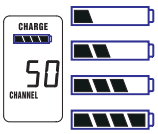
Battery Warnings. When the transmitter battery voltage drops below a critical threshold, the battery icon (which normally displays the voltage level) will begin to flash. This will occur on the transmitter and receiver and is an indication that you need to replace the battery, or charge it by placing the handheld mic in the charger clip. NOTE: Microphone will still transmit audio when placed in clip. Alternatively, you can connect the charger directly to the transmitter using the built-in charger jack located on the side of the beltpack transmitter and near the antenna on the handheld transmitter (see Fig. 4l). If the battery is not changed or recharged, the transmitter will eventually turn off (see Fig. 4k).

Fig. 4h: ***TESTING/NOT CHARGING***



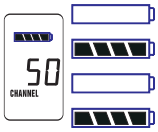
Right-side battery indicator segment will flash to indicate that the battery is being tested. This occurs prior to charging a NiMH battery and whenever a non-rechargeable battery is placed on charge. Charging is not occuring when indicator lights in this fashion.

Fig. 4i: ***CHARGING***



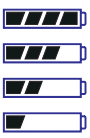
Battery indicator segments will flash progressively starting from the relative charge state of the battery. This example depicts a fully discharged battery being charged. As the charge progresses, left-side segments will remain visible as right side segments continue to flash, until all segments are visible. At that point, all segments will flash on and off in unison (see Fig. 4j).

Fig. 4j: ***FULL CHARGE***



Battery indicator segments will flash in unison to indicate that the battery is fully charged.
NOTE: Battery can be left connected to the charger and will receive periodic maintenance charging.

Fig. 4k: ***Battery CHARGE LEVEL displays***



Fully Charged
Partially Used
Very Used
Very Low (Flashing)

NOTE: When the battery has reached a specific discharge level, the transmitter will automatically turn off, and the transmitter LCD will display the message at right.

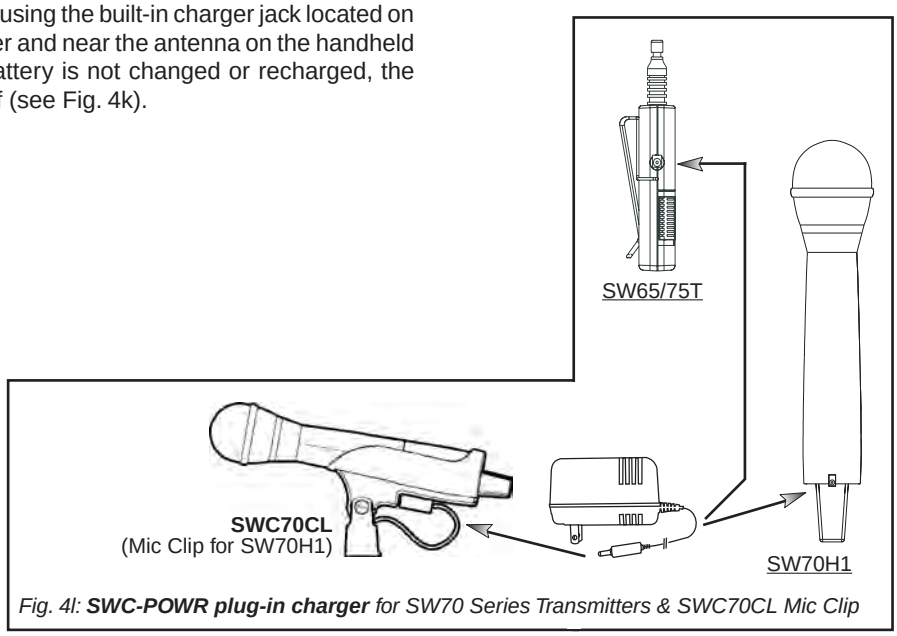


Fig. 4l: ***SWC-POWR plug-in charger*** *for SW70 Series Transmitters & SWC70CL Mic Clip*

LIT-SWM6-7000-OG-EN-090317.indd - rr

5. RECEIVER OPERATION

5.1. LCD Display.

The receiver LCD display is shown below (Fig. 5b). Two-channel receivers feature two LCDs, one for each channel. The display provides a snapshot report of the condition of your wireless channel, including battery status information sent from the transmitter by telemetry.

The right two-thirds of the display primarily shows status information regarding the condition of your receiver channel, as follows:

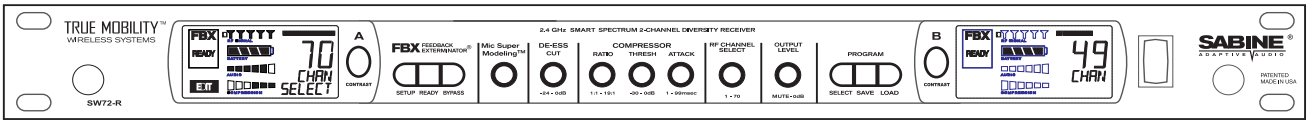


Fig. 5a: SW72-R (SW62-R) front panel

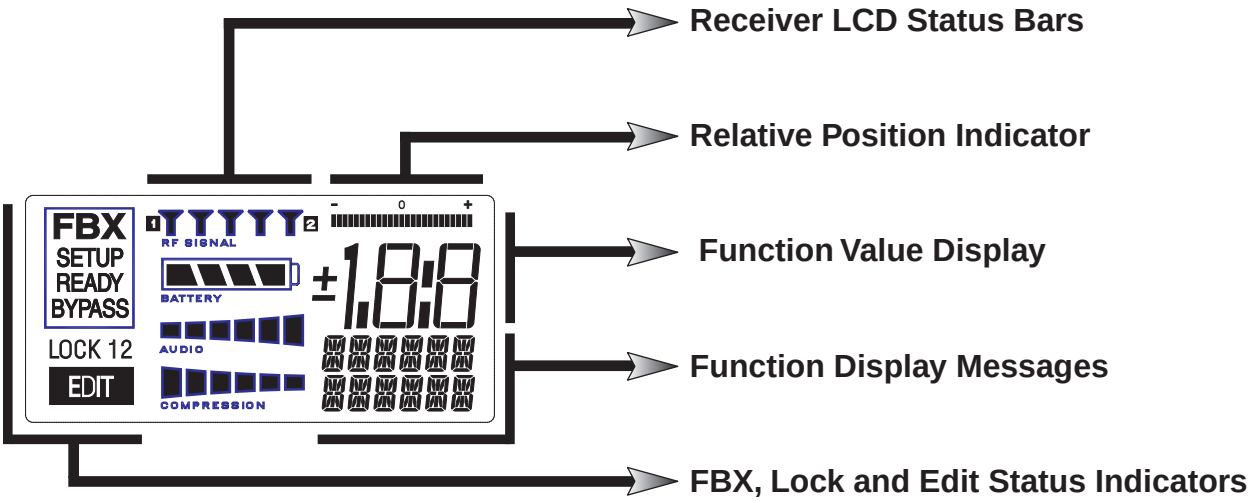
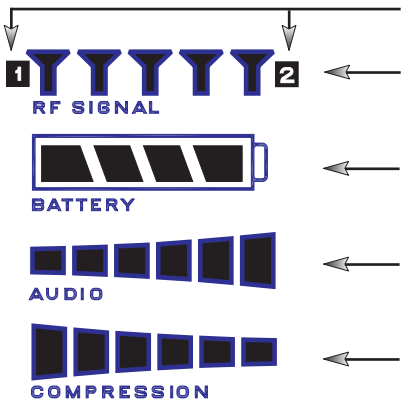


Fig. 5b: Receiver LCD Compete Display

Receiver LCD Status Bars



Diversity Status: Either 1 or 2 is lit, showing the active antenna.

RF Signal Strength Indicator: Indicates presence of RF (from transmitter, or external sources) on the chosen reception channel. The greater the number of illuminated icons, the stronger the RF signal detected.

Battery Voltage Level Meter: Indicates the battery voltage of the corresponding transmitter; the more segments are illuminated, the higher the voltage, and the greater the remaining battery life.

Audio Level Meter: Shows the audio input level (received audio signal).

Compression Meter: Shows the active gain reduction applied to the receiver channel's audio output.

Function Display Messages

Firmware Version: Displays for 2 seconds on power up; shows the receiver firmware version.

Transmitter Battery Low: You have 15 minutes or less to change transmitter batteries.

Mute: Transmitter muted; the transmitter on/off switch is set to mute.

Front Panel Locked: Front Panel is locked and the selected function cannot be edited. See Appendix D for an explanation of front panel locking.

De-Esser: The De-Esser is actively reducing sibilance.

FBX, Lock and Edit Status Indicators

FBX Status: SETUP is illuminated while the receiver is in SETUP MODE. READY is the normal operational mode, indicating SETUP has been performed and FBX filters are active. BYPASS indicates the audio signal is NOT going through FBX filters (but all other DSP processing is active).

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.

Edit Status: In a 2-channel receiver, this field illuminates when the corresponding Channel Button is pushed, indicating Controls are assigned to this channel.

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5.2. Parameter Control & LCD Display

5.2.1. One set of Controls for 1 or 2 Channels

Whether you have a one- or two-channel SWM6 or 7000 series receiver is apparent by the number of LCD displays on the front panel. However, only one set of control knobs is provided for either one- or two-channel receivers. Note that in a 2-channel receiver, this set of controls is shared, and assigned to a channel by pushing either the A or B **Channel Select button** (see Section 5.2.2). Your receiver uses Sabine's Tweek-n-Peek™ digital control system. Whenever you turn a control knob one click, the associated function is shown on two lines of text display in the LCD. The large numeric display will indicate the current parameter value. Additional turns/clicks change the parameter setting and display the value as the change is made. After a few seconds of inactivity, the LCD will revert to its default display (RF channel).

Sabine's Tweek-n-Peek™

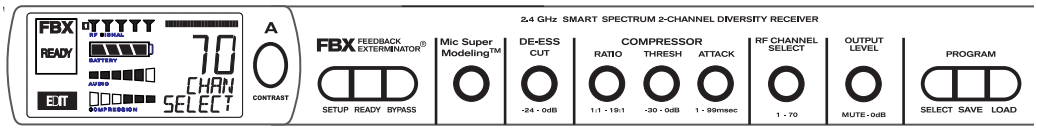


Fig. 5c Sabine Tweek-n-Peek

Whenever you turn a control knob one click, the name of the corresponding function is shown and the current edit setting is displayed on the LCD. This applies for all the front panel knobs.

For example, if you turn the Compressor ratio knob one click, you will see the current compression ratio in the Settings Display. The Text display will show COMP on the first line and RATIO on the second. Subsequent turns will edit that setting up or down, depending on the direction you turn the knob.

Since the control knobs are continuous rotary encoders with no end points, the Relative Position Indicator (RPI) is a handy way of seeing where you are in relation to the full range of the knob in question. In our compressor Ratio example, if you are at a ratio of 9:1, about the middle of the range, the RPI will display about one half of the bar. **NOTE:** The setting range of each control is printed on the front panel below each knob.

5.2.2. Channel Select / Contrast Button.

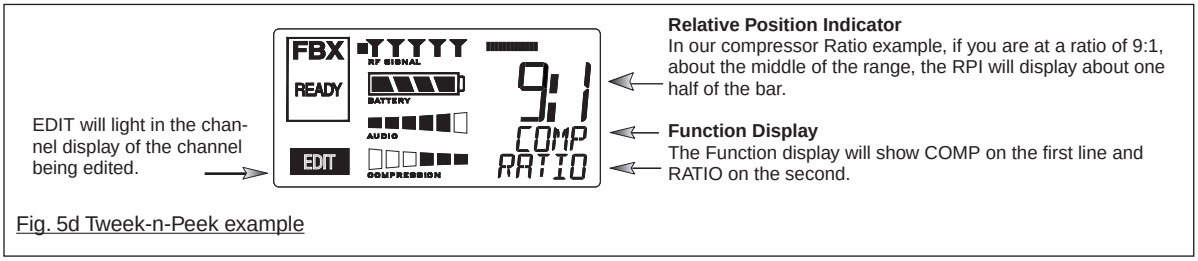


Fig. 5d Tweek-n-Peek example

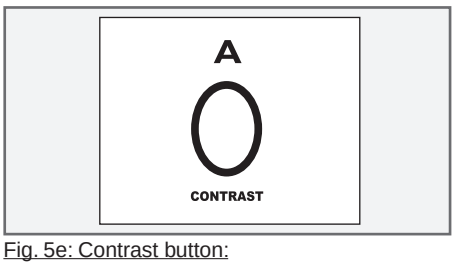


Fig. 5e: Contrast button:

Tap to select which channel to control

Hold to adjust contrast and viewing angle. Range of value is 1 - 30, 15 is default.

The elliptical button immediately adjacent to the LCD has multiple functions. First, it adjusts the LCD contrast and viewing angle. Change the degree of angle by pressing and holding the button down. The adjustment range will cycle in a continuously reversing loop — when it gets to the maximum value it reverses and begins to decrease in value. You can stop holding the button down and initiate single button pushes to advance (or decrease) the contrast setting incrementally.

In addition, the Contrast/Channel Select button has another function, in 2-channel receivers only (SWM62 or 72-R or SWM62 or 72-NDR). Such units feature two LCDs and two Contrast/Channel Select buttons. A single (without continuing pressure) push assigns all Parameter Control knobs to the selected channel. The button will light, the associated LCD will brighten, and the word EDIT will appear in the lower left of the LCD, all indicating the active edit channel. For the active channel, turning any Parameter Control knob will first display (one click) and then adjust (subsequent turns) the settings of the function selected, indicating the changes in the Settings Display. For the inactive channel, turning any Parameter Control knob will display the current setting in that channel's Settings Display. **The channel must be activated in order to change settings.**

5.2.3. Special LCD Display Messages.

In addition to the Status and programmable information discussed above, the text lines of the LCD Settings Display may also (under certain circumstances) automatically override other displays. The conditions when this will occur and the messages displayed are shown on page 19.

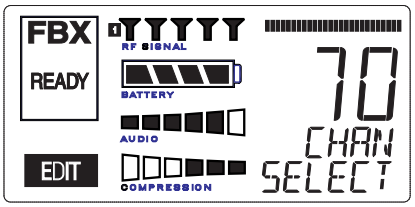


Fig. 5f

5.3. RF Channel Select

Range = 1 to 70 (SWM7000) or 1 to 34 (SWM6000) Choose the RF channel for this system. The transmitter must have the same channel selected. Turn the **RF CHANNEL SELECT** knob until the desired channel is displayed on the LCD. See chart (Appendix E) for exact frequency of each channel.

NOTE: Dual channel receivers will not allow you to select the same RF channel for both channels.

NOTE: Front panel RF Signal display will only register Sabine transmitters. It will not show RF interference. Use the RF Scan function in the software to scan for potential RF interference (see Section 13.4.2.5).

5.4. Output Level

Range = MUTE to 0 dB Adjust the output level to match the input characteristics of the downstream component. Each tick of the output level knob adjusts the level by ½ dB. The LCD displays this in 1 dB resolution, so it takes two ticks of the knob to change the output level value on the LCD.

The output level varies from microphone level to line level, so if you are patching the receiver to the mic level input of a mixer, turn down the level to avoid overdriving the mixer input. Minus 15 dB is a good place to start. If you are patching into a line level device, turn up the receiver output. For best results, follow the golden rule of gain structure: maximize gain at early stages in the signal path, to minimize noise that will be accumulated and amplified by adding late-stage gain.

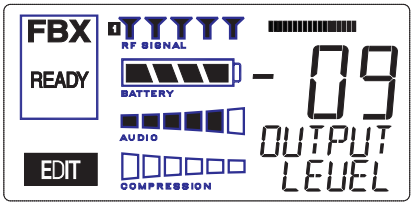


Fig. 5g

5.5. Channel Mixing

Your SWM Series two-channel receiver now has the ability to mix the A and B outputs. In Channel Mixing mode both the A channel audio and the B channel audio are mixed together, and are available on both the A and B outputs.This is an advantage for several applications:

EXAMPLE: *Guitarists who wish to have a spare guitar ready to go without re-patching the output of the receiver to their pedal board or other processors*. All you have to do is turn the transmitter off for one guitar and turn on the other. The audio is sent out through the same output of the receiver.

EXAMPLE: *Sound techs who wish to use more mics than they have channels for on their mixer.* For example, you may have a mixer with only 8 inputs, but you really need 12 mics for a show. You can combine the outputs of several pairs of Sabine wireless mics and the show can go on without buying a new mixer.

You maintain separate control over all channel functions except output level. Output levels are the same for both channels when in Channel Mixing mode, and the ouput values appear on the A channel LCD.

5.5.1. How to Toggle Channel Mixing Mode

Press and hold both the A and B Channel Select buttons (the blue buttons) at the same time. After a moment both buttons will be lit. This is your indication that you are in Channel Mix mode. To go back to the standard mode, press and hold the A and B channel select buttons again until the backlight of one of the buttons turns off.

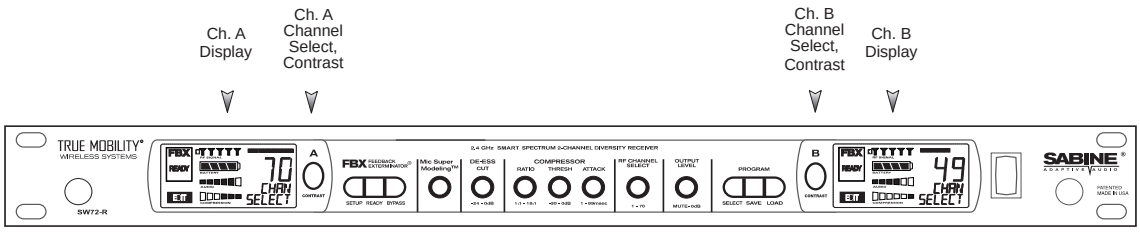
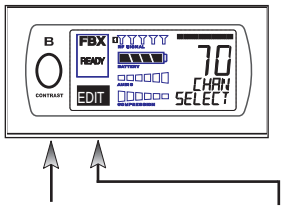


Fig. 5h



Channel Select/Contrast button (selects receiver channel to edit)

EDIT

Fig. 5i

Fig. 5j

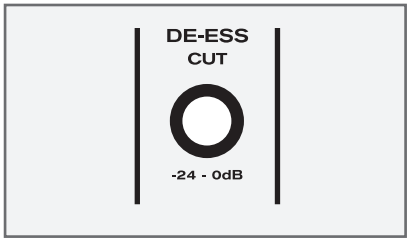


Fig. 5k

5.5.2. Controlling the Receiver in Channel Mixing Mode

All functions are individually controllable for each channel when in Channel Mix mode, except the output level, which is shared. Normally the active channel for control is displayed in three ways: the blue button for that channel lights up, the LCD gets brighter, and the word EDIT is shown. Use the Channel Select buttons to choose the channel you wish to control.

In Channel Mix mode you still use the Channel Select buttons to choose the channel to control, but you will only see one of these three indicators. The word EDIT will be shown in the LCD of the channel selected for control. Look carefully – this is your only indication of which channel you are controlling

5.6. Guitar Cord Simulator *(Beltpack Transmitter Only)*

This feature allows you to fine tune the sound of your instrument while it is patched into your Sabine wireless beltpack. The wireless sounds of guitars or basses can be very different from the direct (patched with a cord) sounds. Your Sabine wireless solves this problem by using a unique broadcast scheme that gives full 20 to 20KHz frequency response. This results in a much fuller sounding instrument (the bass response is finally there on a wireless!), and sometimes a brighter sound, too.

How can this be? Your guitar cable can actually reduce your high frequency response. We are all quite used to this slight rolling off of the high end, but the Sabine wireless does not roll off, so your instrument may sound brighter then ever before.

Here's where the Cord Simulator can help. Turn on your beltpack transmitter and put it in GUI mode. To select GUI mode, open the beltpack, push the select button a few times until you see the MIC or GUI display. Use the up/down button to choose GUI. (See the Beltpack Quick Guide for detailed instructions). The De-Esser knob on your receiver becomes your Cord Simulator knob. Turn the knob counter-clockwise until your instrument sounds like it does when patched direct.

The Cord Simulator replaces the De-Esser function only when a beltpack transmitter is turned on and set to GUI mode.

5.7. Receiver Antenna Placement

One of the biggest potential problems in any wireless system is RF interference. Understanding wave interference patterns will help you to place and orient your receivers and antennas properly, and thereby reduce the likelihood of RF interference.

Your receiver ships with two standard coaxial bipole antennas. Each antenna picks up in a donut-shaped (toroidal) pattern, more or less equally in all directions, with null points directly above and below.

5.7.1. Multi-path Interference

Like sound waves, radio waves are subject to wave interference patterns produced by reflected or delayed waves combining with direct, unreflected waves, converging upon a receiving antenna simultaneously. In the RF world this phenomenon is called **multi-path interference**. As with audio comb filtering, radio waves can combine additively or subtractively. Thus, mounting an antenna close to a reflective surface can result in poor reception. For example, if weaker than expected reception occurs, and the receptive part of the antenna (the top 3 cm) is close to a reflective surface (wall, large metal objects, etc.), you might improve reception simply by repositioning, or re-aiming, the antennas.

In some situations — for example, those with difficult lines-of-sight, or when transmitters and receivers are separated by a wall, or when receiver placement options are limited — an extension antenna may be necessary to guarantee reliable reception. Please refer to Section 12 for information about the advantages and use of Sabine's SWASS-EXT Extension Antenna Kit.

5.7.2. Receiver & Antenna Placement Tips

1. **When possible, maintain line of sight from transmitter to receiver.** Consider the potential range of transmitter "roaming," and locate your receiver accordingly. If direct line of sight proves impossible or difficult, consider using Sabine's low-profile, active Extension Antenna Kit (SWASS-

EXT), which boosts the signal strength, extends the maximum distance from transmitter to receiver, expands and focuses antenna sensitivity, and allows antenna and receiver to be positioned further apart or in separate rooms.

2. **Decide on front or rear panel antenna mounting (to maintain line-of-sight path).** Antennas typically mount on the rear panel of your receiver, but the included accessory SWA700 front mounting kit can be screwed onto the front and connected via jumper to the back panel terminals. When mounting receivers in a rack that is deeper than the receiver, move the antennas to the front for improved reception. For any rack mounted receiver, try to keep the top 1.25 " (3 cm) of both antennas extended outside the sides of the rack (see Fig. 5h). Non-rack mounted receivers should be oriented so that the antennas face the transmitters.
3. **Maximize the distance between the receiver and light sources,** such as fluorescent bulbs or neon signs, which may emit very short-range, broadband interference. These light sources should not be a problem in normal circumstances, but, as a cautionary preventative, we recommend a minimum distance of 3 meters (10 feet) between them and any receivers or extension antennas.
4. **Note the placement of any microwave ovens in the immediate vicinity**. Place any receivers or extension antennas as far away as is practical from microwave ovens.
5. **Mount receiver antennas at 90 degrees to one another,** leaning away at 45 degree angles, in the same plane. This will decrease the likelihood that one antenna will be susceptible to the same orientation-specific directional or multi-path problems that may affect the other one.
6. **When using multiple receivers, try to maintain at least 1 foot (30 cm) distance between antennas from different units.** If you are rack-mounting multiple receivers, you may want to avoid spacing them in adjacent rack spaces, to maintain distance between antennas. When such antenna spacing proves difficult or impossible, we recommend using Sabine's Antenna Distribution Amplifier (Sabine SWA6SS), which can help manage antenna configurations and, more importantly, improve system-wide interference rejection. The SWA6SS works with up to six receivers.
7. In very rare instances, **poorly shielded or malfunctioning computers or digital effects units may cause RF interference.** You can test whether such units are the sources of such interference by switching them off one at a time, and determining if interference rejection improves.
8. **Turn on your system one component at a time, beginning with the first receiver.** If you don't have a computer handy, keep all other receivers and transmitters switched off for the time being.
9. **Use the RF Scan function included in the Remote Control Software.** This will give you a picture of the potential interference in your area, both real-time and over time. Please refer to Section 13.4.2.5. for information on Sabine Remote Control Software's Automatic RF Scan function, which will automatically determine the best RF channels to use.
10. **Maintain a minimum distance of at least 3 meters (10 feet) between transmitters and receivers or extension antennas.** This can solve many anomalies.
11. **Be careful not to set more than one transmitter to the same channel**; each paired transmitter and receiver should be set to unique corresponding channels, until all channels are receiving clearly and cleanly.
12. **Once the physical placement of your receiver(s) and antenna(s) is decided**, proceed with the remainder of the setup process.

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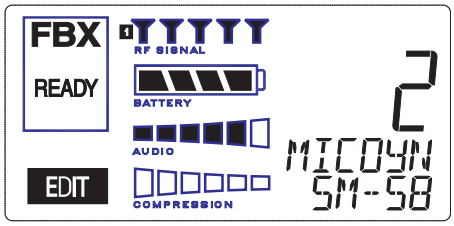

Fig. 6a

6. MIC SUPERMODELING™

6.1. Introduction

Microphones come in a dazzling variety of shapes, sizes, polar patterns, frequency response curves, phase response curves, etc. Few things arouse as much passion amongst audio engineers as discussions about what microphone to use in a given application. Sound rental companies and recording studios proudly tout their impressive microphone collections, and singers frequently favor a certain brand and model number as "perfect for my voice."

The only viable "please everyone" strategy is to stock a wide assortment of microphones. This is far easier for wired microphones than for wireless. Changing a wired microphone is as simple as disconnecting one mic and connecting an alternative — the same cable and same microphone stand allows easy interchangeability. At worst you might have to exchange microphone clips along with the microphones themselves.

For wireless microphones, however, the situation is not so simple. With different transmission frequencies, different proprietary designs, different types of connectors (microphone to belt pack transmitter), and the matched-set nature of transmitters and receivers, changing a microphone/transmitter is far more complex.

Sabine has a better idea — Sabine's proprietary Microphone SuperModeling™. With digital technology, it's possible to start with the sonic signature of a high quality microphone (such as Sabine's standard condenser and dynamic capsules used in our handheld series systems), and emulate the characteristics of other popular microphones—all at the twist of a knob. You won't have to change microphones, cables, connections, or receivers, interrupt a performance, or even get up from your mixing chair! Best of all, you will have an instant answer to a variety of demands from singers and speakers for their favorite microphone — even if they pass the microphone around.

6.2. Emulation Choices

Each Sabine receiver comes equipped with 7 different SuperModel microphones available per channel. Four of these (Shure SM-58, Shure Beta 58, Audio Technica ATM 41A, and AKG D-3800)* are designed for use with either of Sabine's dynamic handheld microphone/transmitters (SW60 or 70-H13 and H15). The remaining three (Shure Beta 87A, AKG C535EB, and Audio Technica ATM 89R)* are designed for use with Sabine's condenser handheld microphone/transmitter (SW60 or 70-H19). In addition to these SuperModeling choices, you may prefer to use Sabine's high quality microphones "just the way they are;" i.e., without emulation.

Telemetry information sent by the handheld transmitter to the corresponding receiver (or receiver channel for a 2-channel unit) identifies the type of transmitter, and loads the appropriate emulation library. Note that beltpack transmitters also send telemetry that turns off the Super Model option, as this feature is designed to work only with handheld microphone/transmitters.

6.3. Mic Modeling Front Panel Control

Simply turn the parameter control labeled "Mic SuperModeling™" to scroll through and select the microphone you wish to emulate. The first click of the knob will show the current setting, without changing it; additional turns will change the emulation that is active. The top text line of the Settings Display will read either MICDYN (dynamic) or MICCON (condenser) depending on the telemetry information sent by the handheld; the bottom line will display the microphone being emulated. Note that one choice is to bypass modeling, and simply utilize the excellent quality of the Sabine microphone capsules. In this case the bottom text line will simply read OFF. Finally, whenever telemetry information indicates that a belt pack transmitter is the RF source, or if a handheld transmitter is replaced by a belt pack with the same receiver (or some such other unpredictable event transpires), the Settings Display will read MICMOD/OFF whenever the Mic Modeling knob is turned.

Sabine Mic SuperModeling™

SuperModeling™ Dynamic Models*:

- Shure SM-58
- Shure Beta-58A
- AKG D-3800
- Audio-Technica ATM 41a

SuperModeling™ Condenser Models*:

- Shure Beta 87A
- AKG C535 EB
- Audio-Technica ATM 89R
- Crown CM200A

*****_Company names, product names, and trademarks listed as modeled 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._

There are no modeling settings for lavalier or headset microphones — mic placement makes these an unrealistic choice for modeling. NOTE: other lavalier microphones can be used with the Sabine Beltpack Transmitter.

NOTE

A very short crossfade of the audio signal occurs when switching between mic models. This ensures no digital artifacts will occur when you change the sound of the mic.

6.4. Future Microphone Modeling Choices

When Sabine adds to the library of "virtual microphones" that are modeled by the receiver DSP, these will be made available as a firmware upgrade from the Sabine web site, www.Sabine.com.

6.4.1. Mic Model Upgrade Instructions

New Mic SuperModeling™ "virtual microphones" can be downloaded easily using the remote control software on your PC. NOTE: The Mic SuperModeling Update Wizard **can be accessed only from the initial software startup menu** (prior to connecting to a receiver or entering Demo/Edit Mode). If you have already connected and attempt to access the Upgrade Wizard, the message box at right will appear (Fig. 6b):

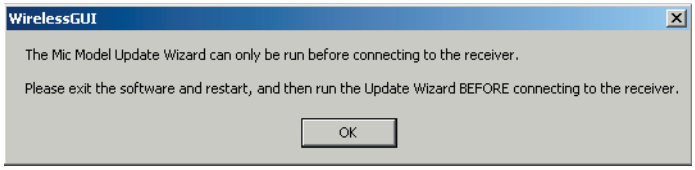

Fig. 6b

To download new mic models:

1. With your PC connected to the Internet, pull down the Sabine Online menu in the software menu bar and select "Add New Mic Models."
2. Click the "Download Mic Models from Sabine" and follow the dialog box instructions.
3. The last dialog box will allow you to either connect to a receiver and update the mic models on that receiver, or cancel and complete the upgrade process at a later date. Note that this dialog box will show the actual file path of the new mic model file.

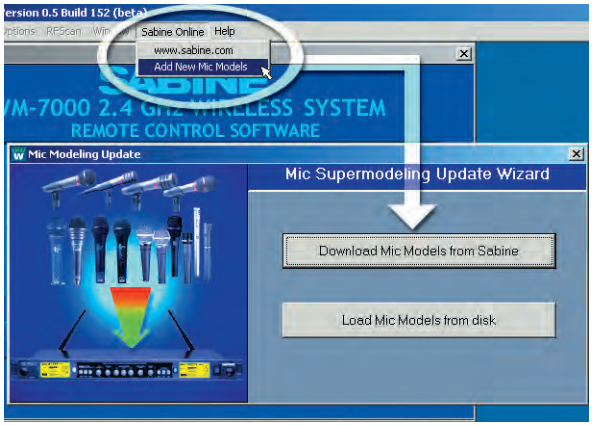

Fig 6c

Upgrading from a disk or previously downloaded files:

Mic SuperModeling™ files already downloaded can be flashed into your receiver using the second option "Load Mic Models from disk." Clicking this button opens a dialog box (default directory is your "Sabine" directory).

NOTE: File name will always be "micmodels.smm" **and will include all mic models available up to the date the file was downloaded.**

NOTE

Mic SuperModeling™ is not available using beltpack transmitters.

CHANGING CAPSULES

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.

See **Appendix G** for instructions on how to reset your transmitter after changing capsules

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7. FBX FEEDBACK EXTERMINATOR®

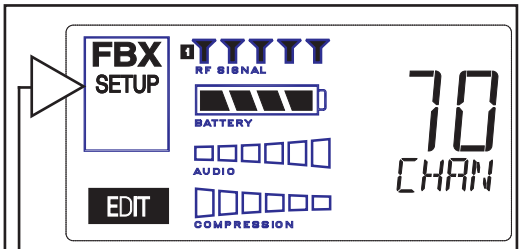

Fig. 7a

SETUP Indicator

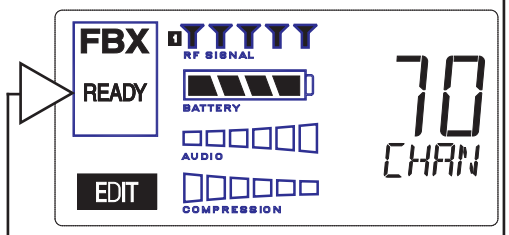

Fig. 7b: READY Indicator

NOTE: make sure READY is displayed before using your system for a performance.

7.1. FBX Introduction

There are two types of FBX filters, 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.

7.1.1. FBX Fixed Filters

Fixed filters are set automatically during the FBX SETUP and will not change frequency until manually reset.

7.1.2. FBX Dynamic Filters

Dynamic FBX filters also set automatically, but can change frequency, on a rotating basis, as the need arises.

7.1.3. Balancing Fixed & Dynamic Filters

Each channel of your receiver offers a total of 10 FBX filters (combined fixed and dynamic), which can be used as needed to exterminate feedback. The default setting of 7 Fixed and 3 Dynamic can be changed to 8 Fixed and 2 Dynamic using the DIP switches 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, 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.

7.1.4. 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 Mobility® 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.

FBX SETUP NOTE

LCD "READY" Flashing

As you get close to the end of the setup procedure, READY will begin to flash on the LCD. **Stop raising the gain!** The FBX will now go into Ready Mode.

7.2. FBX Set Up

Follow these easy steps to obtain the maximum gain and protection from feedback. Sabine FBX employs a very fast and quiet setup mode to make it easy to use.

1. Place the speakers in the positions where they will be used during the program.
2. If there is any equipment with a noise gate in the signal path, you MUST DISENGAGE the noise gate(s) prior to the setup procedure. You may reengage these noise gates upon conclusion of your FBX setup.
3. Patch your Sabine receiver into the mixer or amp channel. Set the amp master output gain to a normal operating position.

   NOTE: The level of your power amplifier should be set to a level that allows a healthy gain structure prior to the amplifier. If your amplifier is turned up

fully, and your mixer meters show little movement when signal passes through, then your amplifier will have to work harder to process the weak signal. You will improve the performance of your sound system and lower system noise by reducing the gain on your power amp and increasing your mixer gain. FBX response time will also be better with proper gain structure.

4. First, turn on your receiver and select a clear channel (no RF Signal bars showing). Then turn on your wireless transmitter or handheld microphone and select the same channel, Now turn on the mixer (gain low), then any other accessories, and finally the power amp. If you are using a graphic EQ, adjust only for the desired tonal qualities, but **do not notch for feedback!**
5. With the microphone turned on, raise the Output Level of the receiver slowly until a strong input signal at the mixer is apparent. The microphone should now be audible.
6. Now you are ready to set FBX filters. Press and hold SETUP (far left button) on the wireless receiver, until the word SETUP in the channel LCD flashes 4 times, then stops flashing. This will clear any FBX filters already in place. NOTE: You should do this each time you move your sound system, change a sound system component, or relocate your microphone. Your Sabine True Mobility Wireless System will remember its settings from the last time you turned the unit off.
7. During Setup mode, do not talk into the microphone or pass audio program through a transmitter. This may cause the Sabine True Mobility™ system to set inappropriate filters. The only appropriate use of the setup mode is to create and filter feedback. SETUP must be exited prior to normal microphone usage. This happens automatically after setting FBX filters, or you may exit manually by pressing READY at any time.
8. Identify the primary usage positions, and likely feedback-prone locations, in the potential movement range of the wireless microphone. Take the microphone to the first of these locations.

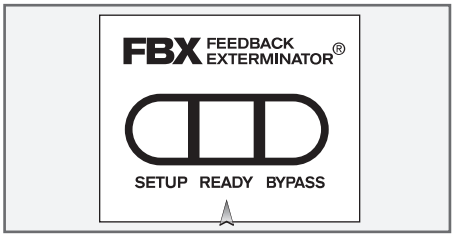

Fig. 7c: READY Button

Tech Tip

READY & Locked Fixed

READY = Lock Fixed on other Sabine FBX products

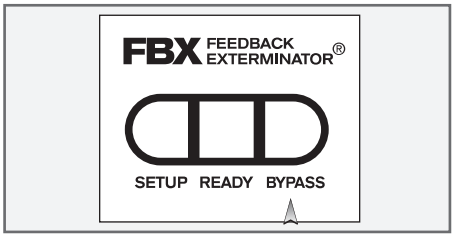

Fig. 7d:BYPASS Button

9. Slowly raise the mixer channel gain to the point of feedback — and then slowly beyond, until you hear the chirping tones of feedback quickly being eliminated by FBX filters setting. Stop raising gain after 2 or 3 feedback tones have chirped and corresponding FBX filters have set. Rest assured that any feedback that occurs will be at a quiet volume, and very short in duration.
10. Move the microphone to another area of use and slowly raise gain until FBX eliminates a few more feedback tones (2 or 3). Repeat this step until the word Setup automatically disappears and the word READY appears. This indicates your unit is ready for operation. The total number of filters available for feedback filtering is 10; in the factory default setting, your unit will automatically enter READY mode when the eighth filter is set. Alternatively, you may enter READY status with fewer fixed FBX filters in place, simply by pressing the READY button at any time. NOTE: Be sure that the word READY appears in the FBX section of your receiver LCD during performance or any normal operation.

    Any feedback that occurs after setup will be eliminated by dynamic filters, which remain in reserve to catch surprise feedback if it occurs during performance/operation.

    In most instances you will experience an additional gain of 6-9 dB before feedback when using the Sabine True MobilityTM System. Precise results will depend on system and acoustical considerations.

    All fixed filters in place will remain set until the Setup button is pushed and held as described in step 6. All dynamic filters will remain in place until new feedback occurs (when they will move to the new frequency), or until the Setup button is pushed and held. Your True Mobility receiver will remember its FBX (and all other) settings even if the power is turned off. See Section 14 for a complete discussion of Sabine FBX Feedback Exterminators®.

7.2. FBX Bypass Button

The Bypass button bypasses only the FBX Section, and not the additional signal processing (Parametric Filters, Hi/Lo Cut, De-essing and Compression) available in the Targeted Input Processing section of the Sabine True Mobility™ Wireless Receiver.

NOTE: You can easily bypass Compression signal processing by turning the Compressor Ratio knob counterclockwise until you get to 1:1 ratio, and the De-esser signal processing by turning the De-esser knob clockwise until you get to 0 cut.

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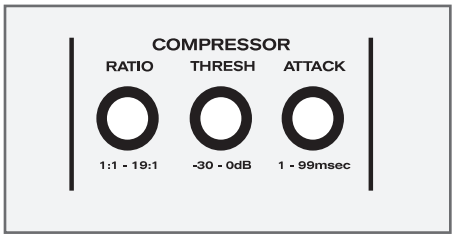
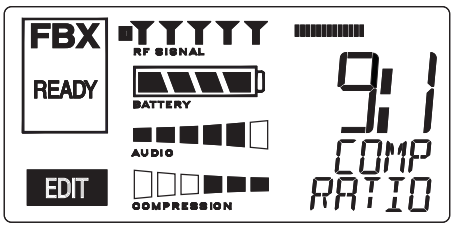




8. COMPRESSOR/LIMITER OPERATION

8.1. Basics of Compression

The dynamic range (how loud we can hear to how quiet a sound we can detect) of the human ear is far greater than the capability of sound systems to reproduce. Although some of this equipment limitation is at the upper extreme of the dynamic range (where too loud a signal will produce distortion), much of the restriction occurs at the low level end, where the signal disappears below the "noise floor" of the circuitry.

A compressor (or in its most powerful form, a limiter) is the most widely used tool for controlling dynamic range. In the simplest terms, a compressor is designed to squeeze the dynamic range of an audio program; i.e., to make quiet signals louder, and loud signals quieter. A compressor becomes a limiter when the compression ratio (the ratio of the input gain change to the output gain change) is so high that the output level effectively won't rise above a "brick wall" ceiling, regardless of how much the input gain increases (typically a ratio of 10:1 and greater).

A compressor acts like an "automatic mix engineer" with a hand on the fader and an inhumanly fast reaction time. When the input level increases, the "engineer" drops the fader; when the level decreases, the fader is raised. When the amount of fader compensation equals the variation in signal level, the output level of the audio program will sound consistent.

The practical benefits of compression and limiting include:

1. **Speaker protection.** A compressor will control sudden level peaks and prevent your speakers from damage. Most often in this type of application, the compression ratio is high enough to qualify as a limiter.
2. **Perceived increase in loudness.** Because compressed peak levels are kept from rising as high as uncompressed signals, you gain headroom for your audio program and can raise its overall average gain. Compression is often added to the entire audio mix, both in live sound and recording, to increase its perceived loudness.
3. **Achieving more consistent levels**. For expressive instruments or vocals, which may have a large dynamic range, compression can help maintain more consistent mix levels. So a speaker who varies from a whisper to a shout will not disappear or stand out in the mix, relative to other less dynamic instruments or vocals. Vocal level variations are also common when multiple users share a single microphone, due to differences in voice volumes and mic-to-mouth positions from one user to another. Compression will help even out such variations as well.

8.2. Using the Compressor

Compressor knobs are located immediately to the right of the FBX and De-Esser controls. The controls consist of standard Ratio, Thresh (threshold) and Attack knobs, and a horizontal gain ladder in the LED display shows compressor gain reduction.

Ratio: Compression ratio is the ratio of the input gain change to the output gain change. The compression ratio on your Sabine Wireless ranges from 1:1 to 19:1, in increments of 1 dB. Set Ratio to 1:1 to bypass Compressor.

Thresh: Compression threshold sets the input level at which the compressor/limiter begins to act on the signal. The input level threshold at which compression is engaged can be adjusted from -30 dBv to 0 dBv, in increments of 1 dBv.

Attack: Compressor attack time sets the speed with which signal compression begins once an input signal exceeds the threshold level. The range may be adjusted from 1 to 99 mS, in 1 mS increments.

Gain: (Output Level) Since the output gain is attenuated whenever the input gain exceeds the compression threshold, the overall output level of a compressed signal will be reduced. Commonly, this reduced output gain is compensated for by raising the level of the output signal (the term is "gain make-up"). Output Level range may be adjusted from mute (minus infinity) up to +20 dB, in increments of 1 dB (depending on input).

8.3. Suggested Compression Settings

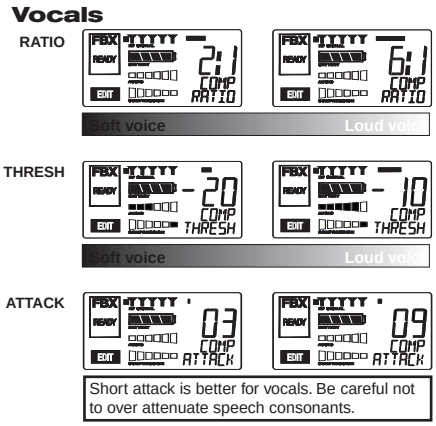
8.3.1. Vocal Settings

The renowned expressiveness of the human voice is due in large part to its dynamics. A vocal that varies from a whisper to a scream has a strong emotional impact, but those same dynamics present a challenge to the sound engineer. Ideal vocal compression maintains some dynamic range while keeping the vocal the focal point of the mix.

Ratio: A soft voice might require a ratio of 2:1, whereas a loud voice might require a ratio setting of 6:1.

Thresh: The higher the threshold setting, the more signal is required to initiate compression. Ideally this should be set to reign in peak levels, and allow signals of lower gain to pass uncompressed. Threshold settings will depend on the nature and variety of the signal source. Strong vocalists will require a different threshold than quiet speakers or singers.

Attack: Short attack times usually work well for voice. However, too strong a compression ratio, too low a threshold, and too fast an attack may attenuate speech consonants, which provide important intelligibility cues to the audience, thus compromising clarity.



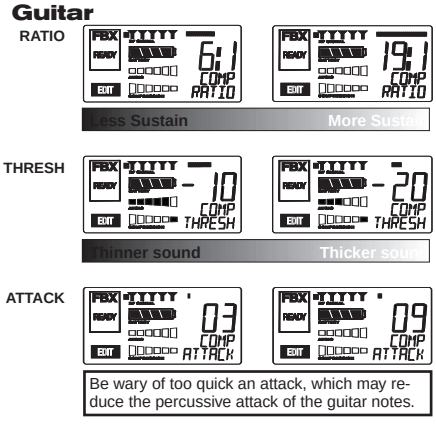
8.3.2. Guitar Settings

Ratio: A high compression ratio (with gain makeup) will add sustain to held notes and chords.

Thresh: Moving the threshold will change the audible thick/thinness of the guitar tone, but generally you want to compress all the notes played.

Attack: Be wary of too quick an attack, which may reduce the percussive attack of the guitar notes.

In general, be wary of too much gain makeup, and too high a compression ratio, which may make a noisy guitar amplifier more objectionable. Ratio settings might range from 6 to 20:1, threshold variable, slower attack, soft knee, output gain boosted slightly to significantly depending on amount of compression.



8.3.3. Bass Guitar Settings

Bass players use a variety of techniques, often in the same song, that can benefit from compression. Compressing bass evens out peaks and keeps the bass level in the mix.

Ratio: Set to 4:1

Thresh: Set to compress peaks only

Attack: Quick attack, medium release, hard knee (try various release settings, depending on the speed of notes played)

Gain: Output boosted slightly

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8.4. Possible Compression Trouble Areas

Like any signal processing, compression can be misused, and improper application may cause undesirable side effects in the audio signal. Some of these problems include:

1. **Noise.** If the threshold for compression is set too low, and the output gain is raised substantially to make up for the gain loss of compression, the resulting output signal can be noisy. This is because the overall signal must be raised significantly to produce the same audible level, and the noise floor of your equipment will be amplified unnecessarily. This problem will be exaggerated if the input signal level to the compressor is very low (which will already degrade the signal-to-noise ratio).
2. **Breathing**. In situations where the compression ratio is high, the threshold is low, and the release time of the compressor is short, the noise floor will modulate up and down as the audio signal rises above and falls below the threshold.
3. **Over-compression**. Applying too much compression to a mix can sometimes result in such evened-out dynamics that the "life" of the music or speech has been removed or curtailed. Dynamic variation may be a major component of a performer's message and command of the audience; don't remove dynamics, just control them. This may be particularly true for percussive musical instruments such as drums.

8.5. Release & Knee Settings

Two other important compressor variables are ***release time*** and ***knee***. Release time adjusts the speed with which compression stops and output gain returns to unity with input gain, once the input signal falls below the compression threshold. Knee refers to the degree with which the full ratio of compression is imposed once the input level threshold is approached and exceeded. A "hard knee" changes from no compression to maximum compression exactly and immediately at the threshold crossing; a "soft knee" gradually imposes the full compression ratio as the input gain approaches and exceeds the threshold. In Sabine products, the "softness" of a knee can vary from 1-40, with the higher level representing the "softest" character. In such a setting, slight compression will begin well below the compression threshold, increase as the input gain crosses the threshold, and reach full compression well above the nominal threshold.

Values for release time and knee are set at the factory: default release time is 250 mSec, and the default knee setting is a "soft" setting of 20. These defaults can be temporarily changed or reprogrammed using the Sabine True Mobility™ Remote Software (see Section 13 for details).

9. DE-ESSER

9.1. De-mystifying De-essers

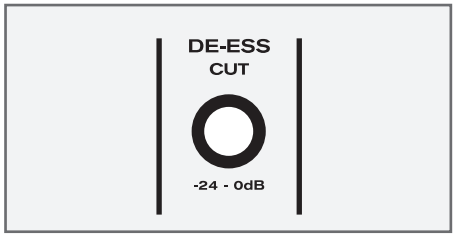
Certain consonant sounds produced by the human voice contain more energy than others, and have the potential to overload a microphone capsule. This can produce a disproportionately harsh result when amplified through a sound system, and/or recorded to analog or digital storage media. The most common and obvious of these sounds (in English and many languages) is the “ssss” sound, associated with pronunciation of both “s” and soft “c” consonants, also the consonants “t,” “f,” “x” and sometimes “d.” The technical term for this particular vocal sound is “sibilance,” and the devices that control such sounds are typically called “de-essers” (or sometimes sibilance controllers). The frequency range of sibilance will vary depending on the singer/speaker, the consonant involved, the orientation to the microphone, the microphone itself, and the normal variations in human vocalization. Cardioid- pattern condenser microphones are especially susceptible to sibilance problems, but the problem can also occur with other types and patterns of microphones. The range of frequencies affected by sibilance starts above 2 KHz, and generally tapers off above 10 KHz; in other words, sibilance is primarily a problem associated with higher frequencies (though not the upper octave of human hearing).

9.2. The Sabine De-esser

The Sabine De-esser is essentially a type of frequency-band compressor, active in the 2-10 KHz range, and inactive below 2KHz and above 10 KHz. Sabine’s algorithm works by dynamically comparing band-specific and associated harmonic energy levels to the total signal energy. When spikes are detected that correspond to sibilance, a shelving filter is imposed on the appropriate frequency bands, and remains in place only for the duration of the sibilance. High frequency energy levels that remain below the comparison threshold do not trigger de-essing, and lows and highs outside the sibilance range are also passed unprocessed and unaffected. This means the Sabine De-esser is effective but transparent.

9.3. Using the De-esser

Using the Sabine De-esser is simplicity itself. Turning the knob labeled “DE-ESS CUT” counterclockwise will increase the amount of sibilance reduction, by increasing the maximum depth of the shelving filter. The maximum allowable cut is 24 dB.



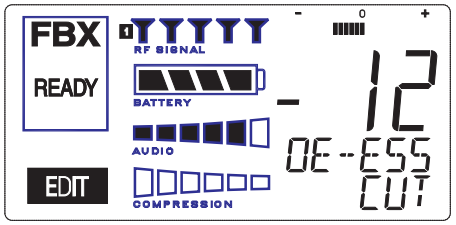


Fig. 9a: De-esser

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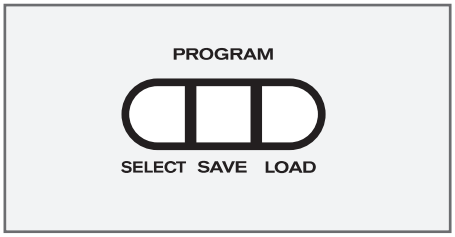

Fig. 10a: Program Front Panel Buttons

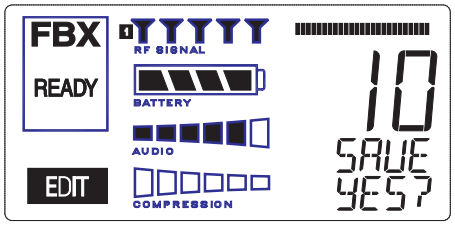

Fig. 10b: Program SAVE YES?

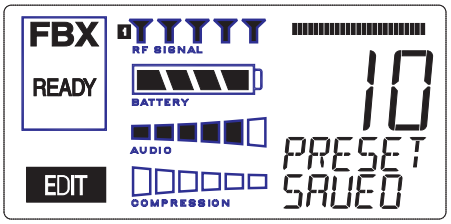

Fig. 10c: Program PRESET SAVED

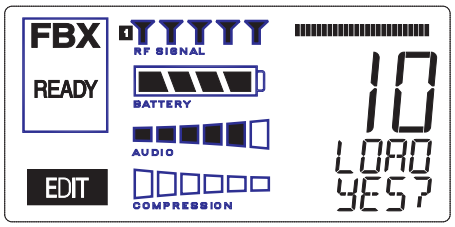

Fig. 10d: Program LOAD YES?

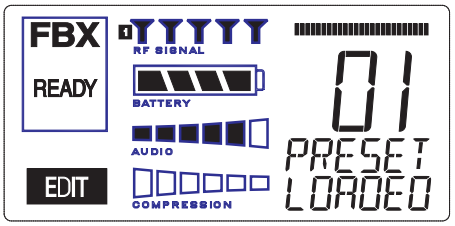

Fig. 10e: Program PRESET LOADED

10. PROGRAM SAVE & RECALL

Most wireless microphone systems provide control of one or two settings (RF channel and maybe gain). With so little to remember, the ability to save and recall system settings has not been necessary. With the Sabine Smart Spectrum® series, however, you get a very sophisticated processor with a variety of adjustable parameters. The ability to save and recall your carefully programmed setups can be a tremendous time-saver. Your Sabine receiver allows you to store and recall up to 10 different presets.

10.1. Saving a Preset

To save a program, press the SELECT button. The last preset used (numbered 01 - 10) will be shown in the LCD Display (see Fig. 10b). If you want to replace an existing program, press SELECT until you reach that program's number. Then press the SAVE button. The function display will show "YES?". If you are ready to save, immediately press the SAVE button again, and your settings will be saved to that program number. The message PRESET SAVED will be shown for four seconds in the text display to confirm this action, as the LCD Display continues to show the number (01-10) of the preset (see Fig. 10c). After four seconds, the LCD Display will revert to an indication of the RF channel.

10.2. Loading a Preset

Loading a program is just as easy. Press SELECT until you locate the program number you wish to load. Press LOAD. The function display will show "LOAD YES?" (see Fig. 10d). Immediately press the LOAD button again and your new program, including all the parameters, will be loaded for that channel. The message PRESET LOADED will appear in confirmation (see Fig. 10e).

10.3. Naming a Preset

Presets, channels and receivers can be named using the Sabine True Mobility Remote Software. Refer to Section 13 for details.

10.4. Power Off Memory

The receiver retains in memory all settings in effect at the time of being powered off, and returns to those settings when powered on.

PRESET NOTES

1. Preset 01 is the System Default (SYSDEF on the front panel) and you cannot save a preset here. Load this setting when you want to return the receiver to the factory default settings.

2. Preset names will appear on the LCD only after you name the preset using the remote control software.

11. MULTIPLE SYSTEMS OPERATION

11.1. Overview

In many circumstances a single wireless microphone system is all that will be in use at any one time. Larger applications (church, concert hall, theater stage, conference room, etc), however, can often require a large array of wireless microphones, all demanding flawless uninterrupted simultaneous operation.

Multiple system operation presents at least two important operational challenges: interference among transmission channels, and setup complexity. Sabine Smart Spectrum provides powerful solutions to both, particularly the interference problems associated with two or more RF channels at work at the same time, at the same location.

11.1.1. Multiple System Interference

Sabine Wireless addresses multiple system interference with two strategies. First, greater available bandwidth in the 2.4 GHz and 915 MHz ranges means more channels can occupy the band, i.e., the expanded range can be divided into a greater number of separate transmission/reception bands. Second, with Smart Spectrum transmission and reception, channels are more tolerant of interference. The net result is that Sabine Wirelss offers the potential for many more simultaneous transmission channels than conventional UHF or VHF systems.

While such performance benefits are one of the major advantages of the SWM, more systems working at the same time leads to a greater potential for complexity. Fortunately, the SWM6000 and 7000 also offer tools to simplify setup and operation.

11.1.2. Setup Complexity

Multiple wireless systems in a large installation are of course more complicated than a single transmitter/receiver. More space is needed, and the sheer quantity of transmitters and receivers that may be in use at a single installation can prove difficult to manage. The SWM series helps manage such potential complexity with four strategies and/or system accessories:

1. First, the dual channel receivers (SW72 and SW62) receivers offer a 50% space-saving advantage with 2-channel receivers that occupy the same 1U space as single channel receivers. Each channel in a 2-channel system shares the true diversity operation of the two antennas connected to the single receiver chassis.
2. Second, the optional SWA6SS (six-system antenna distribution amplifier) greatly reduces the complexities of multiple receiver antenna deployment. Since each receiver has two (diversity) antennas, which can be mounted on either the rear or front panel, multiple receivers at one location can potentially create a forest of antennas protruding from the front or back of a rack. The SWA6SS Antenna Distributor reduces the number of antennas to as few as 1/6 what would otherwise be needed. An added important advantage of using the SWA6SS is its distributed signal boost provided to all the antenna outputs, delivered while maintaining diversity in all attached reception channels.
3. Third, large installations often entail long distances from transmitters to receivers, or the presence of obstacles (walls, for example) in the transmission path that can interfere with clear reception. While the SWM Series series are designed to minimize these kinds of problems without accessories, the SWASS-EXT (set of two extension antennas, shown in figure 12b on page 38) may prove helpful or even necessary in some situations. In addition to providing remote and/or desirable low profile positioning with improved reception, the SWASS-EXT also adds significant gain for even more reliable system performance. The Extension Antenna and Distribution Amplifier components are also designed to operate in tandem, with the Extension Antenna plugged directly into the amp, which can then feed (via cable) the antenna inputs of 6 receivers. A combination of 2-channel receivers, a set (2 pieces) of SWASS-EXT, and one SWA6SS, would reduce the antenna clutter of 12 transmission

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channels to a single pair of extension antennas. See Section 12 for more information about setup and use of the SWASS-EXT.

4. Fourth, software control for the ND series receivers allows up to 70 receiver channels to be controlled from a single computer. This quick and powerful control methodology means you can monitor and change transmission channels, mic modeling, compression and de-essing — in short, all front panel controls — from a remote laptop or desktop. In addition to simplifying multiple unit operation with remote front panel controls, the remote software provides additional features and functions not available from front panel control. See Section 13 for more information about setup and use of the Remote Software.

11.2. Antenna Distribution Amplifier

Sabine's optional accessory SWA6SS Antenna Distribution Amplifier is ideal for simplifying antenna set up when multiple receivers are used, by using a single pair of antennas to replace pairs for up to 6 different receivers. Standard equipment packed with each Antenna Distributor includes an AC power cable, and 6 pairs of 1-meter long jumper cables (RG-58 AU foam core) for connecting the Antenna Distributor to receivers (2 cables provide true diversity reception to each receiver).

For best results, the Antenna Distribution Amplifier should be positioned close enough to the receivers to minimize cable runs. In most applications, you can use the standard Sabine 2.4 GHz or 915 MHz antennas supplied with any of the receivers to connect to the terminals on the Antenna Distributor, and then connect (in matching pairs) the jumpers to all your receiver antenna connections (up to 6 receivers, 1 pair per receiver).

Care should be exercised when using longer cables, due to possible transmission signal loss (approximately 1.7 dB/meter). Using the "rule-of-thumb" that a signal loss no greater than 6 dB will prove acceptable in many circumstances, you may be able to use RG-58 cable up to 3 meters or so in length. However, a better strategy than moving the Antenna Distributor to a better position, and risking excessive transmission loss back to the receivers or requiring an upgrade to more expensive cable, is to utilize a pair of Sabine Extension Antennas (SWASS-EXT). These will connect to the antenna inputs of the Antenna Distribution Amplifier, and offer increased range, better rear-source RF rejection, an expanded 135 degree forward sensitivity, flexible mounting options, and signal boost (see Section 12).

For more details regarding specifications and operation of the SWA6SS Antenna Distribution Amplifier, please refer to the operating guide included with that product.

11.3. Antenna Distribution Amplifier Connection

1 Connect receiver Antenna 1 input to any RF Output 1 connector on the SWA6SS.

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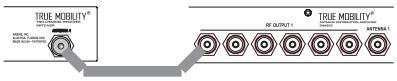
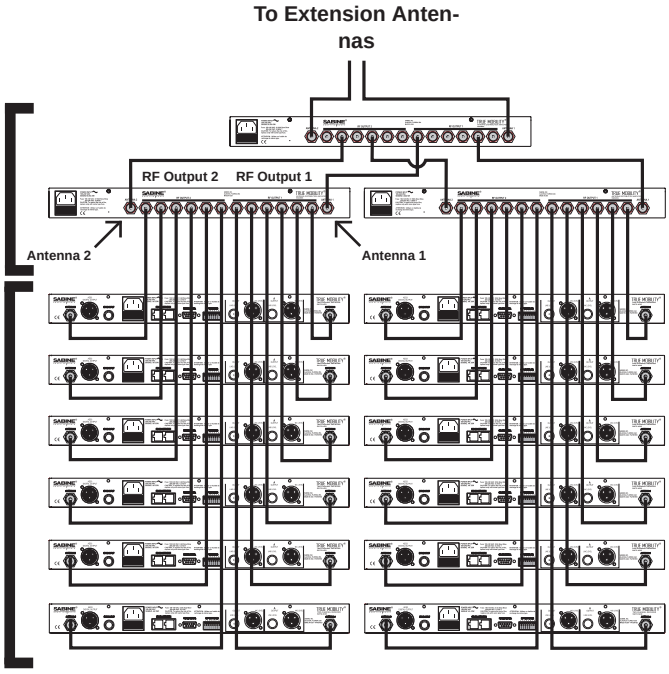


Receiver — Antenna Distribution Amplifier (SWA6SS)

2 Connect any receiver Antenna 2 to any RF Output 2 connector on the SWA6SS.

Receiver — Antenna Distribution Amplifier (SWA6SS)

3 Continue with remaining receivers



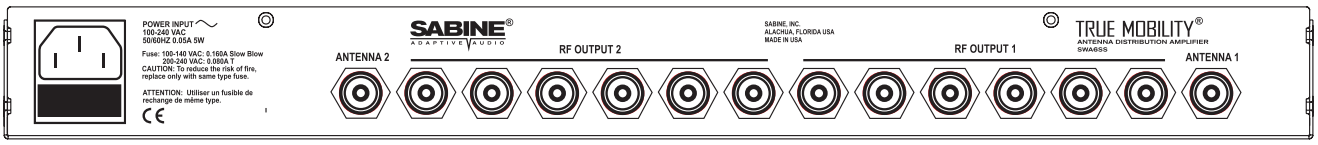


Fig. 12a: SWA6SS Antenna Distribution Amp Back Panel

⚠ IMPORTANT ⚠

Active Electronics Antenna

Sabine wireless receivers provide antennas with active electronics. The inputs to the receiver & antenna distributor amplifier have phantom ower available for this purpose.

DO NOT SHORT TO GROUND

⚠ IMPORTANT ⚠

Antenna Cabling Impedence must be 50 Ohm.

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Fig. 12b SWASS-EXT Mic-stand mount and wall-mount extension antennas

12. EXTENSION ANTENNAS

12.1. Overview

Sabine's receivers are designed for easy interface with Sabine's SWASS-EXT Extension Antenna Kit (figure 12b). This triangular, attractive wood-grained unit is designed to mount easily and unobtrusively on a wall (allowing either a through-the-wall or out-the-bottom connection), or (by threading) atop a microphone stand for a more portable or temporary positioning. Each package contains 2 Extension Antennas, all necessary mounting hardware (screws and mic stand thread connectors) and both right-angle and straight connectors for mating with RG-58 cable (for connections to a receiver or Antenna Distribution Amplifier).

12.2. Antenna Cabling & Cable Loss

While an extension antenna affords the opportunity to increase the distance from transmitter to receiver, there is a loss of signal in the interconnecting cable that limits that distance. The maximum connection length is determined by the type of cable used, and the degree of signal attenuation acceptable.

Sabine's Active Extension Antenna allows for a cost-effective way of boosting signal levels due to its built-in active switchable (+22 or +44) signal boost. In the case of low-cost RG-58 cable, adding an SWASS-EXT to your setup increases the acceptable maximum cable run by more than 4 times, to 14 meters. With RG-8 cable, the maximum length is extended to 88 meters.

Coaxial Cable Attenuation Table

Cable Type	Belden #	Insulation	Center Conductor	10 Meter Attenuation (dB)		Maximum Practical Distance Using SWASS-EXT set for +22 dB boost (meters)		Connector Type
				2.4 GHz	915 MHz	2.4 GHz	915 MHz	
RG58	9203	Polyethylene	#20 Stranded	-16.29	-6.5	14	35	TNC
RG58/AU	9311	Foam Polyethylene	#20 Stranded	-11.10	-4.7	20	47	TNC
RG212/U	9861	Polyethylene	#15.5 solid, Silver Plated	-6.11	-3.0	36	73	N
RG8/U	9913	Semi-solid Polyethylene	#10 Solid	-2.50	-1.3	88	170	N
RG142	83242	Teflon	#18 Solid, Silver Plated	-6.54	-4.0	34	55	TNC

Fig. 12c Coaxial Cable Attenuation Table

⚠ IMPORTANT ⚠

Antenna Cabling Impedance must be 50 Ohm.

Power for the Extension Antenna is delivered from any Sabine SWM series receiver or SWA6SS Antenna Distribution Amplifier (see Section 11).

An additional advantage of using Sabine's SWASS-EXT Extension Antenna stems from its more focused, directional nature. Sabine receiver's coaxial dipole antennas (standard equipment that mount directly on the front or rear panels of the receiver or SWA6SS) are more omni directional in nature. In contrast, the Sabine's Extension Antenna is sensitive to RF reception in a 135-degree arc in front of its mounted position. It extends sensitivity to the front and off-axis side locations as it increases rear RF rejection.

NOTE: The higher boost level (+44 dB) is only recommended for very long cable runs - at least 50 meters, or you have more than a 12 dB of cable loss. Using this setting without that much cable loss can cause a signal overload and poor RF performance.

The multiple functions (relocation of antenna, boost of signal, directional sensitivity) of Sabine's Extension Antenna mean there are many applications in which its addition to your system can greatly enhance performance. Here's a short list of such applications and operating instructions:

1. **Antenna Repositioning.** Provides solutions when receiver placement options are limited or challenging. Sabine's Extension Antenna's multiple mounting options allow higher placement (wall mount or microphone stand mount).
2. **Barriers interrupting transmission.** Anytime a barrier interferes with transmission and reception, Sabine's SWASS-EXT can be mounted on the transmitter side of the barrier with cable connections made on the receiver side. Perhaps the most common situation of this nature would arise when receiver and transmitter are located in separate rooms.
3. **Expanded or directional sensitivity required.** Sabine's Extension Antenna picks up in a 135-degree arc, focused towards the front. Reception in this arc is enhanced.
4. **Rear RF rejection required.** Because Sabine's Extension Antenna is less sensitive to signals received from the rear, it can be positioned to reject any such directional RF interference.
5. **Extended operational range.** Given a potential maximum cable length of almost 90 meters from Extension Antenna to receiver, Sabine's SWASS-EXT allows more options for extending the distance between transmitter and receiver. (The typical range of Sabine Wireless without the Extension Antenna is already 100 meters in typical circumstances). Consider that RF signal strength through the air is diminished by the square of the distance (twice as far away = ¼ the signal strength), while signal loss through cable is (roughly) inversely proportional (twice as far away = ½ the signal). That means you can use an extension antenna to replace transmission-through-air with transmission-through-cable, to help minimize signal loss.
6. **Placing extension antennas.** The assymetrical pattern of each antenna helps reduce the chance for a null spot in your room. You may use either antenna on the left or right side of your performance space. When you mount the extension antennas on a stand or on a wall, make sure the short end of the triangle is up.
7. In order for the system to be effective, **both extension antennas should be in a good pickup position at all times** but separated by about ten or fifteen feet if the antennas are within 100 or so feet.
8. If you put the antennas too far apart, i.e., at opposite ends of the room, or in separate rooms, to improve coverage, diversity is defeated and you will get dropouts. In other words, diversity is more important that coverage. If you mount the **extension antennas in the ceiling**, the antennas metallic backplane must be orientated parallel to the floor and the antennas must not be blocked by pillars, lights or similar obstructions. Aim the hole in the plastic cover toward the podium.
9. **Do not daisy-chain extension antennas** together in series. Receivers and the antenna distribution amp are only designed to use one left and one right antenna.
10. **Extension Antenna Cables:** Use coax cable to connect the extension antennas to the receiver or to the ADA. See the chart on the previous page for cable specifications. Use the SWATNC-N step-down cable to connect thicker RG8 cables to the extension antenna.
11. The SWASS-EXT extension antennas add from 22 to 44 dB signal strength to overcome cable loss. **Bad crimp connections are a common cause of dropouts**. Check them carefully!

⚠ IMPORTANT ⚠

Active Electronics Antenna

Sabine wireless receivers provide antennas with active electronics. The inputs to the receiver & antenna distributor amplifier have phantom power available for this purpose.

The red LED on the inside of the antenna cover indicates phantom power (3V) is good.

DO NOT SHORT TO GROUND

The SWASS-EXT features:

- Wall or mic-stand mount
- Straight and right angle TNC connectors
- 135 degree reception pattern
- Adjustable from +22 to +44 dB boost in RF
- Wood-tone finish
- Phantom-powered from the receiver or the distribution amp

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13. REMOTE CONTROL OPERATION

13.1. Overview

In many circumstances you will adjust and control your Sabine wireless microphone system using the front panel controls, as outlined in previous sections of this operating guide. In circumstances where an enhanced level of control over a single receiver is desired, or to enable simultaneous computer-based control of multiple receivers, you will need to install (on either a laptop or desktop computer) the free Sabine SWM Remote Control Software included with your system. Only receivers may be remotely controlled; handheld and belt pack transmitters cannot be remotely controlled.

For online instructions for any function in the software, you may also refer to the Help menu.

Notes on USB

SWM7000: Only -NDR receivers have a USB port. You can use a USB to RS-232 9-pin adaptor for the standard units if you need to use USB. Go to Sabine.com for a list of suggested adapters.

SWM6000: All SWM6000 series receivers have USB connections.

13.1.1. Single vs. Multiple Receiver Control

All series receivers have an RS-232 9-pin serial COMM Port and a USB port. Thus, any single receiver can be controlled remotely. Control over multiple receivers from a single computer is possible only with ND-series receivers (SW62 and 72-NDR). These units have additional RS-485 network connections (RJ-45 jacks) for daisy-chain connection from one receiver to the next. Up to 35 receivers (70 transmission channels if all receivers are 2-channel) may be connected in this network, all under the control of a single computer. Single- and dual-channel receivers can be mixed in the same network. The first receiver in such a network can be connected to the computer via an RS-232 9-pin serial cable or USB cable. The remaining units connect via an RS-485 cable.

NOTE: It is not possible to upgrade/retrofit a standard receiver to make it an ND-series unit.

13.1.2 Features & Controls Added Software

All front panel controls and displays are duplicated in the software. In addition, a deeper level of software control over receiver operation is enabled. These new controls are complete and independent for each transmission/reception channel, meaning there are two sets of controls for dual channel receivers. These controls and displays include:

- **Parametric filter access and control.** FBX filters can be changed to parametric filters, and their width, depth, and frequency can be adjusted. Changes can be made at any time, both before and after FBX filters have been set. Parametric and FBX filters can be mixed in any combination, totaling 10 for each receiver channel.
- **Adjustable FBX parameter control.** Maximum depth of FBX filters can be adjusted globally; filter width can be adjusted globally or individually. Two controls, Sensitivity and Persistence, can be tweaked to tailor the operation of automatic FBX filter placement to match the audio program. Proper settings will optimize the balance between false filtering and delayed response to feedback (the factory default settings should operate excellently in the vast majority of conditions and may never need to be changed).
- **Control over balance of FBX Fixed and Dynamic filters.** Any FBX filter can be set to be either fixed or dynamic.
- **Adjustable high and low cut filters.** (Software only) High Cut Filter, user controllable between 3 KHz and 20 KHz, 12 dB/octave roll-off; Low Cut Filter user controllable between 20 Hz and 1 KHz, 12 dB/octave roll-off.
- **Additional compressor controls.** Aside from adjustments for ratio, threshold, and attack (which duplicate front panel controls), the Remote Software provides control of compressor release time and knee. The effect of compression on the output signal as a function of input signal strength and parameter settings is displayed in Sabine's unique dynamic ColorComp graph, in addition to the traditional opposing-meter indicators.

- **RF Scan and Report,** which measures strength for each of the transmission channels (70 for the SWM7000, 34 for the SWM6000), and displays a hierarchical ordering of the clearest, strongest channels to use during system setup and operation. You can print a copy of the scan results.
- **Additional memory options.** In addition to saving presets in receiver memory, channel configuration settings can be saved to and recalled from disc or hard drive. All parameter settings made with the remote control, including adjustments that are not accessible from front panel controls (e.g., compressor knee and release), are saved with presets. All software settings stored for each of the 10 presets, including settings not accessible from the front panel, will be loaded whether presets are recalled by remote control or from the front panel. Note that all settings made in Off-line/Edit mode can be saved and applied in online operation.
- **Ability to print a report of all parameter settings,** creating hard copy documentation.
- **A receiver channel output mute button.**
- **The ability to custom name each RF channel and receiver.** This name will be displayed in the software only.
- **Display of important transmitter status information.** In addition to duplicating the battery charge status, battery warning message, and transmitter on/off/mute status from the front panel display, the Remote Software displays the number of hours the battery has been in use, the frequency midpoint (in GHz) of the transmission channel chosen, the transmitter pad and low cut filter settings, and a warning indication in the case of low RF signal strength. For handheld transmitters, the software display also shows the type of mic capsule in use.
- **Improved and expanded operational displays.** In addition to organizing all front panel displays on a single computer screen, the Remote Software also displays the exact frequency, width, and depth of FBX filters. The frequency response curve resulting from combined filter settings (including FBX, parametric, and high and low cut) is graphically displayed in the software. Frequency response changes imposed by choosing various microphone models are also shown.
- **Customizable front panel lock settings.** Software control allows you to program selective access to front panel controls to be made available once the Remote Control is disconnected. Customizable front panel lock settings are saved and recalled as part of each receiver's settings. All software-only accessible settings are saved with presets. Careful programming enables some powerful operational features — for example, locking Program Save but enabling other front panel controls (including Program Load) will let front panel users update settings temporarily, yet reload the original settings at the push of a button. Such a temporary adjustment would not permanently alter a setup designed to work in most situations, but would allow tweaking to address unusual situations.

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.

13.1.3. Software Multiple Unit Control

The true extent of the power of the SWM Remote Software is realized when it is used to control multiple wireless receivers. When ND-series receivers are connected in a network, the additional controls offered by the Remote Software over the entire system include:

- **Simultaneous multiple channel/system monitoring.** The Remote Software "All Channel View" (figure 13h) shows all important status conditions for up to 70 transmission channels. Color-coded warnings and alerts draw attention to potential problems.
- **Detailed, quick access to a single set of controls.** The "Command View" (figure 13c) displays comprehensive information about a single selected RF channel, and easy adjustment of all its controls. Channels are selected by clicking the appropriate All Channel View button. (NOTE: Each channel display in the All Channel View also allows quick access to parameter adjustments, by using the right mouse button to popup a parameter control menu.)
- **Quick, interactive control of wireless network channels.** All or selected parameter settings for a given channel can be copied to one or more additional channels, using the Copy Parameters option.

USB DRIVERS

Your USB-enabled receiver requires version 2.0 or above software. Installing this software also installs the necessary USB drivers onto your computer. If at any time you need to re-install USB drivers, use the software CD supplied with your receiver, or download them from Sabine.com.

13.2. Software Installation

13.2.1. Requirements & Recommendations

- **PC Minimum Requirements:** Pentium 266 MHZ CPU or AMD Duron CPU**;** 128 Megabytes of RAM; 20 Megabytes free space on hard drive; Windows 95 or higher.
- **PC Recommended Requirements:** Pentium 1.0 GHZ CPU or AMD Athlon CPU; 512 Megabytes of RAM; 20 Megabytes free space on hard drive; Windows 2000 or XP.
- SVGA or greater resolution graphic card and monitor. Recommended minimum monitor resolution: 1024 x 768 pixels (or 800 x 600 pixels for 15 inch monitors). Select "small fonts" and 16 bit color as defaults for monitor display. Windows XP users select 96 dpi screen settings.
- USB or Serial COMM Port.

13.2.2. Connections

There are three types of connections that are used in a remote controlled one- or two-channel Sabine system:

- **Serial port (RS-232 9-pin):** Use this to connect to a single receiver, or the first receiver in a network (multiple receivers). Be sure to use a cable with standard 9-pin D-connectors (male on one end, female on the other) that is a "serial," not a "null modem" cable.
- **USB:** Use this to connect to a single receiver, or the first receiver in a network (multiple receivers).

  NOTE: Some receivers may not have a USB port. In this case, simply use a USB to RS-232 9-pin adaptor. Go to Sabine.com for a list of suggested adapters.
- **Network (multiple -ND series receivers):**

  1. Connect the first receiver in your network to the PC using a USB cable or an RS-232 Serial Cable (not supplied).

  2. Connect all other receivers as a chain using RS-485 (or standard Ethernet) cables. There are two such jacks on the back of all ND-series receivers. Either jack can connect to another receiver either "upstream" or "downstream" from the computer remote control. As signals travel in both directions (from computer to receiver and back), it is not necessary to connect the last receiver in a network back to the computer (you do not need to make a "loop").

NETWORK CABLE CONNECTIONS

Connect the **first receiver** of a network using a USB or RS-232 9-pin connection. All subsequent receivers connect to each other via RS-485 connection.

NETWORK DIP SWITCH SETTINGS

DIP SWITCHES

1 2 3 4 5 6 7 8

UP: All but the first receiver connected to a network. ↑

DOWN: First receiver connected to the network. ↓

See page 55 for a chart of all DIP switch settings.

3. IMPORTANT: Set dip switch #7 on the back of the first receiver to the "OFF" (down) position (default). Set dip switch #7 on all other networked receivers to the "ON" (up) position.

4. When all cable connections have been made, open the SWM Remote Control Software program on your PC. The software will find all the receivers in the network and show them in a dialog box (receiver sequence can be reordered). Click "Accept" to control the network. NOTE: Up to 35 2-channel (or 1-channel, or any combination thereof) receivers – totalling up to 70 (34 for SWM6000) transmission channels – can be connected in a single network to a single PC.

13.2.3. Installing the Software

Follow these simple instructions for installing the Sabine SWM Remote Software on your computer:

1. Insert the Sabine software CD into your PC's CD ROM drive and wait a few seconds for the auto-start software installer to open.
2. Select the SWM Remote Control Software installation icon and follow the instructions given in the dialog boxes that appear. NOTE: For best results, allow the installation program to install the software within the default directories.

13.3. Launching the software

Launching the software produces the Startup Screen (Fig. 13a).

Fig. 13a Control Software Startup window

13.3.1. Off-Line Edit/Demo

Clicking the right button ("Off-Line Edit/Demo") will open the main software screen regardless of whether any SWM receivers are connected. The software functions in Off-Line mode are completely programmable, and may be saved and downloaded to a connected receiver at a later time. Display settings (e.g., level, compression, transmitter settings) which are dependent on the presence of actual signal are simulated, for demonstration only. You may turn the simulated displays on or off using the OPTIONS menu.

13.3.2. Connecting Receivers.

Fig. 13b - Connection Screen

Comm Port: Select the Comm port you are using to connect the receiver(s).

Connect Receiver: Select this and the software will poll the bus on the designated COMM Port to detect connected, powered-on receivers. If no receivers are detected, you may change the designated COMM Port by clicking the appropriate button. If this also proves ineffective, check your cables and connections, and make sure the connected receivers are powered on. In very rare instances you may need to reset your COMM Port settings on your computer.

Once polling is completed, the software will display all the receivers detected, in sequence, and the model of each receiver (ND series or standard, 1 or 2-channel). (See figure 13b for a sample opening display)

You may re-order the receivers here. When multiple receivers are connected a numeric field appears above each one. Enter the new order values and select "Re-Order." You may also verify your receiver selections by clicking on the icons above each receiver. The corresponding receiver's front panel will flash.

Once you confirm that the information reported is correct, choose "Accept" to proceed to the main screen, where you may begin remote control operation.

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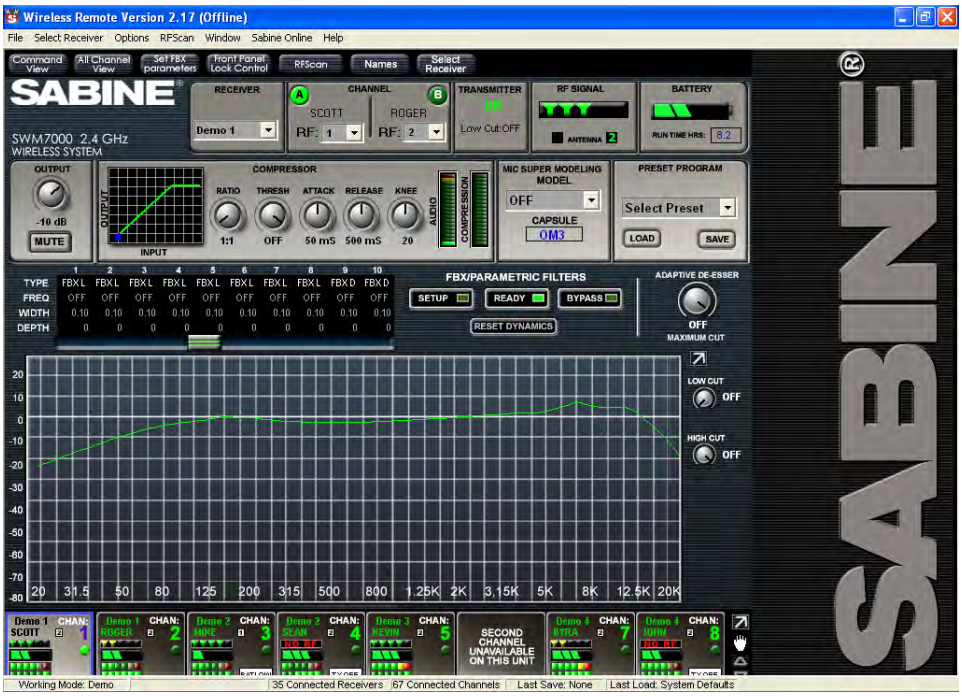
13.4. Remote Control Operation

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.

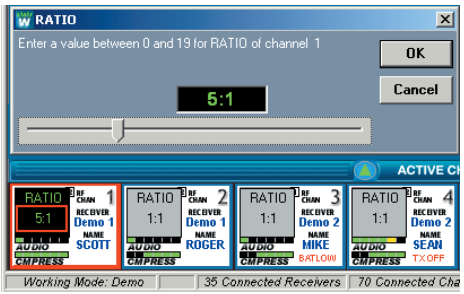


Fig. 13d - All Channel View (after right-clicking and selecting Ratio).

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.

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.

Fig. 13f - FBX Parameters window

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.

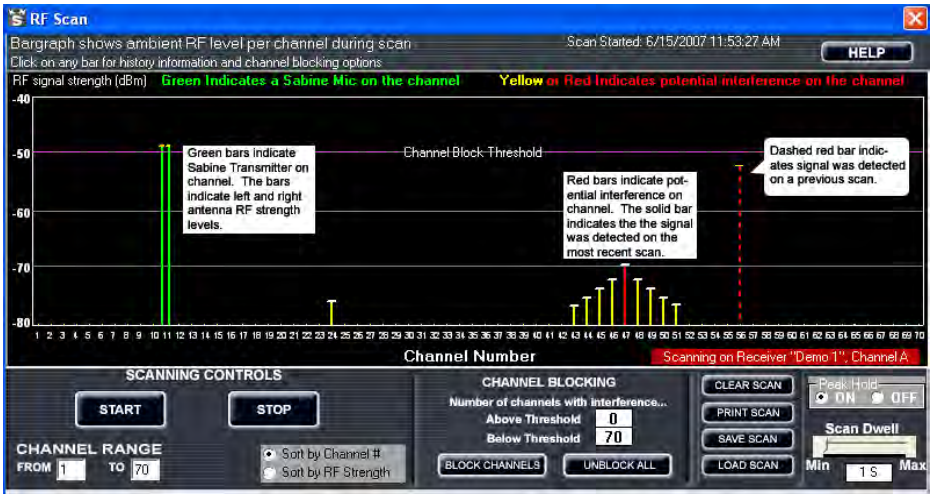
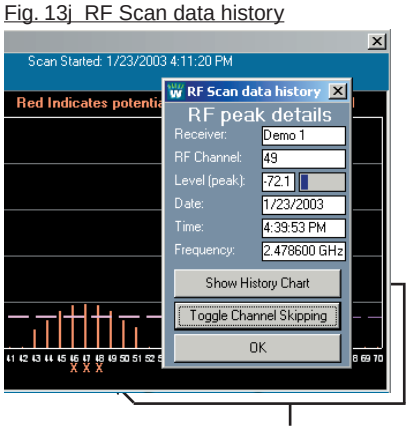


Fig. 13i RF Scanner results: one Sabine Transmitter (will display as a green line) and some low-level RF interference (will display as red lines)

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.

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.

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.

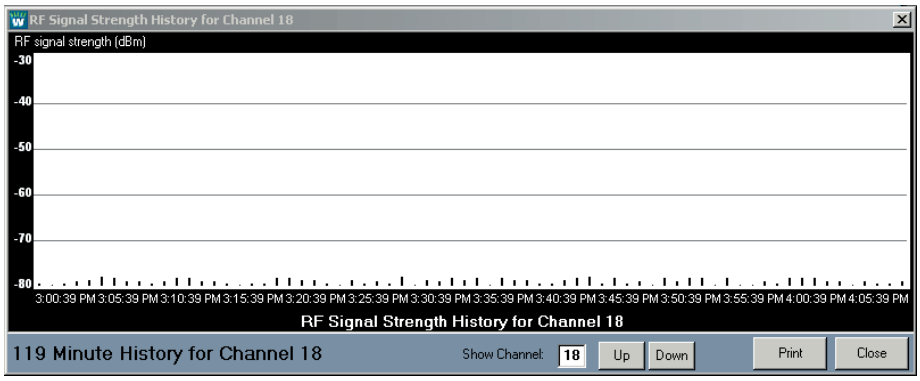


Fig. 13k RF Signal Strength History

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.

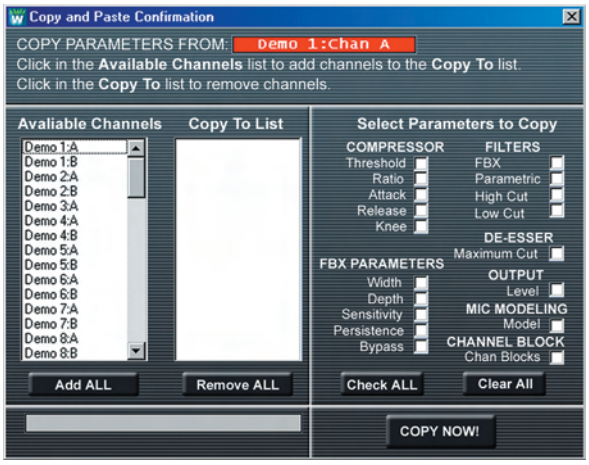


Fig. 13L Copy Parameters window

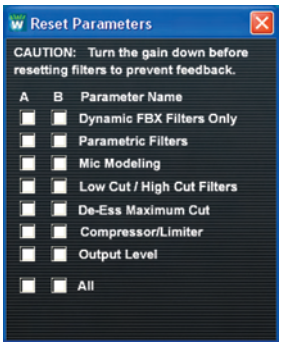


Fig. 13m Reset Parameters window

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.

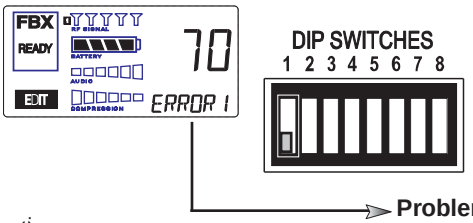
Solution: Check for fluorescent lights — bad ballasts may cause noise or hum in your system.

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 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 multiple 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 and 915 MHz cordless telephones, microwave ovens, WLAN antennas and wireless video camera transmitters twice the distance from your Sabine wireless microphone system antennas as that of your Sabine transmitters.

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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 and 900 MHz cordless telephones, microwave ovens, WLAN antennas and wireless video camera transmitters twice the distance from your Sabine wireless microphone system antennas as that of your Sabine 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.

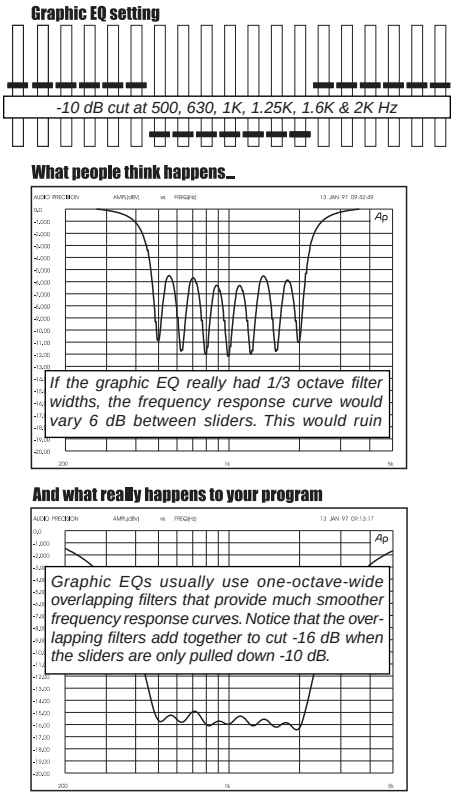

Fig. 15a What a Graphic EQ does to your Program

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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

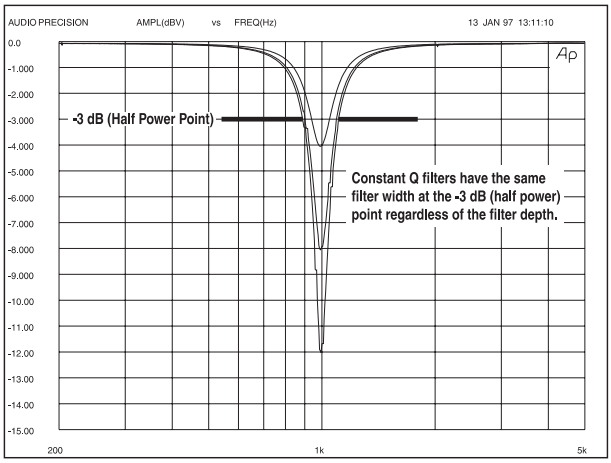

Fig. 15b - Constant Q Filter

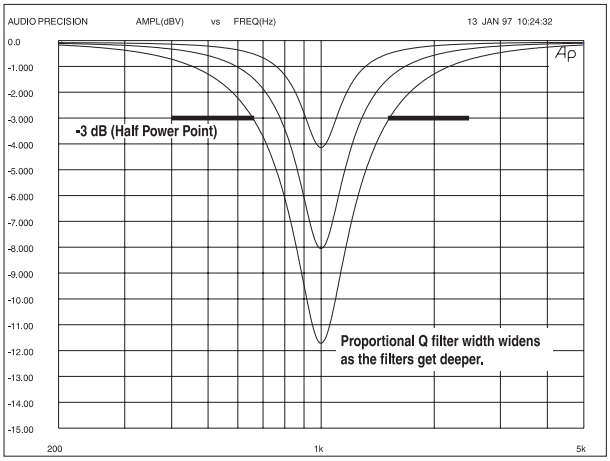

Fig. 15c - Proportional Filter

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?

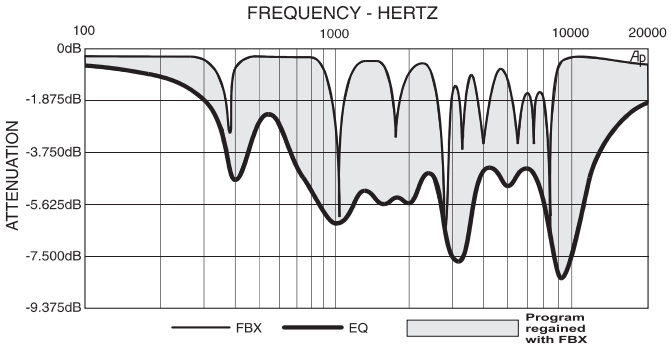

Fig. 15d - FBX at Work: What FBX Gives Back to your Program

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?

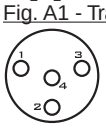
Virtually every sound system will be improved with the Sabine True Mobility® Wireless System. Singers and speakers who do not have sound technicians can now increase their monitor or house system volume so they can hear themselves clearly and with full fidelity, without worrying if their microphones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

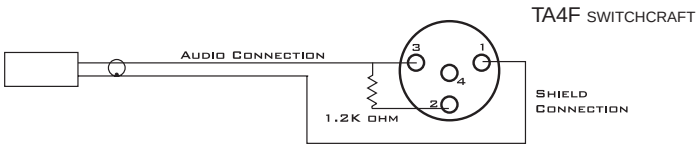


Fig. A3 - 3-conductor Electret Wiring Diagram

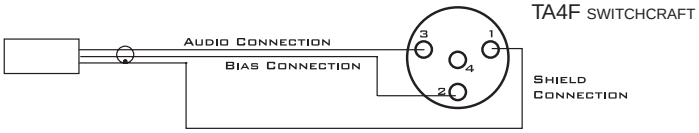


Fig. A4 - Beltpack Instrument Cable

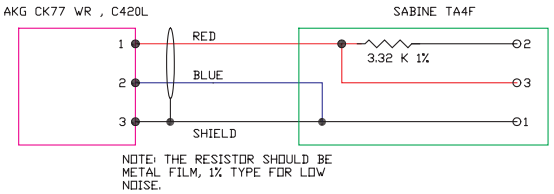
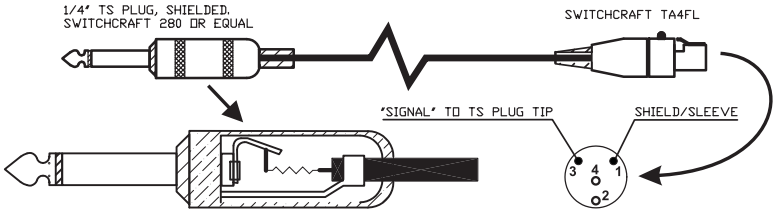


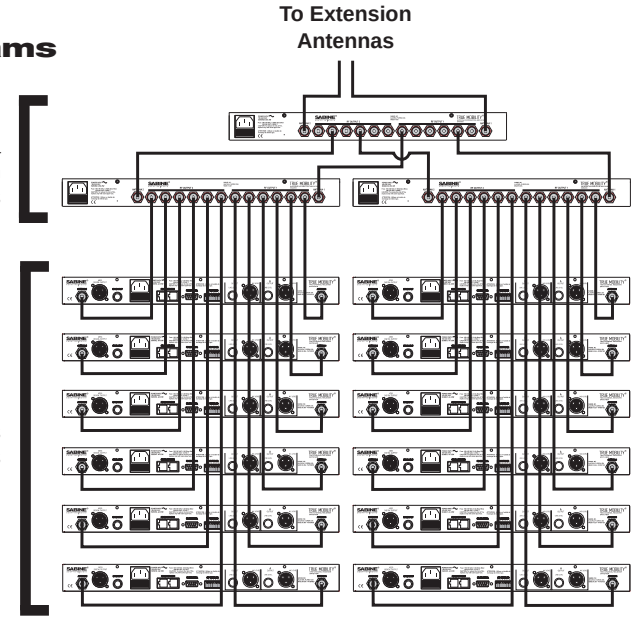
Fig. A5 - AKG CK77 WR, C420L to Sabine SW65 and 75-T



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

SW60 Series Receivers, 1- or 2-channel

Carrier Frequency Range: ISM Band 902.2 - 927.5 MHz
Frequencies: 34 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

SW60-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)

SW65 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: 902 - 928 MHz +/- 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

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.*

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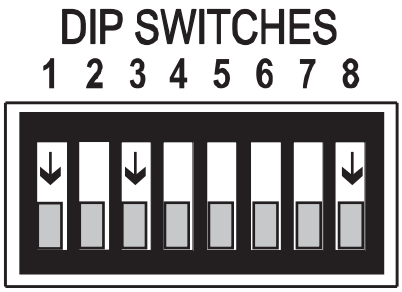
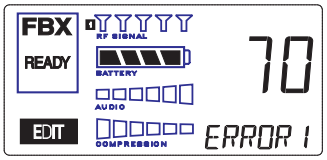
Appendix D: Dip Switch Settings

(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
1	902.214367	25	920.781551
2	902.730122	26	921.297306
3	903.761633	27	922.328816
4	904.277388	28	922.844571
5	905.308898	29	923.876082
6	905.824653	30	924.391837
7	906.856163	31	925.423347
8	907.371918	32	925.939102
9	908.403429	33	926.970612
10	908.919184	34	927.486367
11	909.950694		
12	910.466449		
13	911.497959		
14	912.013714		
15	913.045224		
16	913.560980		
17	914.592490		
18	915.108245		
19	916.139755		
20	916.655510		
21	917.687020		
22	918.202776		
23	919.234286		
24	919.750041		

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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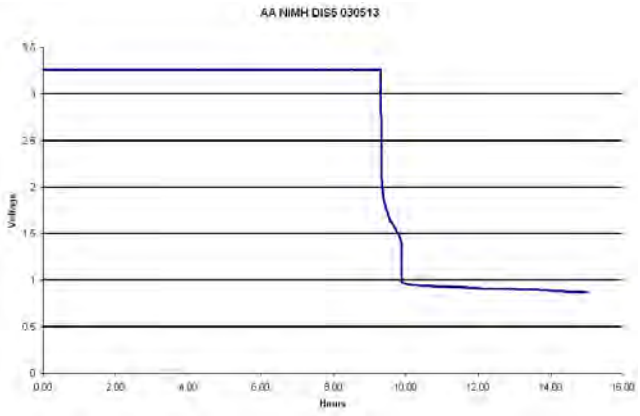
Appendix F: Battery Endurance Test (Typical)



NiMH AA Battery (SWAA2, Typical)

Appendix G: Changing Mic Capsules (SW60 and 70-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 (70 Series) or 902.2 - 927.5 MHz (60 Series).

- 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.

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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.

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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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