Installation & Operation

- INTRODUCTION -

The SignaLink Model SL-1+ is an enhanced version of the Tigertronics SL-1 Sound Card - Radio Interface. In addition to providing all the features and capabilities of the original SignaLink, the SL-1+ offers fully adjustable Transmit and Receive Audio levels, a front panel selectable short or variable õHang Timeö delay, and a more sensitive Auto-PTT[i] circuit. These new features insure compatibility with virtually all radio Mic jacks, Data and Accessory Ports, and now make it possible to attach the SignaLink to the back of the radio, so that you can keep your microphone plugged-in! Support for Voice modes such as Internet Repeater Linking (EchoLink, etc.) and Voice Contest Keyer operation is now provided, and switching from Digital to Voice can be done with just a press of the õDelayö switch.

The SignaLink SL-1+ is designed and manufactured using only the highest quality components. Assembly is done using õstate of the artö robotic production equipment. Strict testing of every unit, and our high level of quality control insures you of a premium quality product that will provide many years of dependable service. A great deal of effort has gone into the design and manufacture of the SignaLink SL-1+, and we are very proud to make it available.

- INSTALLATION OVERVIEW -

The SignaLink is very easy to install and operate. However, if it is not installed and operated correctly, you will not realize its best performance and in extreme cases you can damage your other equipment. Therefore, it is extremely important that you take the time to read these installation instructions carefully to avoid any possible problems. If after completing the installation you have any difficulty, please refer to the õTroubleshootingö section near the end of this manual. It covers most of the common problems that you might run into. Technical Support for the SignaLink is also available if you need it. Please see the õTechnical Supportö section of this manual for more information.

- WHAT YOU WILL NEED -

If you purchased the optional SignaLink Cable Accessory Kit (P/N: SLASSY), then you should have everything that you need to complete the installation and start operating. If not, then you will need to purchase the following items from your local electronics supply store:

- You will need two shielded audio cables with a 3.5mm stereo plug installed on each end. These cables must be long enough to attach the SignaLink to your sound cardøs Mic and Speaker jacks.

- If your radio does not provide speaker audio (or the equivalent) on the Mic, Data, or Accessory Port connector (check your radio manual), then you will also need one shielded audio cable with a 3.5mm mono plug installed on each end. This cable is used to connect your radioøs External Speaker or Headphone Jack to the SignaLink, so it can be relatively short. A length of two feet is usually about right.

To verify your radio wiring you will need a multimeter. Some customers may find needle-nosed pliers to be helpful when installing the programming jumpers. You will need software for testing when the installation is complete. Sample software selections for popular modes (PSK-31, SSTV, MT63, RTTY, etc.) are supplied on the CDROM included with your SignaLink. You can also download additional software from the main page of our website at www.tigertronics.com (see the õSignaLink Softwareö link).

- CONNECTING POWER -

CAUTION – *Before applying power to the SignaLink read this entire section thoroughly. Both the SignaLink and your radio can be damaged by improper installation.*

The SignaLink requires a power source of 6.75 to 15 volts DC at 13 milliamps (nominal). This is low enough that it can usually be powered by the õAccessory Voltageö found on the microphone or Accessory Port connector of most radios. If Accessory Voltage is not available from the radio, then power can be supplied through a 2.1mm power jack on the rear of the unit.

Powering From Your Radio ó To determine if the SignaLink can be powered from your radio, you will need to check the õpin-outö of the radio connector that you are going to attach the SignaLink to (Mic, Data, Accessory, etc.). This information can be found in your radio Operators Manual. Most radios have a small amount of power available on the mic jack (typically 8v @ 10ma) for microphone accessories (DTMF pad, LEDs, etc.). Power is also sometimes available on the Data or Accessory port. If your manual shows that this voltage is available, then you can skip now to the õConnecting The Radioö section of this manual. That section will cover making the actual power connection.

If power is not available on the radio connector you are using, then you have a couple of other easy options for powering the SignaLink. The first option would be to obtain power from whatever 12 volt supply powers your radio. To do this you will need to make a short cable from that power supply to the external power jack on the back of the SignaLink. Note that you might also be able to obtain 12-volt power from an Accessory Voltage connector on the back of the radio (check your radio manual). The external power jack on the SignaLink requires a standard 2.1mm/5.5mm power plug. This plug has been included with the SignaLink for your convenience. You will need to wire the plug to your power supply in the appropriate manner. The **polarity** of the plug should be **center positive**. Be sure to wire the plug with the correct polarity and be sure to **install a fuse** in the line for safety. For maximum protection, we recommend that you fuse BOTH the positive and negative power lines with a low current (250 ma or less) õfast blowö fuse.

The second option for powering the SignaLink is to use a Wall Transformer. This is the quick and easy solution but it does require an outlet. If you choose this option, you will need to select a transformer with an appropriate rating. A common problem in selecting wall transformers is that they almost always put out more voltage than you expect. This is because they are rated for output voltage at a specific load current. If the load on the transformer is below the rated load, then the voltage output will be higher than the rated output. Under a light load, it is not uncommon for wall transformers to provide twice their rated output voltage! This means that a typical 12 volt transformer might put out as much as 25 volts under little or no load, which would exceed the SignaLink input voltage ratings. Because of the very light load (13ma) provided by the SignaLink, you will need to select a transformer with a rated voltage well under

12 volts. We would recommend a 6 volt transformer with a low current rating. Below are some transformer sources that are appropriate.

Radio Shack P/N 273-1758 (6v 300ma). You will also need the 2.1mm (5.5mm OD) adapter plug P/N 273-1716.

Mouser Electronics (1-800-346-6873): P/N 412-106054. (6v 500ma). Mouser also has a 9 Volt 200ma wall transformer (P/N: 412-109024) that will work.

Digikey (1-800-344-4539): P/N DPD090020-P-5 or DPD090020-P5-TC. These are both 9 Volt 200 ma units that will work fine.

- CONNECTING THE SOUND CARD -

The SignaLink connects to the sound card through two shielded audio cables with 3.5mm *stereo* connectors. Connect one cable from the jack labeled õComputer ó SPKRö on the SignaLink to the jack labeled õSpeaker Outputö on your sound card. The Speaker Output jack will be Green if color-coded. Connect the other cable from the jack labeled õComputer ó MICö on the SignaLink to the õMicrophone Inputö jack on the sound card. This jack will be Pink or Red if color-coded.

Note that if you normally have speakers connected to your sound card and want to keep them connected while the SignaLink is installed, then you will need to use a stereo õYö adapter cable on the sound card output. We have supplied a õYö adapter in our optional Cable Accessory Kit for your convenience. We do NOT recommend the use of a õYö adapter unless you are using õamplifiedö (powered) speakers. Conventional speakers often times cause slight overloading of the sound card output, which can reduce the signal level available to the SignaLink and produce minor distortion. This distortion is generally not noticeable to your ear but can greatly impact the quality of some digital modulation signals like PSK-31. It is generally preferred not to leave the speakers connected unless they can be switched OFF when not in use. You will find most of the digital modulation schemes very loud and very annoying anyway!

- CONNECTING THE RADIO -

CAUTION – *Before connecting the SignaLink to your radio, read this entire section thoroughly. Both the SignaLink and your radio can be damaged by improper installation.*

The SignaLink attaches to the radio through an 8-pin RJ-45 connector located on the rear of the unit. A radio cable with the appropriate connector for your radio was supplied with the SignaLink for this purpose. One end of this cable plugs into the SignaLinkøs õRADIOö connector, and the other end plugs into the radioøs Mic, Data, or Accessory Port

connector. This cable brings all of the radio's signal lines into the SignaLink, so that you can connect to any line that is required (see note below on connectors with more than eight pins). The SignaLink uses the radio's Ground, PTT, Speaker Output, Mic Input, and Accessory Voltage lines. These are the signal names that you will find on a typical Mic connector. These signals are also available on most Data and Accessory ports, but they are often labeled differently. This will be covered in more detail below.

Because the location of these signals on the radio connector varies from radio to radio, we have provided a "Programming Socket" inside the SignaLink (see JP-1 in Figure-4). The Programming Socket provides a convenient way to route the various signals to the correct pin on the radio connector. This is accomplished with "press-in" jumper wires so no soldering is required.

Since the Programming Socket is a standard DIP-16 format, you can also use a Dip Header Module for programming rather than wires. This "module" approach requires soldering but does have the advantage that the resulting "module" can be quickly changed to re-configure for different radios. The Dip Headers are available from Tigertronics as part number "SLHEAD", and from electronic suppliers like DigiKey (P/N A103-ND) and Mouser (P/N 544-16PT-02).

Signal Lines – Every installation requires connecting to at least three pins on the radio's Mic, Data, or Accessory connector. On the Mic connector these are "Mic Input", "PTT", and "Ground". On the Data or Accessory Port, these same basic signals are used, but they are usually labeled differently. The table in Figure 1 shows the common mic signals and their Data / Accessory port equivalents. Please refer to this table if you are installing the SignaLink on your radio's Data or Accessory port.

Mic Signal	Data/Accessory Port Signal
PTT (Push-To-Talk)	Standby, PKS, or Packet Standby
Mic / Mic Input	TX Data, Data Input, PKD, or Mod In
AF Out / Speaker	RX Data, Data Out, RXD, or RX Audio
PTT GND	PTT Ground, Chassis Ground
Mic GND	Signal GND, Mic GND

Figure 1 - Data / Accessory Port Signal Names

Note that many radios actually have multiple ground connections (Mic Ground, PTT Ground, etc.). The Programming Socket has multiple ground (G) connections for this reason.

On many radios the Mic, Data, and Accessory connectors also provide access to Supply Voltage and Speaker Audio. Supply Voltage has already been discussed in the section on "Connecting Power". If your radio has power available on

the connector then you will be instructed to connect it later in this section. If Speaker Audio (or the equivalent Data / Accessory Port signal) is not available from the connector on your radio, then you will need to install a short (mono) jumper cable from the External Speaker or Headphone jack on your radio to the SPKR jack on the rear panel of the SignaLink. If this signal is available on the connector, then you will connect it later in this section.

Before proceeding with jumper installation you should verify in your radio manual that the radio PTT requirements do not exceed the specifications of the SignaLink keying circuit. Verify that the PTT is "Grounded" to make the radio transmit and the PTT signal does not exceed 15 volts @ 75ma. This is well within the ratings of all modern radios but could be a problem on some older rigs. If your radio exceeds these specifications or requires some other keying arrangement, then you will need to key the radio using a low voltage/low current relay. Please feel free to contact Technical Support if you need assistance with this.

Connectors With More Than Eight Pins – The jumper installation procedure in this manual is for use with radio connectors that have 8 pins or less. If you are installing the SignaLink on a 13-pin Accessory port (currently the only radio connector with more than eight pins), then you will either be using a fully assembled cable that we provided, or you will be attaching your own 13-pin connector to our un-terminated cable. In either case, jumper settings and/or special instructions for installing the connector and jumpers were included with the radio cable. Please follow those instructions instead of the procedures in this manual.

Jumper Settings – If printed jumper settings were supplied with your radio cable, then please skip to the "Install Jumper Wires" section, and install the jumpers as shown on the document. If you did not receive printed jumper settings with your radio cable, then please check the "Jumper Settings" section of the SignaLink CD to see if information for your radio is available. Jumper settings for the most common radios are included on the CD. If you do not find the jumpers settings for your radio, then you will need to follow the procedure below to install the jumpers.

Identifying Jumper Locations - Identifying the jumper locations for your radio is a two-step process. First we will identify the pin-out for the radio connector, and then we will verify that it is correct. The verification process is very important since incorrect wiring could damage your equipment. The final steps will be to draw a wiring diagram using Figure-2 and actually install the jumpers.

• **Lookup Pin-out** – In your radio Operators Manual, find the page that identifies the pin-out of the Mic, Data, or Accessory connector that you are going to use. Using the manual, identify the pin numbers assigned to the following signals, and record them below. Note that the signals found on radio Data and Accessory ports will likely be labeled differently from those

shown. Please refer to the table in Figure 1 for the equivalent Data / Accessory Port signals.

____ PTT
____ Mic Input
____ Speaker Audio
____ Accessory Voltage
____ Mic Ground**
____ PTT Ground**
____ Chassis Ground**

** Note that some radios only have one ground pin.
** Speaker and Accy Power are not always available.

- **Verify Pin-out –** This step is **Extremely Important** since not all manufacturers use the same numbering convention for their connectors. This is especially true of radios using RJ-45 mic connectors. This brief verification process could ward off a **major disaster** when you turn on the power! This procedure verifies that the pin numbers, which you just identified in the Operators Manual, do in fact match the numbers identified on the Programming Socket. The easiest way to do this is to use a multimeter to verify some of the more important lines. Before you start, you will need to make sure that the radio power is OFF, that there are NO JUMPERS are installed in JP-1, and that the supplied cable is connected between the SignaLink and the radio.

  Note that you should not find the lines õscrambledö. They will either be in the correct order or they will be completely reversed (pin 1=8, 2=7, 3=6, etc).

  First check the Ground pin (or pins) recorded earlier. You can do this by checking for continuity between the radio chassis and the pins numbered on the Programming Socket (JP-1). JP-1 is a very convenient place to probe since it is wired 1:1 to every pin on the radio connector. You will be checking against the numbers you recorded earlier from the Operators Manual. Note that if your radio has a separate mic ground it may have a slight resistance to chassis ground. Any other ground pin should test very close to zero ohms. If you do not get the expected continuity in this test, try checking against the numbers in the reverse order (1=8, 2=7, 3=6, etc). It would probably be very helpful to make a new table using the reversed number sequence to avoid mistakes! This step should establish whether or not the radio connector is õreverse orderedö and allow you to correct the numbers on your table.

  Once you are confident about the ground lines you can move on to other pins. If your radio had Accessory Power you should be able to turn ON the radio and use your multimeter (volts scale) to test for power on the appropriate pin of JP-1.

You can test the PTT pin as follows: First check the pin with your multimeter (volts). You should see a voltage on the PTT pin (5-12v) when the radio is ON. You should be able to key the radio by grounding the PTT line. For the sake of safety, you should ground the PTT pin through a small value resistor (100-1000 ohms) in case itøs not the pin you think it is! Be sure your radio power is set to LOW and an antenna or dummy load is connected for this test, as the radio will go into õtransmitö with the line grounded.

If the Speaker signal is available on the connector you are using, then you can try attaching a speaker or headphone to the appropriate pin on JP-1 to see if you can hear audio. Note that you will NOT be able to hear anything if the speaker source is a low level output (usually the case on Data and Accessory ports).

There is no easy way to test the mic line but there will be little doubt about it if the other lines are correct. The main thing you are looking for here is to determine whether or not the connector numbers are reversed on your radio. If you have any unresolved errors, then you should double check your numbering in the Operators Manual again.
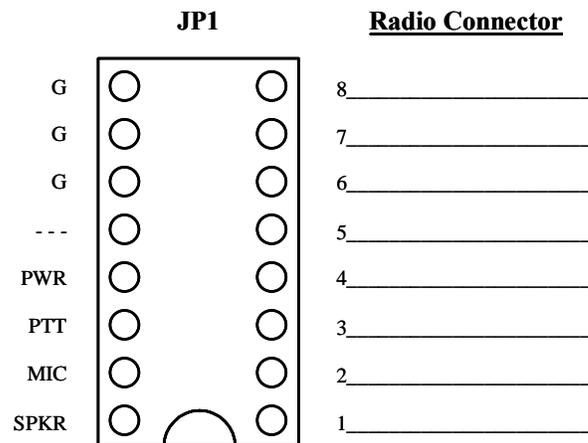

Figure 2 ó Jumper Wiring Diagram

- **Draw Jumper Wires -** Once you have verified your pin-out and are comfortable with the results, you are ready to label the lines in Figure-2 and draw in the jumper wires. To do this, you simply need to draw a line between the pins on the left of JP-1 (G, PWR, PTT, Mic & SPKR) and their appropriate match on the right side of the diagram. For example, draw a line between õPWRö pin on the left of JP-1 and the line that you labeled õAccessory Voltageö. The õPTTö pin should be connected to the pin that you labeled õPTTö and so on. If you are installing the SignaLink on a Data or Accessory port, then refer to Figure 1 for the correct signal names. An example of the Jumper Wiring Diagram for a Kenwood TS-450 is shown in Figure 3.
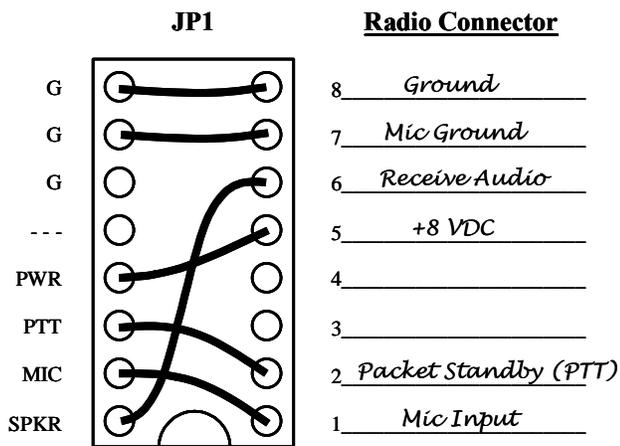
JP1   <u>**Radio Connector**</u>

JP1		Radio Connector
G	8	*Ground*
G	7	*Mic Ground*
G	6	*Receive Audio*
---	5	*+8 VDC*
PWR	4	
PTT	3	
MIC	2	*Packet Standby (PTT)*
SPKR	1	*Mic Input*

Figure 3 – Example Jumper Wire Diagram for TS-450

VERY IMPORTANT NOTE! – You are about to install the jumper wires. The wires **must be 24ga** AWG or you will damage the socket! It would be best to use the wires that we provided for this purpose to avoid damage.

- **Install Jumper Wires** – Now that you know where the jumper wires go, all you need to do is install them! This is best done by gripping them close to the end with needle-nosed pliers. When pushing the wires into the socket, be very careful not to bend them back and forth or they might break. If you break a wire off in the socket, there is no way to remove it. You will have to have a new socket installed! This should not be an issue if you are just a little bit careful. If you plan to change the socket configuration often for different radios, you might prefer to use a Dip Header for programming, rather than wires. The Dip Header is a small terminal block that you can solder the wires onto and then simply plug into JP-1 when it's finished. This is by far the best method if you need to switch radios often. The Dip Headers are available from Tigertronics as part number "SLHEAD", and from electronic suppliers like DigiKey (P/N A103-ND) and Mouser (P/N 544-16PT-02).

Once you have all of the jumpers installed, take a minute to look them over. You might want to compare your jumper settings to the sample settings shown in the "Jumper Settings" section of the SignaLink CDROM.

NOTE: If you are using the external "SPKR" or "PWR" input jacks on the rear of the SignaLink, then you should NOT have any jumpers going to the "SPKR" or "PWR" pins on JP-1.

- **Measure Accessory Voltage** – This step is normally not necessary. But, if you have wired the accessory power from your radio and are not sure if it is adequate to power the SignaLink, then you can easily verify the voltage. First make sure the pc board is on an insolated

surface (no metal or wire clippings under board!). Turn on the radio and press the Power switch on the SignaLink. The green Power led should illuminate. Using your multimeter (volts) verify the voltage between chassis ground and test point TP-1 near the left rear corner of the SignaLink pc board (Figure-4). The voltage should be at least 6.75 volts for proper operation. If the voltage is not adequate, then you will need to remove the Power jumper on JP-1 and power the unit externally (see "Connecting Power").
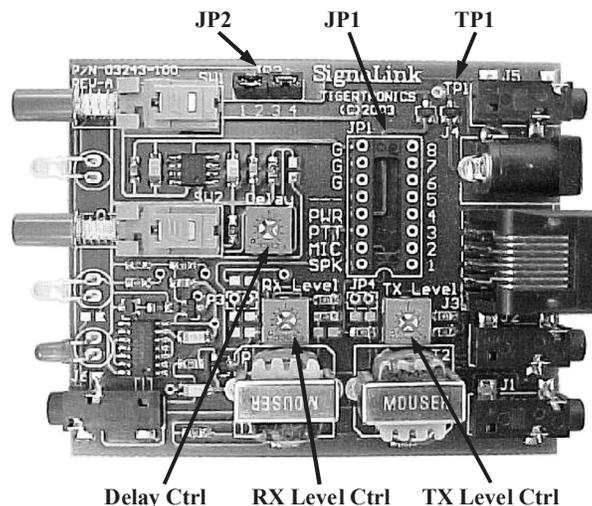

Figure 4 – Location of TP1, JP1, JP2 and the TX, RX, and Level controls.

- AUXILIARY AUDIO OUTPUT –

The SignaLink has an Auxiliary Audio Output jack on the front panel that can be used to attach an external radio speaker or headphones for monitoring receiver audio. Inside the SignaLink we have provided jumper JP-2 to allow you to select when the external audio jack is active. By default we have jumpered both positions on JP-2 which makes the audio available all of the time. However, you can move the jumpers to allow the jack to be active only when the SignaLink is ON or OFF. To make the jack active when the unit is ON, jumper pins 1 & 2. To make the jack active when the unit is OFF, jumper pins 3 & 4. For example, if you only install the jumper on pins 3 & 4, the audio jack will only be active when the SignaLink is OFF. This is a nice way to mute the speaker when you are working the digital modes! Note that if your radio has audio on the mic connector, you can also use the rear panel SPKR connector for an external speaker. This jack is wired directly to the SPKR pin on JP-1.

NOTE: Attaching or removing an external speaker while you are using the SignaLink will change the loading on the radio's speaker circuit. This will probably cause a change

in the level of audio going to the sound card, and may require you to re-adjust the audio level to compensate.

- SETTING THE AUDIO LEVELS -
(QUICK PROCEDURE!)

Before you operate your SignaLink on the air, you will need to adjust your soundcard and radio Receive and Transmit Audio levels. Incorrect adjustment of these levels can cause poor performance or unreliable operation. This procedure tells you how the levels should be set. It assumes you already know how to use your computer to set sound card levels. If you are not familiar with setting the sound card levels, then please refer to the õDetailed Procedureö for doing this in the back of this manual.

Before you can adjust the audio levels, the SignaLink must be connected to the sound card and radio. Both the SignaLink and the radio should be powered ON and a communications program that you have selected should already be installed on your computer. Note that you will be using the communications program to generate the audio tones that are used to adjust the level controls, so CW programs should NOT be used unless they have a continuous "Tune" mode. A PSK-31 program like DigiPan is ideal for making these adjustments.

Transmit Audio Adjustment

- If the SignaLink is connected to your radioøs Mic jack, then set your radio to USB. If the SignaLink is connected to a Data or Accessory Port, then you will need to set your radio to the appropriate mode for this type of connection. USB will work on some radios, but you may need to select a special mode such as õDataö, õUserö, or õD-USBö. If you are not sure which mode to use, then consult your radio manual.

- If the SignaLink is connected to your radioøs Mic jack, then turn the radioøs Mic Gain control all the way down so that there will not be any transmit power. If the SignaLink is connected to a Data or Accessory Port, then the Mic Gain control may not have any effect on the power output (consult your radio manual). If this is the case with your radio, then you will need to turn down the radioøs õForward Powerö control instead. Otherwise, you should set this control to provide maximum power. Note that the õForward Powerö control might be labeled õRF Powerö or õCarrier Powerö on your radio.

- Your radioøs Speech Processor / Compressor and VOX features should be turned OFF.

- Select õTUNEö in your communications program. Open the Windows õVolume Control Panelö and select õPlaybackö controls. Make sure that the õMaster Volumeö (far left volume control) and õWave Volumeö

controls are NOT muted. The õMicrophoneö control (**under Playback ONLY!**) MUST be muted.

- Adjust the õMaster Volumeö control for 75% of full volume. Next, set the õWave Volumeö control to zero and then advance it slowly noting the point where the SignaLinkøs PTT LED turns ON. This õONö point is the absolute *minimum* level needed to switch the SignaLink into Transmit, so we will need to increase the level further to insure reliable operation. Increase the Wave control to a point about 50% higher than the point where PTT activates.

- If the SignaLink is connected to your radioøs Mic jack, then you should now be able to adjust the radioøs Mic Gain control for the desired transmit power level (***see important note below BEFORE making final adjustments to your transmit power!)***. If you cannot get adequate power by adjusting the Mic Gain control, then you may need to set both the Master and Wave volume controls higher (if possible), or adjust the SignaLinkøs internal õTX Levelö control for more output (see õTX Level and RX Level Controlsö at the end of this section).

- If the SignaLink is connected to a Data or Accessory Port, then the Mic Gain control may not affect power output. In this case, you will need to adjust the radioøs transmit power output by setting both the Master and Wave volume controls higher, or by adjusting the SignaLinkøs internal õTX Levelö control for more output (see õTX Level and RX Level Controlsö at the end of this section). Your radio might also have a Data or Accessory Port gain control that can be increased to provide more power out (usually through a radio menu setting ó check your radio manual). ***Be sure to read the important note below BEFORE making final adjustments to your transmit power!***

- Be sure to turn your programøs õTUNEö function OFF when you are finished making adjustments. If the PTT LED never turns ON, then you need to set your Master and Wave controls higher. If it still fails to turn ON, or if you cannot reach the desired transmit power level, then see the Troubleshooting section of this manual for possible causes.

- ***IMPORTANT*** - Before you set your transmit power level, you need to check your radio manual and find out what the recommended maximum transmit level and duty cycle are. Most digital modes are similar to RTTY (100% duty cycle) and cannot be run at full power without damaging your radio. Also, some modes (like PSK-31) typically only require 25 watts or less for reliable communication. You can actually õswampö out other users if you use too much power.

Receive Audio Adjustment

- Open the Windows õVolume Control Panelö and select õRecording Controlsö. The õMaster Volumeö (if available) and õMicrophone Volumeö controls should

be õSelectedö (check box). Set the õMaster Volumeö (if available) and the õMicrophone Volumeö controls to 50%. These settings should be adequate for normal operation.

- If the SignaLink is attached your radioøs Mic jack, then all further adjustment of the Receive Audio level should be done with the radioøs Volume control. If you are not able to get an adequate amount of Receive Audio with these settings, then you can set the sound card Mic volume control higher, or adjust the SignaLinkøs internal õRX Levelö control for more output (see õTX Level and RX Level Controlsö at the end of this section).

- If the SignaLink is attached your radioøs Data or Accessory Port, then all further adjustment of the Receive Audio level should be done with the sound cardøs Mic volume control, or the SignaLinkøs internal õRX Levelö control (see õTX Level and RX Level Controlsö at the end of this section).

- If you are unable to get an adequate Receive Audio level, then please see the Troubleshooting section of this manual.

- TX LEVEL AND RX LEVEL CONTROLS -

IMPORTANT - Do not attempt to adjust these controls until after you have completed either the "Quick" audio level setting procedure, or the more detailed procedure in the back of this manual. The TX Level and RX Level controls do NOT need to be adjusted for most installations.

The SignaLinkøs TX Level and RX Level controls allow you to adjust the Transmit Audio level going to the radio, and the Receive Audio level going to the sound card. The factory default setting for both of these controls is fully counter-clockwise (minimum) and is ideal for most installations. However, some equipment combinations may require more audio than the factory settings provide. If you have completed the audio level setting procedure, and cannot get adequate Transmit power or Receive Audio, then you can adjust these controls to provide the correct level for your installation. The location of these controls is shown in Figure 4. To increase the level, simply turn the control clockwise. We recommend that you use the proper trimmer adjustment tool to do this, but a small jewelers type screwdriver can be used instead.

NOTE: The õTX Levelö control does NOT affect the operation of the SignaLinkøs PTT circuit. If you cannot get the PTT LED to turn ON, it has nothing to do with the TX Level adjustment. You should NOT adjust the TX Level control until the sound card levels have been set properly and the SignaLink is switching to Transmit. See the Troubleshooting section of this manual if you need assistance with this problem.

- GENERAL RADIO SETTINGS -

Virtually all digital modes require that you TURN OFF any Speech Processing or Compression features in your radio. This is to insure RF linearity. You must also TURN OFF your VOX circuit when using the SignaLink. As mentioned in the sound card level settings procedure, you can usually use your radioøs USB mode for digital operation (LSB for some bands). However, if the SignaLink is connected to a Data or Accessory Port, then you may need to select a special mode such as õDataö, õUserö, õD-USBö or õD-LSBö (to name a few). If you are not sure which mode to use, then consult your radio manual.

- SIGNALINK OPERATION -

Operation of the SignaLink is very simple. The SignaLinkøs õreceiveö circuitry is active at all times, so you do not need to turn it ON to receive signals through it. The õtransmitö circuitry is only active when the unit is turned õONö. When active, the SignaLink will trigger your radioøs PTT whenever it sees sound card activity, so it is important to keep it turned õOFFö when it is not in use to prevent accidental transmissions. If you are using your computer solely for Digital operation, you might want to consider disabling your Windows sounds.

Delay Switch - The front panel õDelayö switch is used to control the Transmit õHang Timeö for the SignaLinkøs Auto-PTT™ circuit. With the Delay switch OUT, the radio will remain keyed for approximately 30 milliseconds after Transmit Audio from the sound card has stopped. This setting is suitable for CW QSK operation, and other modes that require fast turn-around times like Packet. It is also the best position for many other digital modes like PSK-31 and MT63.

With the Delay switch pressed IN, the õVarö LED on the SignaLinkøs front panel will turn ON to indicate that the variable Hang Time delay is selected. In this position, the Hang Time delay can be adjusted from approximately 300ms to 3 seconds, by means of an internal õDelayö control (see Figure 4 for location). The factory default setting for this control is approximately two seconds, which is adequate for most Voice modes such as Internet Repeater Linking, Remote Base operation, and Voice Contest Keyers. For slow AFSK CW, you will probably want to decrease the Hang Time delay to between 500 ms and 1 second.

- VISIT US ON THE INTERNET -

If you have Internet access, please visit our web site at:

http://www.tigertronics.com

Our site contains the latest news about Tigertronicsø products, support information, and other information of interest to all Hams and SWLs. This is also the best source for downloadable programs that work with our products. We also have all of our distribution software and documentation available for download as well. The site is updated often, so stop in on a regular basis and get the latest news and updates.

- YOUR COMMENTS WELCOME -

We have made every effort to make the SignaLink the best product possible. We welcome any comments or suggestions that you would like to make. Please drop us a note to let us know about your experiences, tips you would like to share with other users, or how we might do a better job for you.

- LIMITED WARRANTY -

Tigertronics warrants the SignaLink to be free of defects in material and workmanship for a period of 90 days from the date of shipment. Tigertronics will repair or replace, at its option, any parts found to be defective during the warranty period. This warranty does not include any unit that has been subject to misuse, neglect, improper installation or operation. This warranty is in lieu of all others, express or implied, and no person or representative is authorized to assume for Tigertronics any other liability in connection with the sale or use of this product. Tigertronics will not be responsible for any expense or loss of revenue or property incurred by the user due to operation or malfunction of this equipment. Tigertronics reserves the right to make circuit or component changes, or to incorporate new features, at any time, without obligation.

- RETURN POLICY -

A Return Material Authorization Number (RMA#) must be obtained before any product will be accepted for return or repair. Items received without an RMA# clearly marked on the OUTSIDE of the package WILL BE REFUSED. Items being returned must be sent prepaid. Returned items should have a note attached showing the RMA#, customer name, return address, phone number, and action requested. Units being returned for warranty repair must be accompanied by a copy of the original sales invoice showing the date of purchase.

Customers wishing to return a product for REFUND, for ANY REASON, must receive an RMA# within 15 days from the shipping date shown on the original sales invoice. Customers returning products for refund will be charged a Restocking Fee equal to 20% of the purchase price, to cover the cost of re-testing and re-stocking. Products that have

been damaged or modified in any way may not be returned. Contact our Technical Support department for the RMA#.

- TECHNICAL SUPPORT -

BEFORE YOU CALL – *The vast majority of technical issues can be resolved with the information that is available in this manual and on the Tigertronics web site. If you thoroughly investigate these resources, you will probably never need to call. Please take some time to read through this manual, and then check the online support resources to be sure that you have the most current software and documentation available. Thank you.*

If you encounter a problem that you cannot resolve with the SignaLink (not software), please contact our Technical Support Staff at (541) 862-2639. **They are available every Monday, Wednesday, and Friday, from 1:00 PM to 5:00 PM Pacific Time**. Be sure to have your equipment available for testing when you call. Please DO NOT mail, email, or fax your technical inquiries. We realize that calling is a little more expensive, but more can be accomplished in a few minutes on the phone than can be done in hours of writing!

- GENERAL SPECIFICATIONS -

Power Supply:	6.75 - 15 VDC @ 13 ma (nom)
Freq Response:	300Hz ó 3.3KHz
In / Out Impedance:	600 ohm
Attenuation:	Radio To Sound Card: Variable Sound Card to Radio: Variable
Auto-PTT™ Delay:	Fast (OUT) ó 30 ms Variable (IN) ó 300 ms to 3 sec
PTT Circuit:	MOSFET Transistor Rating - 15v @ 75 ma (Max)
Radio Connector:	Mic, Spkr, Pwr, PTT - RJ-45 Spkr - 3.5mm Mono
Sound Card Conn:	Mic/Spkr - 3.5mm Stereo
Other Connectors:	Aux. Spkr - 3.5mm Mono Aux. Power - 2.1mm Coaxial
Case:	Extruded Aluminum - 6061T4
Screws:	Stainless steel socket head cap 3/32ö Allen head
Dimensions:	1.1ö x 2.7ö x 3.2ö

Operating Temp: -30C to +60C

Troubleshooting and Detailed Adjustment Procedures

- TROUBLESHOOTING -

These are the most common problems as reported by our Technical Support Staff. If you do not find your problem listed here, or if you are unable to resolve the problem, then please refer to the Technical Support section of this manual for instructions on contacting Technical Support.

Radio doesn't transmit AND the SignaLink's PTT LED is OFF - It is important to remember that the SignaLink keys the radio automatically when it detects transmit audio. If the PTT LED on the SignaLink is OFF, then it is most likely because the signal from the soundcard's speaker output is not getting to the SignaLink, or because the signal level is too low. Please check the following:

- **Sound card not functioning properly** - If you are not sure that your sound card is functioning correctly, then you should perform the soundcard test following this section.

- **Sound card levels set too low** ó Repeat the procedure for setting the sound card audio levels. If this does not resolve the problem, then set the Master Volume control to 90-95% of full volume (instead of 75%), and try again. If a higher volume setting works, then you should find the lowest setting that works reliably, and then have a friend verify that your transmitted signal is undistorted.

- **Soundcards with Digital outputs** ó If your soundcard has digital outputs, then you will need to disable them for the SignaLink to work properly.   Most digital outputs can be disabled by running the software that was supplied with the sound card, and selecting õDisable Digital Outputsö. If you are not sure how to do this, then please consult the instruction book that came with your soundcard or PC.

- **Sound card cables reversed** ó Make sure you have not reversed the mic/spkr cables to the sound card, and that they are plugged into the correct sound card jacks. The Speaker Output jack will be Green if color-coded, and the Mic Input jack will be Red or Pink. Most sound cards are poorly marked so you may need to refer to your computer's manual to verify the correct jack location.

Radio doesn't transmit even though the SignaLink's PTT LED is ON - If the SignaLink's PTT LED turns ON but the radio doesn't switch to transmit, then you have jumpered the PTT signal incorrectly on JP-1. This should not be an issue if you tested the PTT line as outlined in the jumper section. If you find ANY jumper connected wrong then we recommend that you go through the entire jumper installation procedure again.

Radio transmits but there is no power output, or it is too low ó Verify that your radio's õForward Powerö (sometimes called õRF Powerö or õCarrier Powerö) control is set to maximum. If the SignaLink is attached to your radio's Mic jack, then power is normally adjusted using the radios Mic Gain control. If this control is set to maximum and you are not able to obtain the desired transmit power level, then you may need to set the computer's Master and Wave Playback controls higher, and/or adjust the SignaLink's internal õTX Levelö control for more output. If the SignaLink is attached to your radio's Data or Accessory Port, then the Mic Gain control may not have any effect on the power output. If this is the case with your radio, then you will need to set the computer's Master and Wave Playback controls higher (if possible), and/or adjust the SignaLink's internal õTX Levelö control for more output.   You may also need to increase the Data/Accy Port gain on your radio.   If available, this can be adjusted via a menu setting on most newer radios.

My Transmit signal is "wide" or distorted ó This is generally the result of over-driving your radio. Verify that your radio's speech processor/compressor is turned OFF. Your radio's õForward Powerö control (sometimes called õRF Powerö or õCarrier Powerö) should be set to maximum. If you have lowered this control to decrease your transmit power, then you more than likely have not set the audio levels correctly, and are overdriving your radio. Follow the õSetting The Audio Levelsö procedure to correct this problem. If the above mentioned radio controls are set

correctly, then try turning the mic gain down and see if that improves the quality of your signal. If the mic gain has no effect (this may be the case with a Data or Accessory Port connection), then you may have the software PlayBack volume controls, or the SignaLink's TX Level control set to high. See the "Set Audio Levels" procedure to correct this.

The SignaLink transmits when the radio volume is turned up (or tuned to a strong signal), or the SignaLink flutters between Transmit and Receive – This problem is caused by an incorrect sound card mixer setting. To fix this problem, open the Windows Volume Control Panel. Select PlayBack Controls, and check the "Mute" check-box under the Microphone control. Be sure that you disable the Mic in PLAYBACK CONTROLS ONLY, or you will not be able to receive!

I can't seem to receive - There are several possible causes for this problem:

- **Sound card not functioning properly** - If you are not sure that your sound card is functioning correctly, then you should perform the Sound Card Test following this section.

- **The Microphone volume control is not selected -** The "Select" check box for the Mic control (under RECORDING CONTROLS ONLY) should be checked.

- **Sound card or radio level controls set too low** - Because there are multiple controls that effect audio levels, it is very easy to have one set wrong. See the "Setting The Audio Levels" section of this manual to correct the problem.

- **Sound card cables reversed** – Make sure you have not reversed the mic/spkr cables to the sound card, and that they are plugged into the correct sound card jacks. The Speaker Output jack will be Green if color-coded, and the Mic Input jack will be Red or Pink. Most sound cards are poorly marked so you may need to refer to your computer's manual to verify the correct jack location.

- **Computer too slow or incompatible with software. Software not configured properly** - Check the documentation for the program that you are using and verify that your computer meets the minimum requirements. Verify that the program is configured correctly and be sure that you are using it correctly. If all else fails, try using a different program.

Why Can't I Receive Some Stations - No matter how good your antenna and radio are, there will always be some stations that you cannot copy (even with strong signals!). While the reason for this may be because of operator error (wrong mode or baud rate, off frequency, etc.), radio wave propagation problems can often prevent you from receiving. Some modes are more susceptible to this than others. For example, even though PSK31 usually works very well with weak signals, sometimes even strong PSK31 signals cannot be copied at all because of multipath and Doppler Shift propagation problems. Other modes like HF Packet and RTTY do not work well with weak signals and are susceptible to multipath and Doppler Shift.

Windows "System Sounds" cause the SignaLink to transmit – Because the SignaLink is activated by sound card output, it is important that it is turned OFF when not in use. The sounds that are generated by Windows during different system events (Startup, Shutdown, File Close, etc.) can be transmitted if they are inadvertently sent to the SignaLink. Turn the SignaLink OFF when you're done using it, or disable your Windows system sounds to avoid this issue.

- TESTING YOUR SOUND CARD -

If you are having unexplainable problems or are simply not sure if your sound card is working at all, you can use the following test procedure to verify sound card operation. This test uses the Sound Recorder program that comes with Windows to test your sound card's record and playback functions. Before you begin the test, you need to verify that your computer speakers are plugged into the sound card and that all programs that use the sound card are closed.

To test the record function of the sound card, we need to have an audio source connected to the sound card's Microphone input. We will use your radios external speaker output for this purpose. Disconnect *ALL CABLES* from the SignaLink before you start this test.

- Using a mono cable, connect the Speaker or Headphone output of your radio to the "SPKR" jack on the rear of the SignaLink. Be sure to use the jack that's labeled "SPKR" (not the one labeled "Computer - SPKR").

- Using a stereo cable, connect the SignaLink's "Computer - MIC" jack to your sound card's Microphone input jack (not the Line Input). This jack will be Red or Pink if color-coded. Make sure no other cables are connected.

Before we can record a signal, we need to adjust the radio and computer volume controls. Please note that the volume settings used here are for test purposes only. The controls will need to be re-adjusted later using the procedure found in the "Set Audio Levels" section of this manual. For now, adjust the audio level controls as follows:

- Set your radio's volume control to half of full volume.

- Open the Windows Volume Control Panel by clicking on the Start Button and selecting Programs (or "All Programs"), Accessories, Multimedia (or "Entertainment") and then Volume Control. The

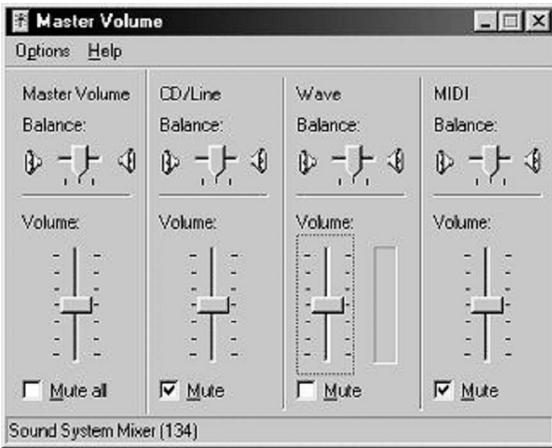Volume Control panel should look similar to the one shown below:

Figure 1 ó Volume Control Panel

- From the Options menu, select Properties to display the Properties page. In the õAdjust Volume Forö window, select Playback.

- In the õShow the following volume controlsö window, verify that the Master Volume and Wave controls are selected. The Properties Page should look like the one shown in Figure-2. Note that the Master Volume control may be labeled õVolume Controlö.
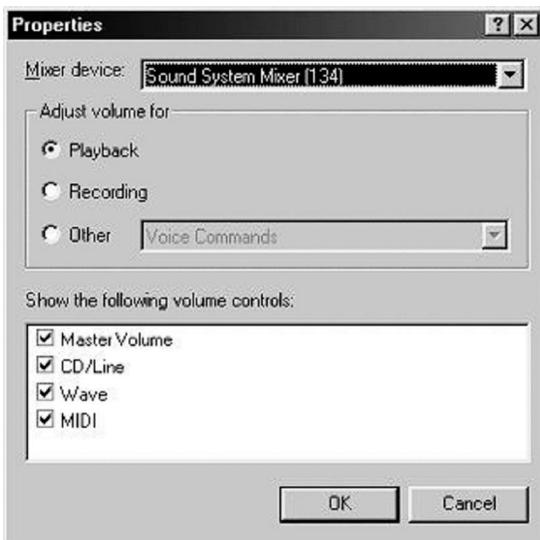

Figure 2 ó Sample Properties Page

- Click OK to close the properties page. The Playback volume controls should now be displayed.

- Set the Master Volume and Wave controls to 1/2 of full volume. Verify that the Master Volume and Wave Level controls are NOT muted. The Balance controls should be left in their center position.

- From the Options menu, select Properties to display the Properties page. In the õAdjust Volume Forö window, select Recording.

- In the õShow the following volume controlsö window, verify that the Microphone box is checked. When you are done, the Properties Page should look similar to the one shown below.
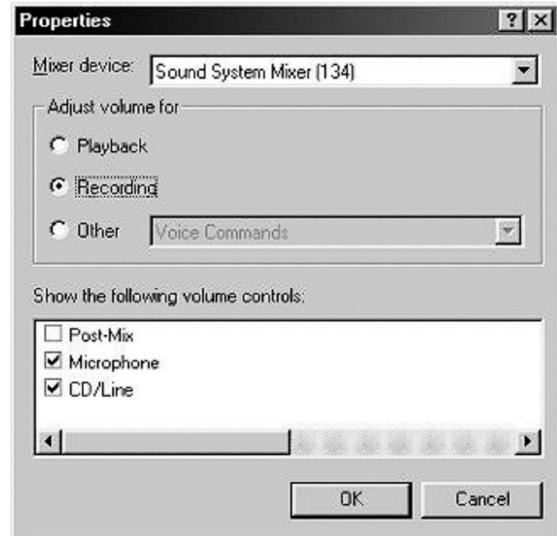

Figure 3 ó Record Properties

- Click OK to close the properties page. The Volume Control panel should now show only the Recording controls, and should look similar to the picture shown below.
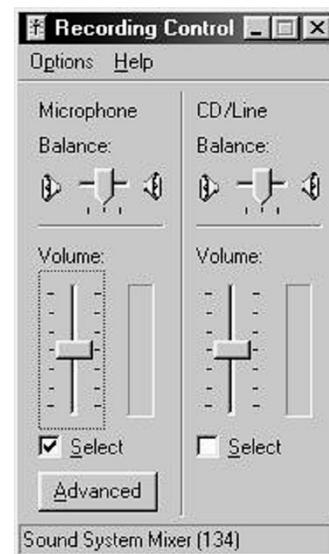

Figure 4 ó Record Level Controls

- Set the Sound Cardøs Master Volume and Microphone Level controls to mid range. Verify that these controls are õSelectedö by the Select check box below each control. If only one level control can be selected at a time, then select the Microphone input.

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NOTE: The Master Volume control may not be available on some computers.

- Click on the X in the upper right-hand corner to close the Volume Control. Your new settings will be saved automatically.

Now that the recording and playback controls are set to a usable level, we are ready to record and playback a test sound.

- Start the Sound Recorder program by clicking on the Start Button and selecting Programs (or õAll Programsö), Accessories, Multimedia (or õEntertainmentö) and then Sound Recorder. The Sound Recorder program should look like the picture below. Note the location of the Record, Stop and Play buttons.

Figure 5 ó Sound Recorder Screen Shot

- To begin recording, click the Record button. If everything is working correctly, you will see the position slider moving from left to right and the Position display incrementing. You should also see the scope display in the center of the program window track the audio signal. If nothing happens, or if you get an error message, then see the "Sound Card Problems" section below.

- If everything appears to be working, then let the program record for a few seconds and then click the Stop button. We now have a test sound recorded that we can play back through the speakers.

- To play the sound, click the Play button. You should hear the sound through your computer speakers. If you do, then you can close the Sound Recorder program. Your sound card is functioning correctly. If you donøt hear the sound playback, then you need to proceed to the "Sound Card Problems" section below.

Sound Card Problems

While Tigertronics does NOT provide support for sound card problems, we have listed a few troubleshooting tips here to help you with some of the most common problems.

If you are unable to resolve a problem with your sound card, then you will need to contact your computerøs manufacturer or a computer repair shop for help.

- If the record and playback features of the Sound Recorder program seem to work, but no sound is ever heard (or seen on the scope display), then check the level controls. You might have one of the volume controls muted, de-selected or set too low. If the volume controls look ok, then check your cabling. Verify that the cables have the right type of connector installed (3.5mm stereo) and are plugged into the right jacks. If you are using amplified speakers, verify that they are turned ON.

- If you receive an error message when you click the Record or Play button, then you need to verify that all other programs that use the sound card are closed. Problems can occur if more than one program tries to access the sound card at one time. If all of the other sound card programs are closed and you still receive an error message when you click the Record or Play button, then your sound card or its drivers may not be installed correctly. Refer to the instructions that came with your sound card (or computer) to re-install the card and / or drivers.

- If all of the Sound Recorder control buttons (Record, Play, etc.) are disabled, then your sound card drivers are probably not installed correctly. Refer to the instructions that came with your sound card (or computer) to re-install the card and /or drivers. Note that it is normal for the Play, Rewind and Fast Forward buttons to be disabled until after you have recorded a sound.

- SETTING THE AUDIO LEVELS - (DETAILED PROCEDURE)

This is a õStep-By-Stepö procedure to assist those who are not already familiar with setting sound card levels using the Windows Volume Control Panel. Before you operate your SignaLink on the air, you will need to adjust the Receive and Transmit Audio levels. Incorrect adjustment of these levels can cause poor reception, over-modulation, or improper operation. This procedure will show you how to adjust your sound card and radio audio levels for optimum performance.

Before you can adjust the audio levels, the SignaLink must be connected to the sound card and radio. Both the SignaLink and the radio should be powered ON and a communications program that you have selected should already be installed on your computer. Note that we will be using the communications program to generate the audio tones that are used to adjust the level controls, so CW programs should NOT be used unless they have a continuous "Tune" mode. A program like DigiPan is ideal.

Transmit Audio

Follow the steps below to set your transmit audio level.

- Start the communication program and leave it in Receive mode.

- Open the Windows Volume Control Panel by clicking on the Start Button and selecting Programs (or õAll Programsö), Accessories, Multimedia (or õEntertainmentö) and then Volume Control. The Volume Control panel should look similar to the one shown in Figure-6.
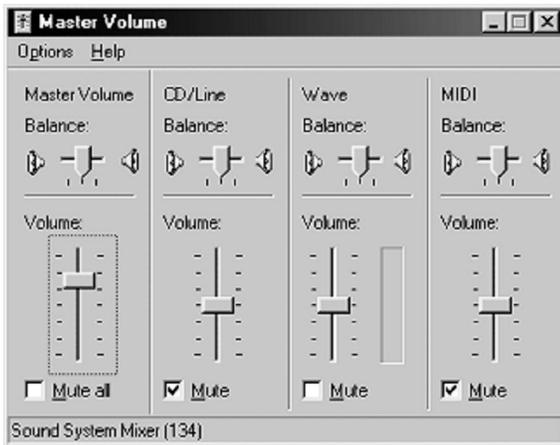

Figure 6 ó Volume Control Panel

- From the Options menu, select Properties to display the Properties page. In the õAdjust Volume Forö window, select Playback.

- In the õShow the following volume controlsö window, verify that the Master Volume and Wave level controls are selected. When you are done, the Properties Page should look like the one shown in Figure-7.

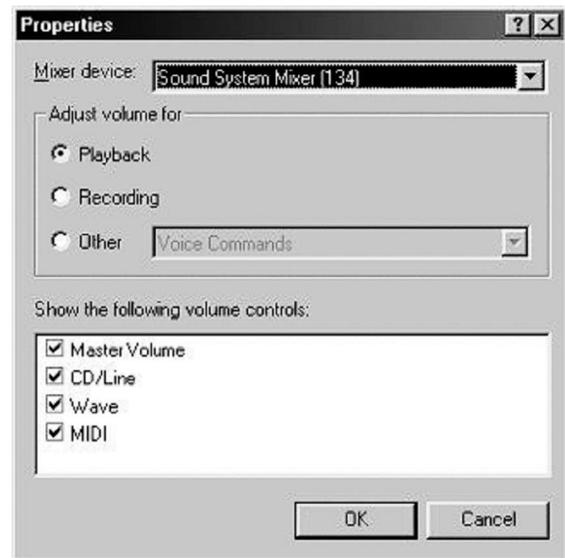 **NOTE:** The Master Volume control may be simply labeled õVolume Controlö.

Figure 7 ó Playback Properties

- Click OK to close the Properties page.

- Set the sound cardøs Master Volume control to approximately 75% of full volume. Set the sound cardøs Wave level control to minimum.

- The Balance controls should be left at their center position.

- Verify that the Master Volume and Wave level controls are NOT muted (check box).

- Verify that the Microphone control is muted. This control MUST be muted. Any other controls that you are not using can be muted to reduce the amount of noise picked up by the sound card, but they do not have to be.

- Verify that all special audio processing features are turned OFF. This includes features like, õBass Boostö, õAudio Expanderö, etc. These features must be turned OFF or they will distort your transmit audio. If available, these features can usually be accessed through an õAdvancedö button on the volume control panel.

- Put your communications program into Transmit mode. If the program has a õTuneö mode, then select it instead.

- The SignaLinkøs PTT LED should be OFF at this point. Now, slowly slide the sound cardøs Wave level control up until the PTT LED turns ON. This õONö point is the absolute *minimum* level needed to switch the SignaLink into Transmit, so we will need to increase the level further to insure reliable operation. Increase

the Wave control to a point about 50% higher than the point where PTT activates.

- If this SignaLink is connected to your radio's Mic jack (see below for Data/Accy Port connections), then you should now be able to adjust the radio's Mic Gain control for the desired transmit power level. If you cannot get adequate power by adjusting the Mic Gain control, then you may need to set both the Master and Wave volume controls higher, or adjust the SignaLink's internal "TX Level" control for more output (see the "TX Level and RX Level Controls" section of this manual). *Be sure to see the IMPORTANT NOTE below BEFORE making final adjustments to your transmit power level.*

- If the SignaLink is connected to a Data or Accessory Port, then the Mic Gain control may not affect power output. In this case, you will need to adjust the radio's transmit power output by setting both the Master and Wave volume controls higher, or by adjusting the SignaLink's internal "TX Level" control for more output (see "TX Level and RX Level Controls" at the end of this section). Your radio might also have a Data or Accessory Port gain control that can be increased (usually through a radio menu setting - check your radio manual). *Be sure to see the IMPORTANT NOTE below BEFORE making final adjustments to your transmit power level.*

- *IMPORTANT NOTE:* Before you set your transmit power level, you need to check your radio manual and find out what the recommended maximum transmit level and duty cycle are. Most digital modes are similar to RTTY (100% duty cycle) and cannot be run at full power without damaging your radio. Also, some modes (like PSK-31) typically only require 25 watts or less for reliable communication. You can actually "swamp" out other users if you use too much power.

Receive Audio

Follow the steps below to set your receive audio level.

- Set your radio's volume control to about 25% of full volume.

- If it's not already running, start the Windows Volume Control program again by clicking on the Start Button and selecting Programs (or "All Programs"), Accessories, Multimedia (or "Entertainment") and then Volume Control.

- From the Options menu, select Properties to display the Properties page. In the "Adjust Volume For" window, select Recording.

- In the "Show the following volume controls" window, verify that the Microphone box is checked. When you are done, the Properties window should look similar to
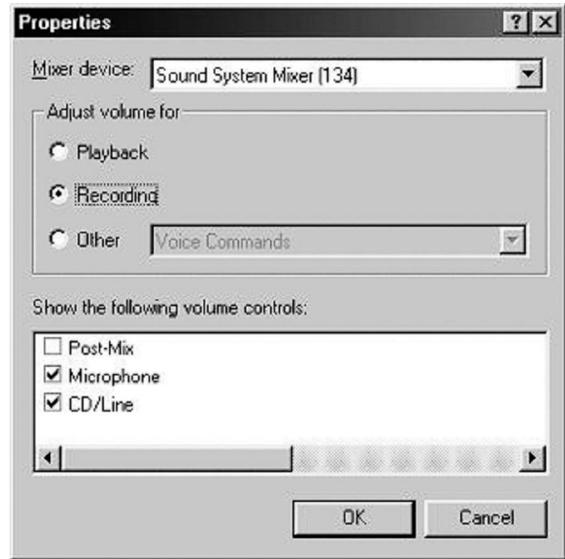
the one shown in Figure-8.

Figure 8 – Recording Properties

- Click OK to close the Properties window.

- The Volume Control panel should now show only the Recording controls. It should look similar to the picture shown in Figure-9.
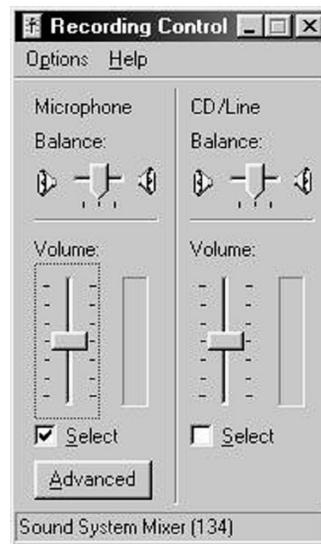

Figure 9 – Record Level Controls

- Set the sound card's Master Volume and Microphone Level controls to mid range. Verify that these controls are selected by the "Select" check box below each control. If only one level control can be selected at a time, then select the Microphone input.

NOTE: The Master Volume control may not be shown.

- The sound card's volume levels are now properly set.

- If the SignaLink is attached your radio's Mic jack, then all further adjustment of the Receive Audio level should be done with the radio's Volume control. If you are not able to get an adequate amount of Receive Audio with these settings, then you can set the sound card Mic volume control higher, or adjust the SignaLink's internal "RX Level" control for more output (see the "TX Level and RX Level Controls" section of this manual).

- If the SignaLink is attached your radio's Data or Accessory Port, then all further adjustment of the Receive Audio level should be done with the sound card's Mic volume control, or the SignaLink's internal "RX Level" control (see the "TX Level and RX Level Controls" section of this manual).

- Click the "X" in the upper right hand corner of the Volume Control window to close it and save your settings.

NOTE: If you are unable to get an adequate Receive Audio level, then please see the Troubleshooting section of this manual for possible causes.

(3/03/06 Rev-C)