

## Radio-SkyPipe Help

# Radio-SkyPipe Configuration

## Setting Up Your Identity

It is important that you provide sufficient information to identify yourself as a Client or Server when using this program. This does not mean that you must provide personal information such as name or address, but the sharing of scientific data has little value if the source is unknown. Your location is important for many types of data, as is the nature of the apparatus used to gather the data.

Identification is configured by selecting Options from the main screen and then selecting the Identity tab.

The screenshot shows the 'Radio-SkyPipe Options' dialog box with the 'Identity' tab selected. The dialog has a blue title bar and several tabs: 'Advanced Logging', 'Servers', 'Sound', 'Timing', 'Misc.', 'Identity', 'Data Source', 'Connection', 'Strip Chart', and 'Logging'. The 'Identity' tab is active, showing the following fields and controls:

- Local Name:** BIRD DEV
- Observer Name:** Jim Sky
- Location:** Papa Hawaii (with a small globe icon)
- Latitude (+/- DD:MM:SS.S):** 19:12:00.0
- Longitude (DDD:MM:SS.S):** 155:45:00.0 (with a 'W' button)
- Time Zone:** -10 (with a checked 'Auto Detect' checkbox)
- Email Address:** radiosky@radiosky.com
- Notes File Name (for inclusion of text info in data file):** C:\Source\WB6\SkyPipe\20mhzdipole.txt (with a 'browse' button)
- Notes File Text ( may be edited here ):** 20.9 MHz dipole 8 feet up.  
Jove Receiver  
See my website at: <http://radiosky.com> (with a 'Save Notes File' button)
- Server Information Text:** This is a test server for development of Radio-SkyPipe

At the bottom of the dialog are three buttons: 'OK', 'Save', and 'Cancel'.

### Local Name

The Local Name is a 20 character or less name which you apply to your computer or observatory. This is a bit like a nickname which others will know you by.

### Observer Name

The Observer name (20 characters or less) is the person responsible for the data and is the ultimate authority for inquiries regarding the observation.

## Location

This refers to the place at which the data is collected. As with other parameters, you may supply more specific information in the Notes File (see below). The limit for Location is 40 characters.

## Latitude and Longitude

These parameters are important for many types of scientific observations. This should be the coordinates for the sensing mechanisms you are monitoring, which is not necessarily the same as location of the Observer. Use the prescribed entry formats of degrees, minutes, and seconds. You may select West or East longitude format using the E-W button.

## Time Zone

All data points are referenced to specific times taken from the computer's clock. In addition, file names reflect the date that the data was collected and this too is derived from the data collection computer. If the computer's clock is set to the local time of the observer, then a time zone offset should be provided so that recipients of the data can reference the time to Universal Time or Greenwich Mean Time. If you set the computer's clock to UT then the offset is 0 (zero), but otherwise the time zone should indicate the number of hours by which the local time differs from UT. Also see [Logging](#) for a description of the Log in UT option. You can have the time zone detected from the computer settings.

## Notes File Name

This refers to a text file which includes other important information you wish to share with others about your observation. This file should be standard ASCII or text as produced by Notepad, for example. You may also edit and save right from this text box in the most recent releases. Keep it as short as possible while supplying the needed information. Use the browse button to select the text file after you have created it. You may use different files for different equipment and observation types. You may also wish to put website and email information here. ***If you do not point this parameter to a legitimate file on your computer, clients will see an error message in their information panels regarding your set up.***

You may include URLs in your Notes area. These will be click-able in Radio-SkyPipe when received. they must have the http:// prefix to be recognized. You can also include the text INTERNETIP in your notes text. This will be replaced by your detected internet IP, thus giving people a way to find sound streams or video, or even a web server located on your PC. Be sure to have a good firewall in place and open only those services that want to be public.

## Server Information Text

This is information about your observation which uniquely identifies its nature for those who are unfamiliar with your Local Name and yet might want to see your data. For example, a person is looking for others who are observing Jupiter noise storms, but does not know your Local Name may want to attach to your information stream if she/he sees *Jupiter at 24 MHz* in your Server Text Information. Keep this short. I will appear in the drop-down list along with your Local Name for all on-line users in Client Mode.

## Email Address

This is the email address of the observer or observatory.

Clicking **Save** makes your selections the defaults for the next time you start the program.

Clicking **OK** simply changes the settings for the session you are in.

Clicking **Cancel** discards any changes and takes you back to the main screen.

### **A few words about credibility and ethics.**

Most amateur scientists are hobbyists who greatly enjoy learning and sharing with others. Amateurs and students can occasionally make significant contributions to the growing body of scientific understanding. Your openness and willingness to share your methods as well as your data are very important if you wish to take part in this process. Faked data and hoaxes, hurt everyone. A few bad seeds ruin the reputation of many. Please be careful and rigorous in your contributions.

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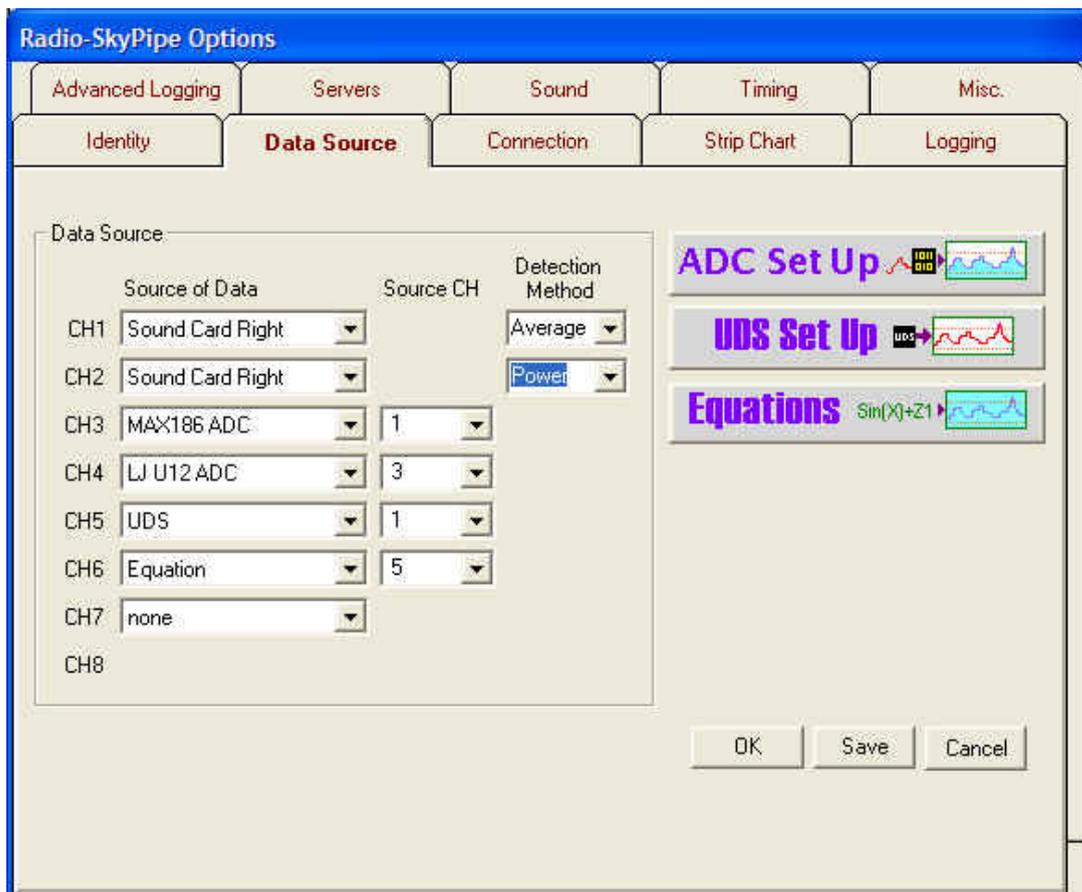
## Radio-SkyPipe Help

# Configuring Radio-SkyPipe

## Data Source

### General Information

The idea behind this program is to share real world data with others. This could be temperature, radio signal strength, seismographic data, just about any physical parameter which fluctuates over time. In order to do this, the continuously changing physical parameter must be converted into a series of measurements. The Data Source options page determines the source of the data that will be displayed in each strip chart channel. Data can be taken from several different sources as determined in each channels Source of Data drop-down list.



Currently the following pre-defined data sources are:

- Sound Card Left
- Sound Card Right
- MAX187 ADC
- MAX186 ADC
- LJ (LabJack) U3 ADC
- LJ U12 ADC
- UDS (User Data Source)
- Equation

The last two entries, UDS and Equation, are only available in the Pro Version of Radio-SkyPipe. Also the Free version is limited to a single channel so options will not appear for CH2 to CH8.

Actually there is one more item on the list; "**none**". *When more than one channel is desired, select data sources for consecutive channels starting with channel 1. The first occurrence of a **None** selection in the list will stop the program*

from searching for additional data sources and will ultimately determine how many channels you are charting.

## Sound Cards as a Data Source

The sound card has the ability to make this conversion to signals which are input to it through the line input or microphone jack, but it only works with rapidly vibrating signals like sounds. If you want to sample sound volume, the sound card is a good option as most PCs have one and there is nothing else to build or buy. If you need to measure a slowly varying voltage, as might be derived from a temperature sensor for example, you will need to use one of the ADC options unless you convert the voltage to rapidly varying signal that the sound card can detect. There are several ways to do this. [If interested visit here.](#)

R-SP Standard Edition users may use only one channel of the sound card for data collection and serving. Pro Edition users can take advantage of both channels and input a different sound signal to each channel. This might be used, for example, to display the audio outputs of two receivers set several megahertz apart in frequency. If two different channels of information are to be displayed from the sound card it is important to choose a Stereo sound format. This issue is discussed on the [Sound options page help](#).

There are three detection methods to choose from when you use a Sound Card data source. Very briefly they are:

1. Peak - the highest value retrieved in the sample period from the sound card.
2. Average - the arithmetic average of the absolute values of all of the samples collected in the sample period.
3. Power - the average of the squares of all of the samples collected in a sample period.

To read more about the detection methods and [how the data is derived from the sound card visit this page](#), but for now understand that a detection method must be selected in association with each Sound Card data source.

## Analog to Digital Converters as a Data Source

Other types of measurements can usually be converted to a voltage and that voltage can be read by an analog to digital converter (ADC). There are hundreds of these devices available and no data collection program can use them all. Originally, I decided to support just two ADCs with Radio-SkyPipe. These devices are inexpensive and simple to build. . We have plenty of [documentation on how to build the MAX187 ADC](#), the single channel unit, right here on our website. The MAX187 ADC connects to your printer port.

You may also use the first channel of a MAX186 8 channel, 12 bit ADC with the Standard Edition of R-SP. Pro Edition users may use all 8 channels for data collection and serving data. The 8 channel ADC can build the unit from a kit. As with the single channel unit, there are [plans for constructing the 8 channel ADC](#) on this website .

Beginning with Radio-SkyPipe II, there is now support for two popular ADC units form LabJack. The LabJack U3 and older U12 devices both interface to the computer via a USB connection. There are a bit more expensive than the MAX units mentioned above (a bit over \$100 USD), but have a great deal of flexibility including outputs that allow you to control relays or other devices. When combined with the Trigger capabilities of Radio-SkyPipe II a control system for various real world applications can be developed.

When you select an ADC device (other than the single channel MAX187), you also need to select which channel of the ADC to feed to the strip chart data channel. When appropriate a drop-down list appears under the Source CH column next to your ADC selection. You might for example chose to map the data from the LJ U12 channel 4 to strip chart channel 5 as shown in the example image above.

Each type of ADC has its own configuration panel that may be accessed by pressing the Set Up ADC button.

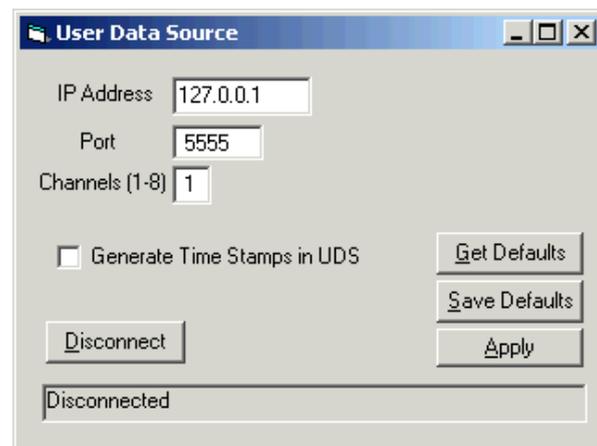
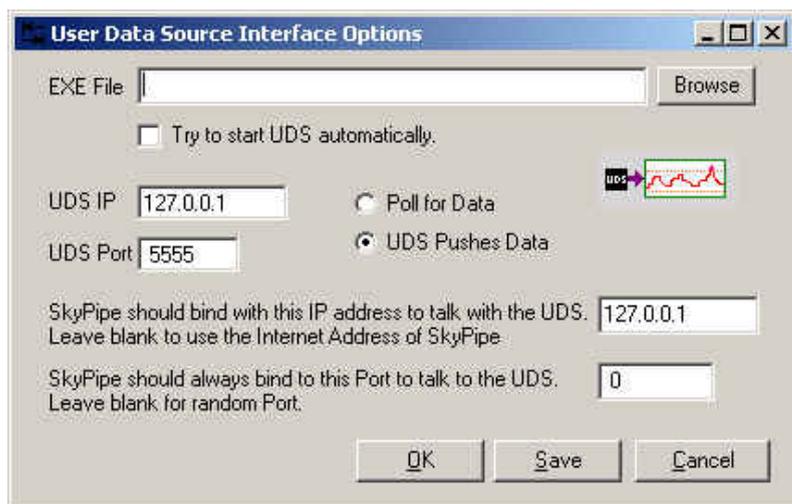


## User Defined Data Source

The [SkyPipe UDS Model](#) opens the possibility for a wide array of devices to act as data sources for the program. **This is a Pro Version feature only.** Select the User Defined radio button. Press the **UDS Set Up** button



to configure the connection with the the UDS.



*The IP and Port Address on the UDS must match that used by RSP11*

Browse for the UDS executable file that will act as the data source or enter the file name and path manually. Select Try to start UDS automatically if that is what you want to happen. If the UDS executable occurs on another PC and will be accessed via a network, it may not be possible to start the UDS program remotely and other arrangements for starting it may be necessary. All UDS programs communicate with R-SP via a TCP connection and TCP must be installed on your PC to use a UDS even if the UDS occurs on the same PC as R-SP. Select **Poll** or **Push** data depending on your preference (see the UDS model documentation for an explanation). Local TCP and remote TCP parameters should be entered.

## Equations as Data Sources

Pro users may also use the result of an equation as a data source. You may select from the 8 possible equations you have written using the data source drop down box. Because equations may refer data in other channels, it is not necessary that the channel have any other source of external data. For example, your channel 3 data source could be an equation that multiplies the data from channels 1 and 2. It is even possible to have an equation data source that has no external source of data and is based purely on a function applied to random numbers, or the current sample number, or part of a day. To go to the [Equation Set Up](#) panel press the **Equations** button  on the lower right to reach the panel where you may write and apply equations.

Clicking **Save** makes your selections the defaults for the next time you start the program.

Clicking **OK** simple changes the settings for the session you are in.

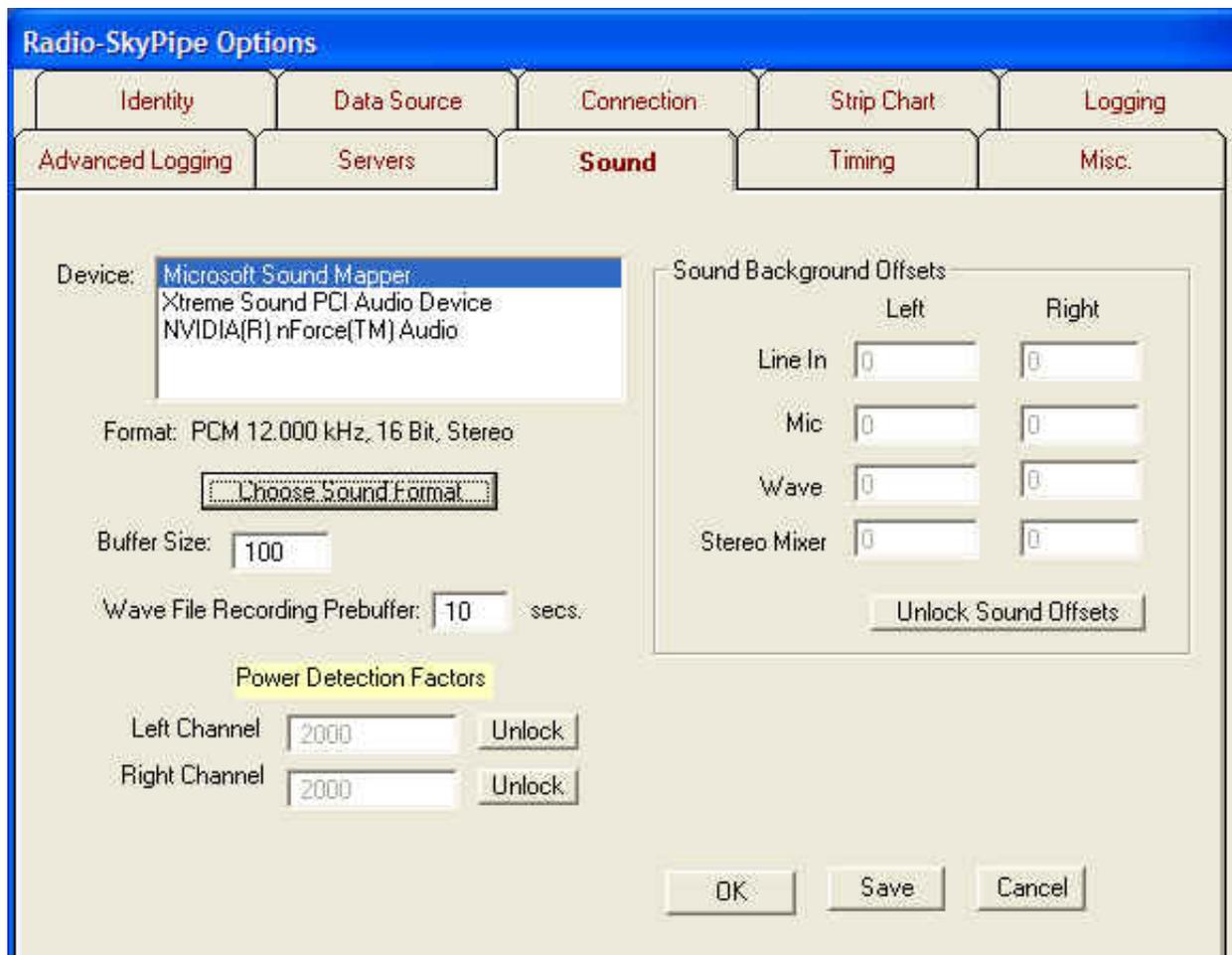
Clicking **Cancel** discards any changes and takes you back to the main screen.

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# Radio-SkyPipe Configuration

## Sound Card Options



Configuration of most sound parameters occurs on the Options / Sound panel. There are several options associated with the sound card. These parameters support the three main functions of the sound card in Radio-SkyPipe II:

- Sound envelope data recording in the strip chart.
- Recording of the raw sound data in wav format.
- The use of the sound card as a timing source for consistent spacing of samples.

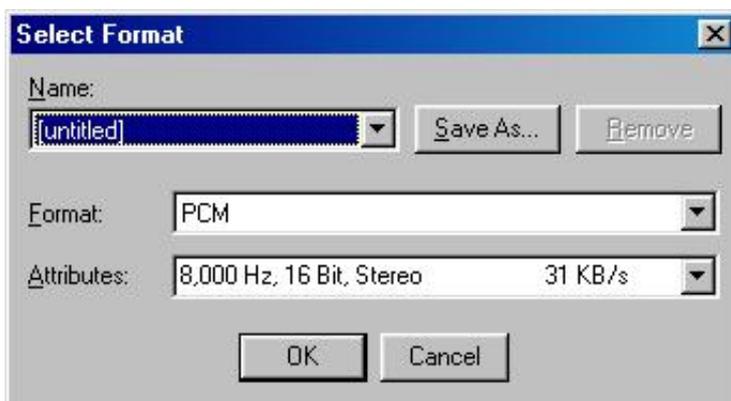
### Select a Sound Card

Radio-SkyPipe supports the use of multiple sound cards on a computer to the extent that it allows you to select which sound card to use when more than one is present. Radio-SkyPipe will only use one of the cards, though. That is, you could not use one card for the first two channels and a second card for the next two, for example. Available devices are selected from the Devices list box as shown above. Note there are three entries in this device list. The first entry, **Microsoft Sound Mapper**, is not really a sound card but rather is a

virtual device that maps to whatever sound card you have chosen as your default audio device in the Windows Control Panel Sound and Audio Devices applet. The following two cards really do exist on my PC.

### Select a Sound Format

You must then select the sound format which includes the sampling rate, mono vs. stereo, etc. This is done via the dialog box obtained by pressing the **Choose Sound Format** button.



The Select Format screen allows you to choose from the registered sound formats on your computer. However, not every format will work for you. For most purposes it is suggested you select **PCM** format. In the Attributes selection list you will find a variety sampling rates 16 bit vs. 8 bit, and stereo/mono options. Radio-SkyPipe is designed to work with 16 bit sound cards so never select 8 bit. Higher sampling rates are used for high fidelity recordings and are generally not needed. Higher sampling rates can degrade the performance of R-SP and take much more drive space when being saved as sound files. The suggested rates are 12000 or 11025 Hz. Use stereo when using 2 channel sound data collection (Pro Edition users only). In addition to the effects that choosing the appropriate sound format has on data collection, the selected format will be used for recording wav files (Pro Edition only).

You may give your sound format selection a readily identifiable name (such as "SkyPipe Format"), and save it so that it will appear in the "Name:" drop-down list for easy selection.

**Buffer Size** - This option can be ignored when using the Sound Card as the Timing Source as the buffer size is then calculated automatically. When the program samples the audio signal passing through the sound card, it does so in little chunks. These groupings of sound card readings are kept in a Buffer. When the Buffer is full, it tells the program to "read me!", and the average value of the samples in the Peak Buffer is saved as a single data point on the strip chart. What this means to the observer is that you can adjust the coarseness of the audio sampling. If the Peak Buffer Size is too large, you will not be able to use an rapid sampling rate. The suggested Peak Buffer Size for most uses is 100 to 1000.

### Wav File Recording Prebuffer

Radio-SkyPipe II can record wav files from audio being processed by the sound card. The Wav File recorder is designed for situations when the observer is present as well as unattended observations. When the observer is present he or she may record sound files of events as they occur. Reaction time when pressing the record button necessarily means that some of the sound event you want the record has passed by the time you start the recording. The wav file recording prebuffer solves this annoying problem by maintaining a circular buffer of the incoming sound. If you set the prebuffer to a length of 10 seconds for example, then when you press the record button the recording will also include the 10 seconds of sound that occurred prior to pressing.

### Power Detection Factors

When using the Power detection method with a sound card data source, a factor may be applied to scale the

output to some meaningful units. You need not worry about this factor unless you are calibrating the input. Calibration for simple radio sound output can be achieved using the Jove Calibration Wizard found under the Tools menu. [Read about detection methods here.](#)

### **Sound Background Offsets**

Some sound cards output a continuous value or a noise signal even when no signal is being processed by the card. This signal can produce significant errors in some times of data collection, especially those that use power detection where the soundcard output is squared. You can test your sound card for this issue very simply by creating a strip chart with no input to the sound card (by unplugging the line In, for example). If the resulting chart is close to 0 then there is no problem. If the result is above perhaps 20 or 30 then you might want to offset this value. This can be done manually or using the Sound Background Null tool. More information is contained on the help page for that tool.

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## Radio-SkyPipe Help

# Measuring DC with a Sound Card

Sound cards have built-in analog to digital converters. Why then can't we place a DC voltage across the Line In jack of a sound card and measure it? You can't do this because sound cards are designed to capture AC voltages and have a capacitor in series with the input. AC voltages can pass through the blocking capacitor but DC voltages cannot.

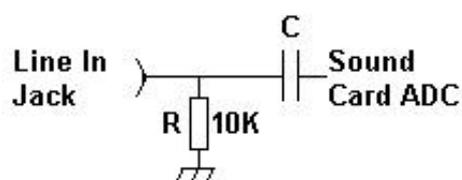


Figure1. Sound Card Input.

The figure above shows a “typical” sound card input, though there are many variations. There is often a resistor across the input forcing an input impedance of around 10K. C prevents passage of DC to the amplifiers and analog to digital converters that make up the sound card input. Some experimenters have managed to place a jumper across the blocking capacitor to allow DC to reach the sound card. However, this does not always work as the following circuitry contain other AC blocking components or may be adversely affected by the new DC path to ground at its input. An interesting article on this type of modification may be found at:

<http://www.qsl.net/om3cph/sb/dcwithsb.htm>

Another approach to using the sound card to measure DC voltages can be had by adding some circuitry that converts the DC signal to AC. The amplitude of the AC signal needs to be proportional to the DC signal and this might be had by “chopping”, that is turning off and on, the DC signal. You need some sort of oscillator to operate a switch that accomplishes this chopping function.

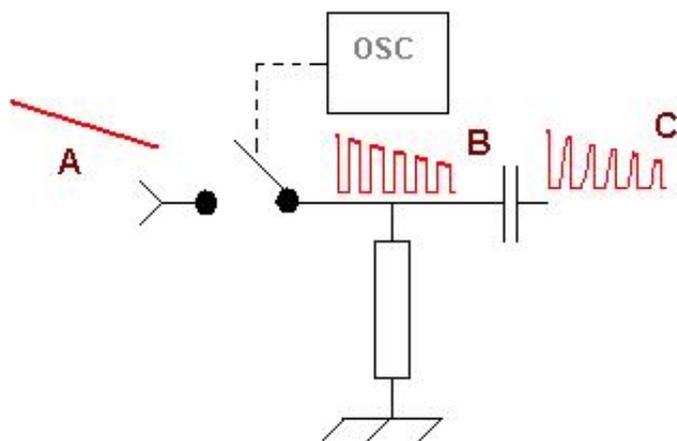


Figure 2. Basic Chopper.

In Figure 2. we see a slowly changing DC voltage applied at A (red). This voltage gets interrupted by a switch that is toggled by an oscillator. The resulting wave is very similar to a square wave shown at B. After passing through the blocking capacitor to the sound card the waveform can become a little distorted due to the filtering imposed by the resistor and capacitor, however, what is most important is that the resulting chopped signal is proportional to the applied DC voltage.

My vote for the best chopper circuit around is the [Cheap Chop](#) by Marko Cebokli. The Cheap Chop incorporates a single, inexpensive 74HC4066 quad switch integrated circuit and a few resistors and capacitors to make a two channel chopper. The circuit works very well. It is simple enough that it would make a good beginners electronic project.

Marko also offers a small C program for Linux users that reads the sound card signal, filtering it for the chopped frequency before extracting the voltage. The advantage of using bandpass filtering in the software is that it reduces any effects from extraneous noise. The disadvantage is that the oscillator must keep within the filter's bandpass or the result will be less than optimal.

Other circuits are of course possible, for example you could use a 555 timer for an oscillator and an FET for a switch. It occurs to me that if you have a full duplex sound card you play a square wave tone to the sound output and use that to turn off and on the FET switch, though I have not tried that. Really, the hardware is so cheap and simple it makes sense to stick with it.

One interesting possibility is that you could chop the DC signal and send it via FM radio to a remote data logging point where it would be demodulated and sent to the sound card.

You can read the chopped DC signal using [Radio-SkyPipe](#). With the Pro version of Radio-SkyPipe you may apply a function to the incoming signal to convert the data to a voltage reading. For reading voltages this way I would suggest using the [Averaging Detector](#) under Options / Data Source. The oscillator frequency used by the chopper should be well below the sound card sampling frequency.

There is a down side to using the sound card this way. You won't be able to use the sound simultaneously to listen to other things. You can, however, purchase sound cards for less than \$10

on ebay. You could use multiple sound cards. Radio-SkyPipe allows you to select from multiple cards for input.

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# Sound card based multimeter

Updated Dec 25, 2008; program updated Dec 28, 2008.

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## Preface

PC sound card, standard component of practically all current personal computers, consists, in minimum, of two parts:

- mixer
- A/D converter

Those parts are usually doubled as all sound cards are two channels - e. g. stereo devices. They may contain other parts, but from the point of view of analog to digital (A/D) signal processing they may not be as important.

**Mixer** is device joining analog signals from different signal sources into one which is delivered to A/D conversion. Important feature of current mixers is full software control of gain and level of all channels.

**A/D converter** is usually high precision 16-bit analog to digital converter with maximum sampling rate 44.1 kHz, or 48 kHz.

All (4 ;-)) sound cards we've tested and analyzed have the same feature - all their line-in inputs (and others too) are insulated from DC input by condenser. The reason is, clearly, to set zero level of processed sound signal stable and close to zero. This is, however, a strong limitation for other use, for example for DC measurements.

The situation, fortunately, is not so bad as it seems...

## Results of SB analysis

We've analyzed, with a good magnifying glass and ohmmeter, LINE IN inputs of four different sound cards - three from Creative Labs, one from Manli:

- SB16 (PCI), model CT4810(?),
- AWE-64 (IDE), model 4520,
- Audio PCI 5000 (PCI), with chip ES1371,
- Manli CMI8738SX (PCI)

Inputs of SB16, Audio PCI5000, AWE-64 and CMI8738SX, respectively, are on the Fig. 1.

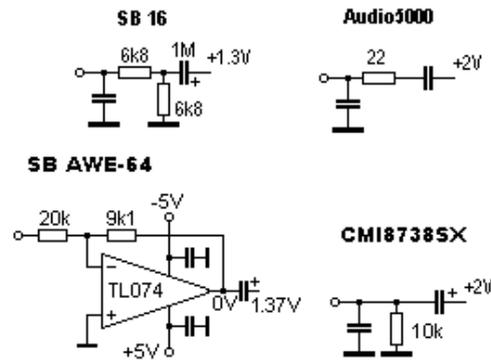


Fig. 1: SB16, Audio PCI5000, AWE-64 and CMI8738SX LINE IN inputs.

As it can be seen, three inputs are very simple. Input of AWE-64 is a bit more complicated. It contains standard FET operating amplifier, but not condenser at the input. The condenser is at the output, however...

All four sound cards have DC default level at mixer input significantly high. The values displayed don't reflect reality. It was found, that it is close to 2.5V. Direct connection of external DC is not applicable. Is there a solution?

### Possibility of DC input solution

There exists well known application of operating amplifier - differential amplifier. It's schematics (Fig. 2) is quite simple.

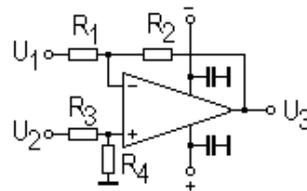


Fig. 2: Differential amplifier.

The output is joined with inputs by the formula:

$$U_0 = U_2 \frac{R_4}{R_3 + R_4} \left(1 + \frac{R_2}{R_1}\right) - U_1 \frac{R_2}{R_1}$$

The analysis of the formula shows, that at the output there can be defined DC level even in the case that  $U_2$  will be zero - provided appropriate signal will be delivered as  $U_1$ .

A brief inspection of Fig. 1 shows, that AWE-64 already has operational amplifier. Good new! It is candidate No. 1. Assumed changes will be negligible.

### Result

#### What is needed:

- disconnect noninverting input from ground,
- make tunable source of  $U_1$ , one for both channels should be enough,
- with a piece of wire make a shortage between condenser pins,
- with running PC tune  $U_1$  to get appropriate DC level.

To make small board with operating amplifier and a few other components is possible too. It is only solution for the rest three sound cards (and the majority of others).

The resulting schematic is on Fig. 3.

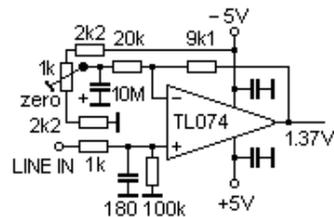


Fig. 3: AWE-64 input modification.

It works fine. With the device we did a few measurements. It was found that the maximum sensitivity is approximately +/- 100 mV. Based on +/- 5 V power it can be assumed that maximum input DC signal will be approximately +/- 2.5 V. Higher voltages must be decreased by hardware divider.

With operational amplifier on small PCB we checked SB16 and CMI8738SX too. The final version had been made with CMI8738SX Manli sound card. Only reason for selection was that it was cheapest and is currently available. Additional to Fig. 3 the schematics contains -5V chip, as sound card has none.

The rest are a bit older models. The results of all sound cards were comparable.

The solution is not limited to AWE-64 and comparables. It seems any sound card can be modified provided small PCB with operational amplifier will be added. At the beginning AWE-64 was chosen only due to fact it already has the (pre)amplifier. However for the final solution it was not suitable - in between mother board of home computer changed and ISA slot gone...

### The final solution

To test, and even to use the device, one needs some useful program. As a first choice we decided to get Konstantin Zeldovich's [Winscope](#). It is complete, sophisticated and ... free. However, its use for more serious job is not very easy as it doesn't contain calibration feature and, what's most important, it doesn't allow AC/DC V/A measurements with numeric output.

To meet our needs we developed original program. It is two channel:

- oscilloscope,
- AC/DC V/A meter,
- frequency meter,
- VU-meter

with possibility to save data in the form of regular WAV file or as a CSV (comma separated variables) data file, which is easily analyzable with majority of current spreadsheet programs.

### Hardware

To make it a real multimeter we equipped the device with manual range switch. Its construction is very simple:

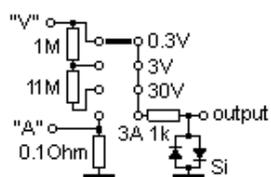


Fig. 4: Manual range switch (one channel only).

The resistors used are standard ones, e. g. no special selection is needed - calibration will ensure the final accuracy. Resistor 1M is standard 0.25 W resistor, resistor 11M is old 0.5W one from stock. It may be difficult nowadays, far from vacuum tubes era, to get one. But who has stock... Anyway, it can be any in the range 5 - 15M, serial combination of smaller resistors too... Resistor 0.1Ohm is a small piece of some resistive wire of unknown origin (maybe from car power controller?) from the same stock.

No special components were used. Dual switch was constructed in small metal box with input bushings. It is connected with LINE IN input by standard shielded stereo cable. Switch takes very little space at the table, PC sits near the table, so no change in the organization in the room was needed.

### Software

It was created [program](#) to use all information available. It is quite complex one. As it can be seen from Fig. 5, it is dual beam oscilloscope-like device combined with AC/DC multimeter and frequency meter.

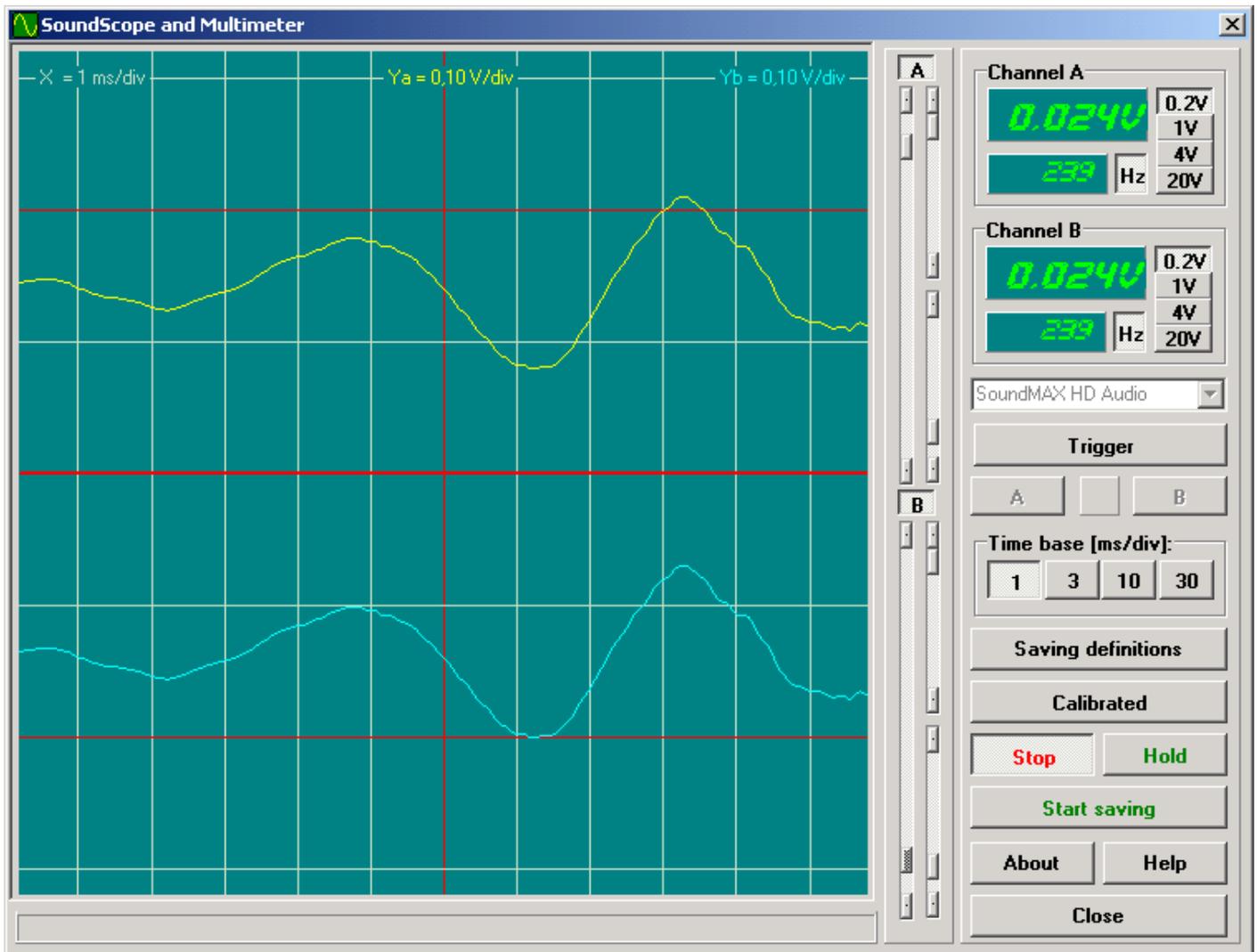


Fig. 5: Soundscope main screen.

Soundscope screen has the following parts:

1. scope window
2. channel controls panel
3. multimeter & controls panel

The scope window has:

- width 11.6 ms or 92.9 ms depending on sweep range selection (see below),
- height +/- 3 depending on range switch selection (see below),

Single click on scope window activates image save dialog - it allows to save screen shots. Currently supported are BMP, GIF and JPG formats.

Below the scope window there is status bar displaying (sometimes) status messages.

Panel of channel controls on the right side of the scope window contains 2 identical sets of controls for each channel - A and B - (from left to right):

- zero level
- gain
- trigger level (below gain control)

All three controls influence **only** scope display. Calibration assumes gain set at maximum level.

Multimeter & controls panel contains (from top to bottom):

- multimeters
- sound device selector
- trigger control
- time base control
- operation controls

Multimeter window contains two displays - larger and smaller ones - larger one displays voltage/current or raw data depending of calibration/raw data button status. Smaller one displays frequency in Hz.

At the right side there are range switch buttons. They are active only if soundscope is calibrated.

AC measurement is enabled by "Hz" button. When pressed, both windows - multimeter and frequency - display AC values.

Below those multimeters there is sound device selector.

The trigger control group consists of (from top to bottom):

- triggering enable/disable
- channel A or B selection
- indicator of active triggering (yellow=active)

Time base control contains 2 buttons in group:

- fast - 1 ms/div
- slow - 10 ms/div

Data saving definition button opens small window for data saving options:

Fig. 6: Data saving definition screen.

It can be selected continual saving into regular WAV file format or timed sample data saving into special text file (CSV). Sampling period, capturing time and data file name can be set.

Right lower corner contains by control buttons:

- calibrated/raw display button
- start/stop button
- hold/release button
- start/stop data saving button
- about
- help
- program close

## Description

Program was created using Borland Delphi 6. No shareware or commercial libraries or components were used. To control mixer it was used excellent free mixer component developed by Vit Kovalcik. To display numeric values nice it was into Microsoft Windows installed LED display font - [NI7SEG.TTF](#) found somewhere on the Internet.

All copyrights of the program are owned by the authors. The noncommercial use of the program is free of any charge. All other use must be consulted with the authors.

Program runs under Microsoft Windows 2000, XP and 98. It successfully runs at AMD K6-2 333MHz/64MB RAM. It may have problems on slower old machines.

Program is based on LINE IN inputs use. It is set to use two-channel 16-bit A/D conversion at 44.1 kHz sampling frequency.

Buffer size of the input sampling is 4096 samples, e. g. measurement frequency is 10.7 measurement per second.

Due to low sound card sampling frequency the highest frequency of the acceptable processed signal is around 10kHz. Higher frequencies are processed too, but the AC accuracy drops down.

Anyway DC measurements can be quite accurate, depending on calibration accuracy, of course and sound device A/D converter quality.

The main domain of the device use should be, except of use as standard multimeter, DC and low frequency AC measurements.

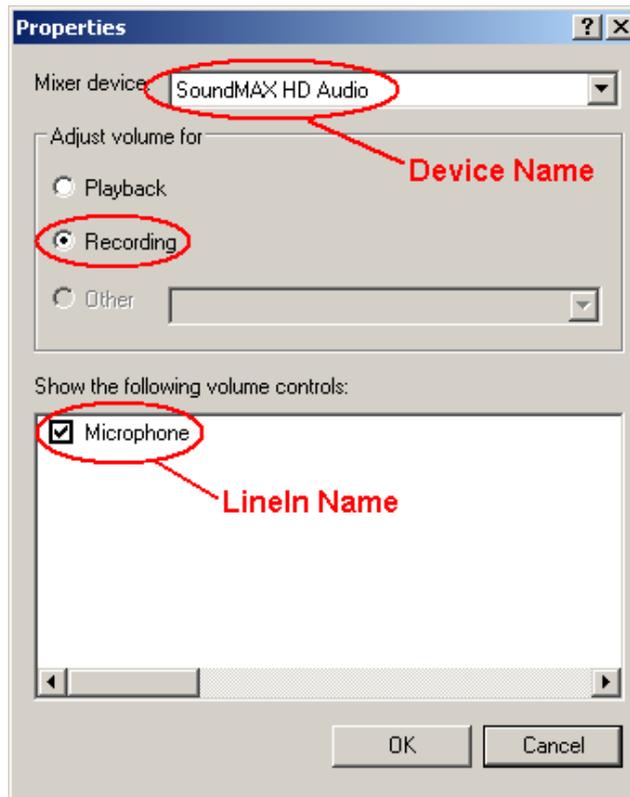
AC amplitude measurements are achieved by software rectifying - the value displayed is close to effective value of the AC signal.

Frequency measurement is achieved by periods count measurement. As the measurement is sampled by 1/44 100 s, it is also measure of the frequency display accuracy. The smallest measurable frequency is around 20Hz.

Triggering is derived from channel A or B. There is no possibility to have triggered both channels. Triggering level can be set. Trigger level is not dependent on display zero level. Currently only positive levels can be set.

As the signal is sampled, e. g. not continual, the resulting triggered display is usually not fully stable.

Successful use of the program expects proper sound card setup. It is accessible via MS Windows Control panel -> Sounds and Multimedia -> Audio -> Recording setup. For more details check Microsoft Windows help.



An example of sound recording setup parameters.

As personal computers can have more than one sound card, proper card selection and setup is prerequisite.

Hardware modification described in this article, provided properly set, does not influence sound card standard features in any way. The modified card can be still used the standard way.

### Calibration

Since the soundscope can be used as no calibrated, it's not its goal. To use multimeter functions it is necessary to calibrate all ranges.

Before calibration is started, it is suggested to measure linearity and sensitivity of the LINE IN input. It can be easily done using voltage calibration circuit described below.

To calibrate soundscope properly it is needed to prepare:

- variable voltage/current source 1 to 15V DC/1A,
- good potentiometer,
- good multimeter, preferably digital one,
- manual range switch properly set and connected with LINE IN input of sound card.

Calibration is three steps process. It consists zero level calibration, sensitivity measurement and measurement ranges calibration, which consists of three identical steps to calibrate voltage ranges and one step to calibrate current range (if used).

First step is zero level calibration. It requires disconnect any external voltages from inputs and connecting both ones with ground. Soundscope is switched to **Raw data** mode. Average value is read for each channel and written into program INI file.

Second step is sensitivity calibration. It requires connecting potentiometer with external DC voltage to both inputs. Soundscope is switched to "Raw data" mode. Potentiometer is set to minimum and slowly turning to get signal as close as possible to red line above (or below) zero line. Voltage required and average raw value is read for each channel and written into program INI file. There is only one value for both channels. They should not differ in sensitivity, however.

To calibrate voltage ranges one is expected to use circuit according Fig.7. Use of regulated power source is very convenient, anyway the calibration can be sufficiently done using batteries as power source. In this case small lamp should be used to limit current.

Current range is calibrated with the help of circuit on Fig. 8. It should be noted, that ground bushing is not used. This is possible only if the power source has ground insulated from common ground. If it is not available, battery with lamp should be used.

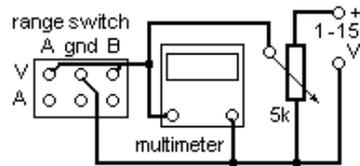


Fig. 7: Voltage calibration circuit.

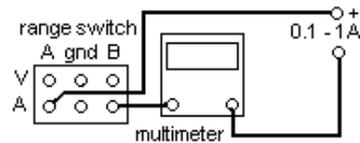


Fig. 8: Current calibration circuit.

Calibration process expects to switch Soundscope to **Calibrated** mode and have all CalFactorR, CalFactorL values in INI file sections [Range1].. [Range4] set to "1". Calibration process contains following steps:

1. select measurement range on range selector (the same in both channels)
2. set corresponding range on manual range switch
3. bring external voltage/current to inputs
4. set voltage/current level to be exactly identical with range switch value
5. read voltage/current values displayed on both displays
6. calculate CalFactorR, CalFactorL values and write them to INI file

Example:

DC input: 0.2V

Display A: 0.192V

Display B: 0.211V

$$\text{CalFactorR} = 0.2/0.192 = 1.041666667$$

$$\text{CalFactorL} = 0.2/0.211 = 0.9478672986$$

### Program INI file

Program doesn't write anything to the MS Windows registry anymore. All required information is now stored in the INI file. It is standard ASCII text file. To change values in the INI file it is expected to use ASCII editor, Windows Notepad is good enough. Use of Winword may produce non-ASCII file and program will crash.

Program INI file name is soundscope.ini and it resides in the same directory as program file. It has following structure:

[Program]	
Debug = 0	If set to "1" it activates program log creation
XPLook = 0	for "classical" Windows theme use "0", for parrot-like XP theme use "1"
[Devices]	
Device Name = C-Media USB Headphone Set	Selection of sound device to use, if not found, first one available will be used instead.
LineIn Name = Microphone	Exact name of input channel to use. Can be found in Control panel - Sounds and Audio Devices settings. It is very important to set correctly, otherwise program will not work
[Calibration]	
Zero left = 0 Zero right = 0	Raw average values of each channel
MaxLevel = 12480	
MaxVoltage = 0,117	
[Range1]..[Range4]	
LabelL = 0.2V, LabelR = 0.2V	Range for channel A and B respectively. It is both label for range switch and internal calculations parameter.
CalFactorR = 1 CalFactorL = 1	Correction calibration factors. Before calibration is done it is "1", after calibration it changes. Never set "0", otherwise program will crash.

[Capture]	This section contains parameters written by program alone. Don't change any of them.
NameOfFile = captured.csv	
SamplingType = CSV	
CaptureTime =60	
SamplingPeriod =1	
TimeMeasure = min	
[Visible]	This section contains labels used for display. Translation to other language will translate user interface.

### Notes for construction

There are no special components used, except 11M resistor in switch. However silicon diodes at the input should be fast ones and should have very high resistivity. 1k resistor conducting signal to them and LINE IN should be **as small as possible** - its function is to be fuse. It should burn to prevent the input from overloading. Diodes should bear the "burning" current, of course.

For soldering at the sound card microsolder is needed. Transformer solder must be avoided. A good lens or glasses and a certainty in hand may be needed too...

Be careful when disconnecting input pins from ground (provided sound card has preamplifier already). SMD chips are quite fragile!

We glued small piece of universal PCB carrying additional components close to the LINE IN input. All joins we did with insulated thin copper wires.

The overall view of the experimental prototype can be seen on Fig. 9.



Fig. 9: Prototype view.

### Features summary

sampling frequency	44.100 Hz
measuring frequency	approx. 10.7/s
measuring ranges	0.3, 3, 30V and 3A
accuracy	better than 1% <sup>*)</sup>
type of measurement	AC and DC
maximum input frequency	22kHz
working input frequency range	20Hz - 10kHz
input resistance on voltage ranges	333kOhm/V (100k, 1.1M, 12.1M)
input resistance on current range	0.1Ohm
data saving file format	WAV or CSV
sampling times	continual, 1/4, 1/2, 1, 15s, 1, 5, 15, 60min
saving time range	1s - 9999min <sup>**)</sup>

<sup>\*)</sup> depends on calibration

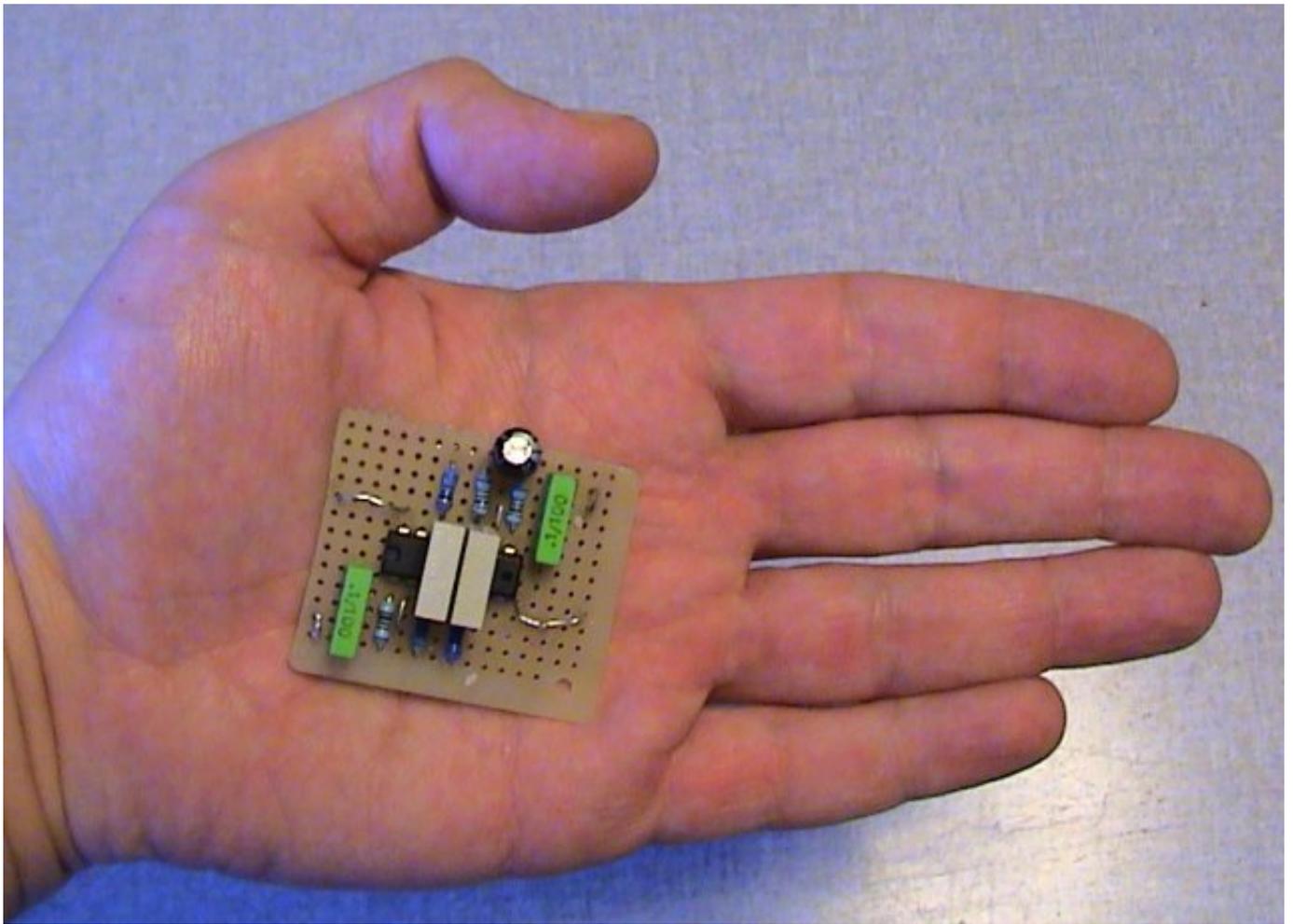
<sup>\*\*) 1s captured WAV file has size 176kB, 1 hour captured WAV file has size 635MB!!, an attempt to capture 9999min WAV file will</sup>

fill your hard drive for sure...

This is **085185** visit from Aug. 23<sup>th</sup>, 2009.

# CheapChop: measuring DC with a sound card

Marko Cebokli, S57UUU



Most people are unaware of the fact, that a humble PC sound card is really a very powerful measuring instrument. Just compare: an 3 1/2 digit ("1999") DMM converts with not quite 12 bits (11 + sign) at maybe 10 samples per second. Most sound cards can convert two channels with 16 bits, at 48000 samples per second.

So why aren't they used more often for measurement purposes?

I can see mainly three reasons:

1. The greatest bane of sound card measurement precision is the "Mixer", where normally audio levels are set

- if you change the "recording level" or "mic gain" or "input boost" or whatever, your calibration goes goodbye!. Almost every sound card has a different mixer interface, so it is virtually impossible to write a program, that would have the mixer under total control.

This variable gain analog circuit in front of the A/D converter can also increase noise, cause nonlinearities and have a temperature dependent gain.

2. Most computers are quite noisy, swamping the lower bits with useless garbage.

3. Inputs of sound cards are AC coupled, which is OK for their intended application, but precludes direct measurement of DC voltages.

Concerning 1, I have no solution for the changing mixer settings, but luckily I have not yet seen big nonlinearity problems in the mixer.

Concerning 2, the good news is that the noise is usually not white, but restricted to a few bands, like 1/f noise and powerline hum at the lower end. In many cases, using some DSP filtering one can get rid of most of the noise.

And concerning 3, this article presents a solution.

## The hardware

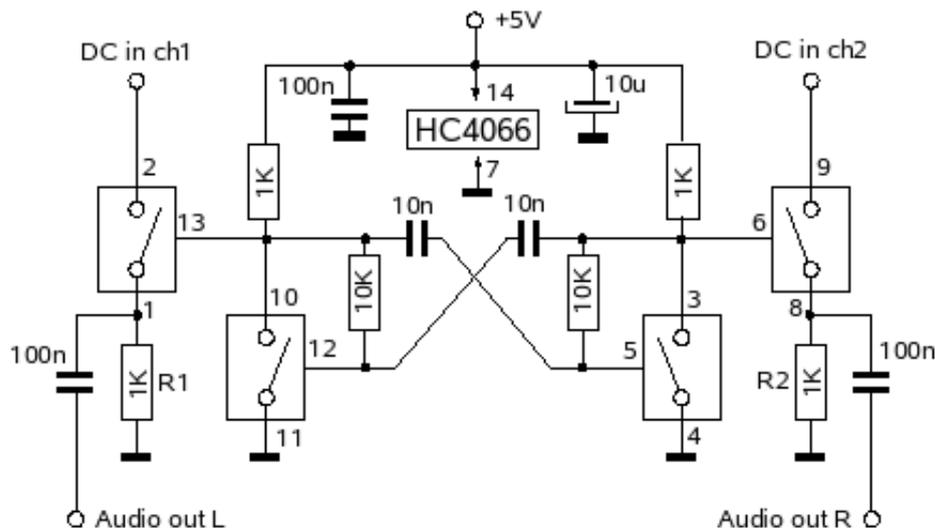
I have developed a very simple and cheap circuit, which makes DC measurements with sound cards possible, by chopping the DC into a cca 5kHz square wave. I mainly intended it to measure the output of log detector ICs like AD8703.

But being a chopper, it is also very well suited for measurement of small DC voltages, especially from low Z sources, like thermocouples.

By modifying the program to write into a file, it can be used for long term monitoring, replacing strip chart recorders etc...

The schematic is very simple:

# CheapChop by S57UUU



It uses a single 74HC4066 chip containing four CMOS switches, and a few resistors and capacitors. The components in the above schematic will cost about a couple of Euros, but you will probably want to spend a little more for a small box and some connectors.

The circuit is supplied with nominally 5V, and can chop DC voltages between zero volts and the supply voltage. It draws cca 5mA at 5V.

It would be possible to supply it directly from an 4.5 or 6V battery, too - but for good accuracy, a stable supply voltage is beneficial.

Maximum allowed supply voltage for 74HC logic is 7V. Using a "classic" (non-HC) 4066, operating voltages up to 18V are possible. However, for operation at 6V or less, I recommend using the HC version of the chip, which has lower "on" resistance at these voltages.

Two of the CMOS switches make up an astable multivibrator, that oscillates at cca 5kHz. Their outputs control the remaining two CMOS switches, that chop two DC voltages for the two sound card channels.

I've made the circuit fully symmetrical, to reduce crosstalks. The two chopping switches are operated anti phase, and could be connected as a SPDT switch, if needed.

Compared to most other DC measuring instruments, like DMMs, the input impedance of this circuit is very low, in the low kOhm range. One can increase it a bit by increasing the value of R1 and R2, but with the typically 10 kOhm input impedance of sound cards, one can not go too high here.

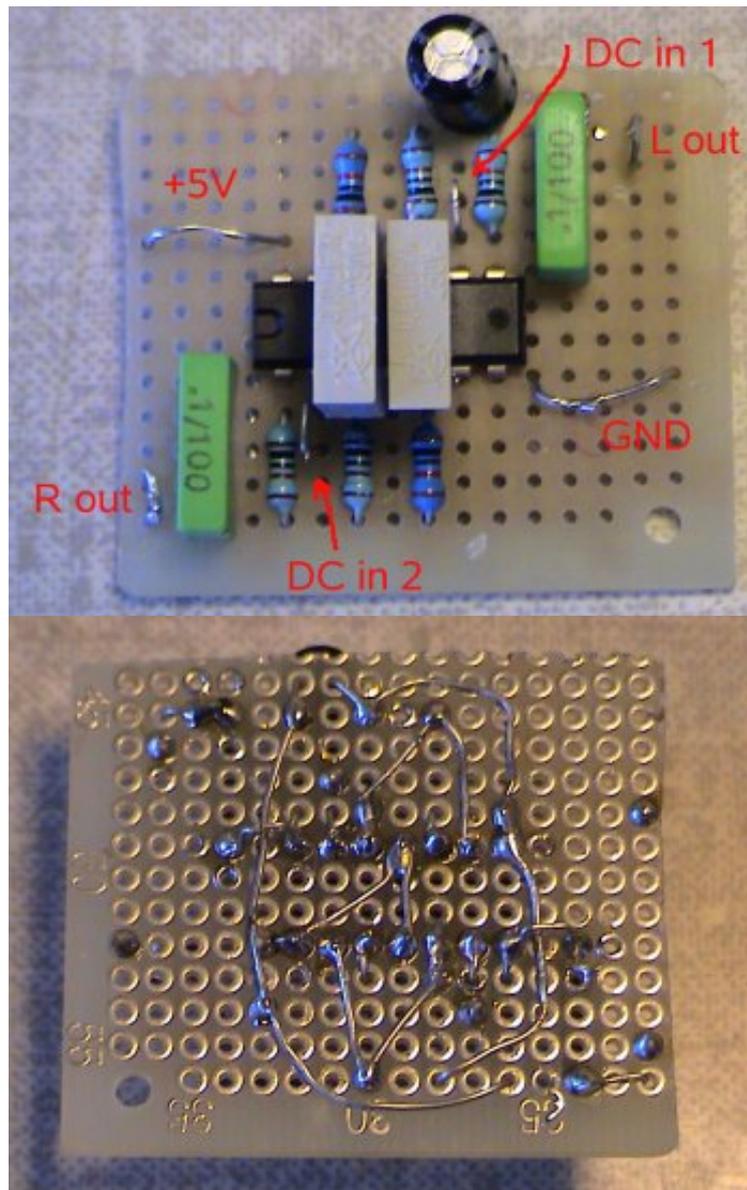
So, if you need to measure a high Z source (like a diode RF detector), a buffer amp will be more or less indispensable.

When measuring voltages higher than the supply voltage, it is NOT enough to just connect a resistor in series with the input!!! Namely, in the "OFF" state of the switch, the whole voltage would be on the switch, killing it instantly! Therefore, a "full" voltage divider with two resistors must be used in front of the chopper, to keep the chopper input voltage below supply at all times.

Another possibility would be to use a 5V zener instead of the "lower" resistor in the divider. This zener would just protect the switch, and would have no effect on the voltage division ratio, which in this case would be

determined by the series resistor and R1 or R2, respectively.

Built on a small protoboard, it looks like this:



## The software

Of course, some software is needed, to read the DC voltage from the chopped waveform. I have written a small program for this. It handles the sound card the OSS way, but since ALSA emulates OSS, most penguins should be able to swallow it without complaints.

The program is here: [cheapchop.c](#) Compile it with:

```
gcc -lm cheapchop.c -o cheapchop
```

It uses a simple FIR bandpass filter for the chop frequency, to reduce the impact of sound card (and PC) noise. It is just a "bare bones" program, consisting of the essential functions for the basic measurement. The user should add to it whatever calibration/display options, data logging etc., are required by his application.

To work properly, the filter in the program has to be tuned to the actual chopper frequency. As-is, the filter is tuned to 5000 Hz, the approximate frequency where the oscillator runs when the components have their nominal values.

There is no need to use tight tolerance components, more important is that they are stable, especially the capacitors in the oscillator. If you measure the frequency after you have built the circuit (for example with an FFT program for the sound card...), you can write it into the source code, variable "fc", assigned in line 148. This will tune the detection filter to the frequency of your particular CheapChop hardware.

If you lack suitable frequency measuring instrumentation (software), just connect some DC voltage to the input of the CheapChop and change the frequency variable up or down in 50Hz steps, until you get the max reading. This will be a bit tedious, because you need to recompile each time.

The filter should be tuned at least within 100Hz of the actual oscillator frequency. I do suggest the use of 10nF capacitors with a bit better thermal stability (polypropylene, styroflex...), so that the frequency will not drift out of the filter bandpass... The cheap "supply blocking" ceramic caps can be quite horrible in this respect!

**NOTE:** Sometimes I have observed that if I overload (saturate) the MIC input, the program will stop (waiting for samples from the sound card). So if you start the program, and nothing appears, first check your inputs - try disconnecting everything from the sound card inputs.

## Using the CheapChop

When run from a console (or X terminal), the program simply continuously prints out the measured values for both channels. For example, on my computer, with 3V at one channel and 0V at the other, the output looks like this:

```
CH1 = 29739.8      CH2 =      8.0
CH1 = 29739.0      CH2 =      7.9
CH1 = 29738.6      CH2 =      8.0
CH1 = 29737.9      CH2 =      8.0
CH1 = 29739.6      CH2 =      8.0
CH1 = 29736.2      CH2 =      8.0
CH1 = 29735.6      CH2 =      8.0
CH1 = 29735.0      CH2 =      7.9
CH1 = 29734.5      CH2 =      8.0
CH1 = 29733.6      CH2 =      8.0
```

On your computer, the values will very probably be different. Because the mixer precludes absolute calibration, the values are not in volts, but some arbitrary units.

If you decide to keep your mixer always at the same setting, you can measure how many of these arbitrary units makes up one volt on your system, and then change the program source to divide the measured value with that number (lines 195,196), to get a display in (milli)volts. In the example above, we get cca 29735 units for 3V, that is 9911.6 units per volt, or put another way, one unit equals 100.89 microvolts, and the printout resolution (0.1 unit) is 10 uV.

CH2 above shows some crosstalk between the channels. Partly it is in the audio cable, where both wires are in the same shield, and partly inside the sound card / PC. In the above case,  $20 \cdot \log_{10}(29735/8) = 71.4\text{dB}$ , which is very good, as far as audio standards go...

When both inputs are at zero, the output is:

```
CH1 = 0.5    CH2 = 0.5
CH1 = 0.4    CH2 = 0.6
CH1 = 0.5    CH2 = 0.5
CH1 = 0.5    CH2 = 0.6
CH1 = 0.5    CH2 = 0.6
```

The numbers aren't zeros because there is some crosstalk in the CheapChop circuit itself, and some sound card / PC noise gets through the bandpass filter, too. Here, the offset caused by noise and crosstalk is cca 0.5 unit, and the noise in the measurement (fluctuation of the numbers) is less than 0.1 unit. The offset is usually pretty stable, and could be subtracted.

The maximum possible value for a clean square wave would be cca 41000, but because of noise etc., saturation will be reached at lower values. Two asterisks next to the displayed value indicate that a channel is close to amplitude saturation, like this:

```
CH1 = 35723.9**  CH2 = 9.7
CH1 = 35725.3**  CH2 = 9.7
CH1 = 35722.5**  CH2 = 9.7
CH1 = 35720.8**  CH2 = 9.7
CH1 = 35721.1**  CH2 = 9.8
CH1 = 35722.0**  CH2 = 9.7
```

In this case, you should not trust the displayed value.

## Input range

The range of the voltages that can be measured, depends on the mixer settings. The upper limit will be either 5V (Cheap Chop supply voltage) or, if your sound card saturates before that, whatever the saturation voltage of your sound card is.

The lower limit will be determined by crosstalk and noise.

The table below shows what I got on my old HP "Vectra VL", with the default values for filter length and averaging:

	scale V/unit	scale units/V	offset V	noise V	saturation V
line, min	197u	5062	59u	9.9u	(>5v)
line, max	15.2u	65615	45u	3.8u	0.5
mic, min, boost=0	86.5u	11558	43u	2.6u	2.9
mic, max, boost=0	6.73u	148.5k	40u	2.7u	220m
min, min, boost=1	8.85u	113.0k	40u	3.5u	300m
mic, max, boost=1	0.77u	1.30M	38u	2.3u	20m

On the line input, when I set "capture" in the mixer to minimum, full 5V on the input of CheapChop will not saturate the input.

From the above it can be seen, that at least on this machine, using the MIC input does not provide any significant increase in sensitivity - but that is not much of a problem, since we already are at the microvolt level!!

The "noise" in the above table is just true random noise, when zero volts are connected to the input. With a nonzero input voltage, there will be some additional "pseudo noise", caused by the fact, that the chopper waveform does not have a fixed phase relationship with the sampling clock. With the default filtering and averaging, this noise is cca 0.005% of the measured value. Therefore it will only become significant at higher input voltages, and will not affect the CheapChop's ability to measure very small voltages.

If you desperately want still higher sensitivity, maybe a low noise audio preamplifier between the CheapChop outputs and the sound card input could help.

## Averaging and filtering

By default, the program uses a filter of length 64, and averages 64 measurements. Decimation is equal to filter length, so with an 48kHz sample rate, it prints out cca ten data points per second, with about four stable digits.

Averaging and filter length can be changed in the source, filter length is determined by the variable "nf", assigned in line 149, and the amount of averaging by the variable "navg", assigned in line 150.

The filter length and amount of averaging affect both the rate at which the measurements are available, and the precision and noise in the measurements. Increasing either will reduce the speed of the measurement, but improve its precision and sensitivity.

Increasing filter length is more effective in reducing the measurement noise, however because it also decreases the filter's bandwidth, it makes precise adjustment of the filter to the chopper frequency more important and difficult.

Decreasing the averaging to one (no averaging) and filter length to 48, one can get 1000 measurements per second, but they will be quite noisy. I don't recommend using filters shorter than about 20 taps.

## Measuring the output of RF log detector ICs

Most of these log chips are "from DC up", so especially if you want to measure low level RF, take great care to prevent the chopper's 5kHz entering the log chip's input! Don't place the CheapChop too close to the log chip (separate boxes maybe...) and watch your grounds and filter your supply lines!

Provided that the 5kHz do not intrude via ground or supply, a suitable high-pass located as close to the input of the log chip as possible can help. If your frequencies are in the HF range, it seems it should be easy to separate them from 5kHz, but 74HC logic is fast, and harmonics of the 5kHz square wave can reach quite high. Putting simple RC lowpasses directly onto the CheapChop outputs might help.

If you need to measure only a single RF frequency, use a bandpass at the input of the log chip.

## Accuracy

It should be clear, this is no precision instrument.

In the CheapChop circuit itself, one error source will be the change of the "ON" resistance of the CMOS switches with temperature. The influence of this could be reduced somewhat by increasing the value of resistors R1 and R2, keeping in mind the input impedance of the sound card - otherwise an high impedance input audio amplifier will be needed between CheapChop and sound card.

Next is the drifting frequency of the oscillator - it will travel along the FIR filter's frequency response, changing the displayed value. If you use ceramic 10nf caps in the oscillator, this will be by far the biggest error source.

And then, the sound card. Audio codecs are designed for everything but DC accuracy. The gain of the mixer circuit will depend on temperature, and the interior of a PC is anything but a stable thermal environment.

PCs vary wildly in their noise levels, especially laptops tend to have high noise levels. I've seen differences in noise between PCs of up to 30dB!

### HOWEVER -

All these caveats aside, I found the CheapChop to be surprisingly stable, and quite accurate, if built with quality components like metal film resistors and foil capacitors.

To test the stability, I set up the following test. Measuring a fixed voltage of 4V, I've monitored the program's output, comparing it to a HP34401A DMM. I did this on my trusty old Vectra VL, after giving everything an hour of warm-up time. The air condition probably kept the room temperature constant to a few degrees C. Initially, I set the scaling variable in the program, so that the displayed value was exactly the same as on the HP34401. During a 3 hour period, the displayed value stayed within  $\pm 0.4\text{mV}$  ( $\pm 0.01\%$ ) of the HP34401. Next, I sprayed the CheapChop circuit with "Freeze Spray", cooling it to cca  $-20\text{C}$ , and the error went to  $+8\text{mV}$ . Surprisingly, most of the change occurred above cca  $5\text{C}$ , going colder did not increase the error very much.

After that, I used a hot air gun to heat it to cca  $+50\text{C}$ , which sent the error to  $-20\text{mV}$ . Most of the change was probably due to the chop frequency going down by cca 80Hz.

I was quite happy to see such good results! Honestly, I was expecting worse.

For a crude accuracy test, I measured voltages from 0 to 5V in 0.5V steps, and compared the readings to the HP34401.

voltage	error
0.0V	+0.4mV
0.5V	-1.6mV
1.0V	-7.0mV
1.5V	-9.0mV
2.0V	-9.0mV
2.5V	-4.3mV
3.0V	-2.0mV
3.5V	-1.5mV
4.0V	-0.7mV
4.5V	+20mV
5.0V	+44mV

Obviously, when approaching the supply voltage, we run into some nonlinearity. But discarding the upper two measurements and centering the values, the error could be held around 0.1% of full scale, which is comparable to what the cheap 3 1/2 digit DMMs are declared to be - but don't always achieve...

And last, I tested the influence of the supply voltage. Measuring 4V, when changing the supply voltage from

4.5 to 5.5V, the maximum error was +11mV at 5.5V supply.

## So, how does CheapChop compare to...

There are many ways to measure a DC voltage, and get the reading into a PC, and many people ask me, why bother with this circuit?

One of the obvious advantages of CheapChop is no doubt its extremely low price tag. Another is, that it does not occupy an useful interface port like parallel or serial, but instead a rarely used sound card input. And there are probably some others - here I try to give a comparison with some of the other possibilities:

### An RS232 equipped DMM

DMM advantages:

1. greater range of input voltages (built in switchable voltage divider)
2. better accuracy (especially if a 4 1/2 digit or better DMM)
3. higher input impedance

CheapChop advantages:

1. higher possible measurement rate
2. better resolution (especially compared to an 3 1/2 digit DMM)

### MAX186 and ilk

MAX advantages:

1. better accuracy

CheapChop advantages:

1. better resolution
2. greater range of input voltages thru mixer settings

### An microcontroller with built in A/D

uC advantages:

1. can do other things besides A/D
2. could have better accuracy (depends on the built in A/D)

CheapChop advantages:

1. no need for specialized programming tools & hardware
2. very probably a better resolution

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[Up to S57UUU Home Page](#)

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## Radio-SkyPipe Help

# Radio-SkyPipe Configuration

## Network Connection

The screenshot shows the 'Radio-SkyPipe Options' dialog box with the 'Connection' tab selected. The dialog has several tabs: 'Advanced Logging', 'Servers', 'Sound', 'Timing', 'Misc.', 'Identity', 'Data Source', 'Connection', 'Strip Chart', and 'Logging'. The 'Connection' tab contains the following options:

- Stand Alone Mode Only
- Use Dial Up Internet Connection
  - unknown
  - Dial Up Automatically
  - Hang Up After Disconnect
- I use a DSL or Cable Internet Connection.
- I use a LAN but no Internet.
- Manually Enter IP to Publish.
- Use SkyPipe Internet IP Check.
- My IP Address Changes Often.
- Always use the following permanent IP address:
  - 0.0.0.0

On the right side of the dialog, there is a black box displaying:

```
Local IP: 192.168.1.10
Local Host Name: unassigned
```

Below this is the 'Client Port Options' section:

- Local Server Port: 6300
- Max Number of Clients: 10
- Time Out After: 240 secs. (Client Mode)
- Check Online Status when Serving.
- Automatically Publish Server Sessions
- Check for Servers Online
- Enable Chat
- View Received Chat from All Connections

At the bottom are buttons for 'OK', 'Save', and 'Cancel'.

**Special Note: It has been found that very often using 0.0.0.0 in the Always use the following permanent IP address box and checking the associated checkbox will produce positive result!**

In order to use R-SP as a strip chart server or in client mode, you must have a connection to the internet or other TCP/IP network. Configuration of your computer to use the internet or a LAN (Local Area Network) is beyond the scope of this document, and help should be requested from your ISP (Internet Service Provider) or in the case of a LAN from your LAN administrator.

### Dial Up Connections

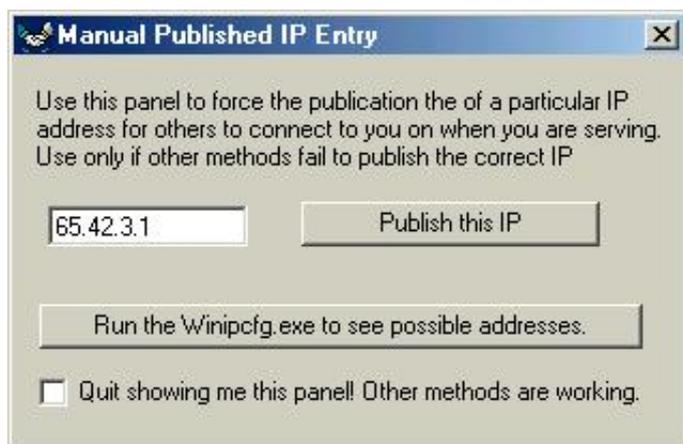
If you have a dial up connection to the internet and want R-SP to handle initiating a connection using one of your dial up scripts, select the **Dial Up** radio button. Your ISP should be able to tell you how to set up a dial up script for connecting to their service. Note: R-SP may not work with an America On Line connection. In the **Dial Up Script Name** box put the exact name for the dial up script you wish to use. If you want R-SP to close your dial up session automatically after pressing the disconnect button or after finishing a Schedule in Server or Client Mode then check the **Hang Up After Disconnect** box.

## Non - Dial Up Connections

If you have a permanent internet connection, such as a DSL or Cable connection, then check the **LAN** radio button. You should also use the **LAN** option if you have a dial up connection but do not want R-SP to control any of the dial up functions. If you are simply connected to a private LAN and want to share strip chart data between computers on your network, the **LAN** button that is appropriate for that choice.

## Manually Enter IP to Publish

This option would normally be left unchecked. It is only used if your network (or ISP's) configuration does not allow your internet IP to be properly detected by any other method. If you select this options, you will receive the following dialog box **every time** you start and try to publish a server session:



You would then enter the IP address to be published manually. A button is available to bring up the winipcfg.exe for Win98 PCs if you need it to determine the IP addresses available on your PC.

## Use SkyPipe Internet IP Check

Check this feature if you want R-SP to try to determine your internet IP address by using an IP checking function on our website. This functions returns the IP address that it sees to the program. This usually works, but in some cases, especially with LANs, the returned address will not the same as the IP address needed for serving or receiving data. Try both ways. Use what works.

## My IP Address Changes Often

Some ISPs change your internet IP address quite often. If this is likely to occur during a single online session, you should select this option. If your address remains relatively constant, do not select this option and performance may be slightly enhanced.

## Permanent IP Address

If you have an IP address that never changes enter it in the box so labeled and check the associated check box. This may also be appropriate for LAN only installations.

## Client Port Options

Some computers hidden behind routers and firewalls will have to establish a fixed Port for Client connections. Click the Client Port Options button for a screen that allows you to do so. Usually this is not necessary.

## Local Server Port

When you are in Server Mode, people running R-SP in Client Mode need to know what Port to connect to on your computer. This can be any number from 1 to 32000, however certain Ports are reserved on computers for special functions such as Web Browsers and FTP. It is suggested that you pick a number between 2000 and 20000 and stick with that number. *The old default is Port was 1002. This has turned out to be in a range that was blocked by some firewalls.* If you experience a conflict with some other

program trying to use the Port you have selected, simply change the Port in R-SP. If you have a permanent internet connection and IP Address, it is more important to try to stay with a given Port number as others may add you to their lists of Permanent Servers. Changing your Port would make those Permanent Server List entries invalid.

### **Maximum Number of Clients**

You can select a Maximum number of users which will be allowed to connect to you when you are acting as a strip chart server. If you are sampling at high speeds, you may experience degradation of performance if you allow too many people to connect to your strip chart data stream. The level at which this occurs depends primarily on the speed of your computer.

### **Time Out After XXX Secs. (Client Mode)**

Place the number of seconds after which you stop receiving data from a server, the connection is ended. In most cases, a lost connection with a server will be automatically detected, however, in some cases you may quit receiving data and maintain the connection. This parameter sets a time limit after which receiving no data the connection is broken by you on the client end.

### **Automatically Publish Server Sessions**

Check this box only if you are sure you want all your server sessions to be public, that is, available for anyone to see over the internet.

### **Check for Servers On Line**

Checking this box allows R-SP to automatically check the ILS for available servers.

### **Enable Chat**

Check this box to enable the Chat function when in Server Mode. High volumes of chat traffic could degrade data sharing but this is unlikely in most situations.

### **View Received Chat from All Connections**

When checked, the [Chat Window](#) will display chat text received from all servers to which you are connected as a Client. When not selected, only chat from the Chat Target will be displayed.

### **Related Topics**

[Instructions for configuring with Microsoft Internet Connection Sharing](#)  
[Linksys Router Configuration](#)

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## Radio-SkyPipe Help

# Strip Chart

Radio-SkyPipe Options

Advanced Logging Servers Sound Timing Misc.

Identity Data Source Connection **Strip Chart** Logging

Chart Width secs:

Y Axis Max:

Y Axis AutoScale:

Update Server/StandAlone Chart Every  Samples.

Update Client Chart Every  Samples.

One-Click Arrow Increment  % (1 - 100)

Key Press Averaging Period  secs.

Channel Offsets

Use Offsets

Send Offsets to Clients

Axis Labels

Channel Labels

Ticks/Line Style

Colors

OK Save Cancel

### Chart Width

Indicates the desired width of the strip chart viewing area in seconds.

### Y Axis Max

This is the upper value to which the Y axis of the strip chart will be set when Y Axis Autoscaling is not selected, (see Y Axis Autoscale below). Normally you would set this value based upon the expect upper value from your soundcard or ADC. The MAX187 and MAX186 ADCs have an upper value of 4095 (representing 4.095 volts). The upper value for a 16 bit soundcard is normally 32767.

### Y Axis Autoscale

Place a check in this box to enable automatic scaling of the strip chart Y axis to the sampled data range. The height of the chart will then change to accommodate the largest value in the current chart. While convenient for displaying a chart of an unknown range of values, autoscaling causes you to lose control of the displayed Y axis range while the strip chart is "running", that is, actively taking in new samples.

### Update Server/StandAlone Chart Every \_\_\_\_ Samples

One of the most time consuming tasks the computer must perform is redrawing the chart each time a new data point arrives. You can improve performance by updating the chart only after a selected number of samples has been collected. This does not directly affect the sample rate except that it may allow you to sample faster than you might be able to sample when continually updating the chart viewing area for every sample. If for example, you set this chart update value to 10 and had a sample period of 50 ms. then the chart would be redrawn each  $10 * 50 = 500$  ms.. All of the data points would be displayed. Nothing would be lost, only the chart would appear a little less smooth in its scrolling.

### Update Client Chart Every \_\_\_\_ Samples

If your computer is having trouble keeping up with the strip chart data stream arriving from a remote R-SP strip chart server, you may find improved performance by setting this value to something higher than 1 (one). No data will be lost by doing this (and in fact, data may be captured which would otherwise be lost), however, the time that the computer must devote to drawing the strip chart is greatly reduced by a factor proportional to the value you choose. This is not usually necessary for slow data rates.

### One Click Auto Increment

The value you put in this box will determine the amount by which the screen updates when using the One Click Arrow Buttons. For example if 50 (%) is entered, then clicking the right arrow button will advance the X axis by 50% of its current span. If one hour of data was displayed, the time coordinates would be advanced by 30 minutes.

### Key Press Averaging Period

You can find the an average value for live data arriving in a chart over a period of X seconds by pressing the ALT key and a number key corresponding to the channel number you want to average. For example, pressing ALT and the "2" key will begin calculating the incoming average for channel 2. The duration in seconds for the averaging is the Key Press Averaging Period.

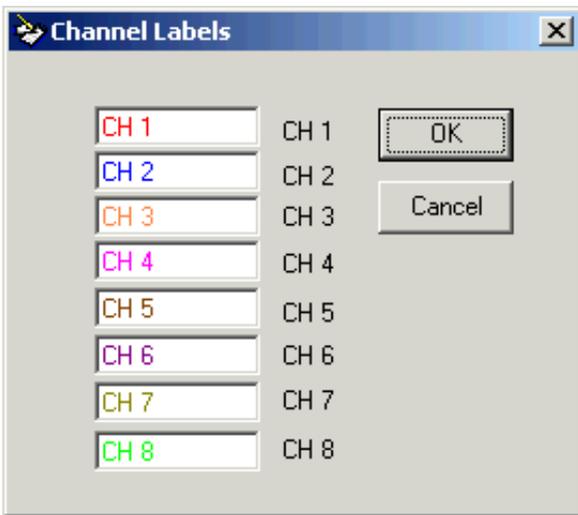
### The Grid/Ticks Button

Pressing this button brings up the screen below where you can configure some of the charts appearance:



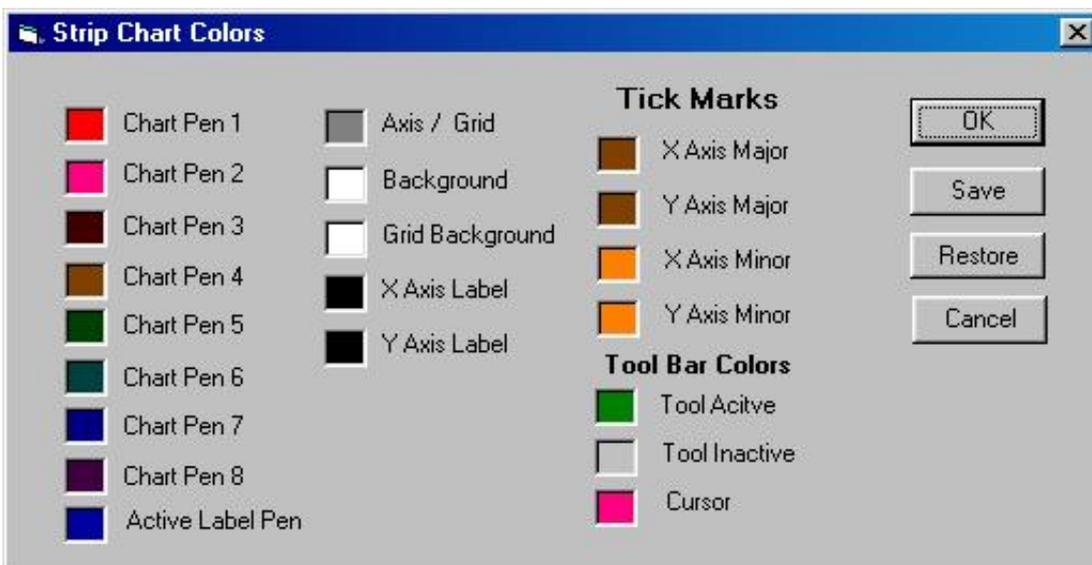
Make sure the chart pen style and grid style selections are actually highlighted (by clicking in the box) before saving.

### The Channel Labels Button



You may apply color coded labels to be optionally viewed on the chart. These labels would ordinarily give a very short description of what the channel data references. When the chart is displayed you make these labels visible by selecting *View/Channel Legend*.

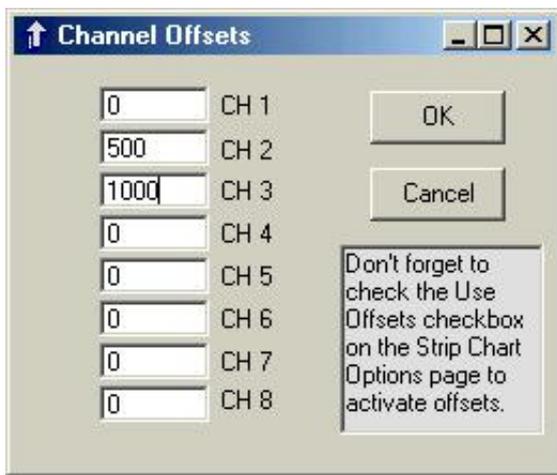
### The Colors Button



Click in the appropriate box to bring up a color palette to make your color selection.

### Channel Offsets

Radio-SkyPipe Pro version users can define default channel offsets which can be applied to their charts. This is most useful for multi-channel charts. Click the **Channel Offsets** button for a small panel to define the individual channel offset values.



The **Use Offsets** checkbox must be checked for the offsets to be automatically applied whenever a chart is started in Stand Alone or Server mode. To send these offsets to clients, and thus separate the channels on their screens as they receive your data, check the **Send Offsets to Clients** checkbox.

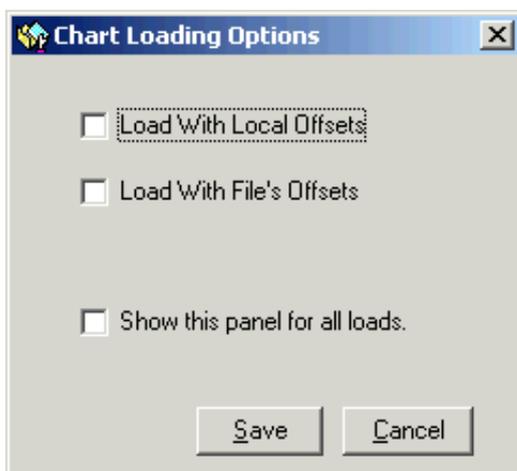
### Axis Labels

Optional X and Y axis labels may be applied by default to your charts. Pushing the Axis Labels button brings up the following panel:



You may also access this panel from the menu bar on the main window of the program under View / Chart Text /XY Axis Labels.

### File Loading Options Button



This panel determines whether or not a file will be loaded with the offsets that are locally applied by this configuration of Radio-SkyPipe, and whether or not to apply the offsets that were used when the data was saved by this or another instance of the program. Optionally, you display whether or not to prompt for these

whenever you load a file.

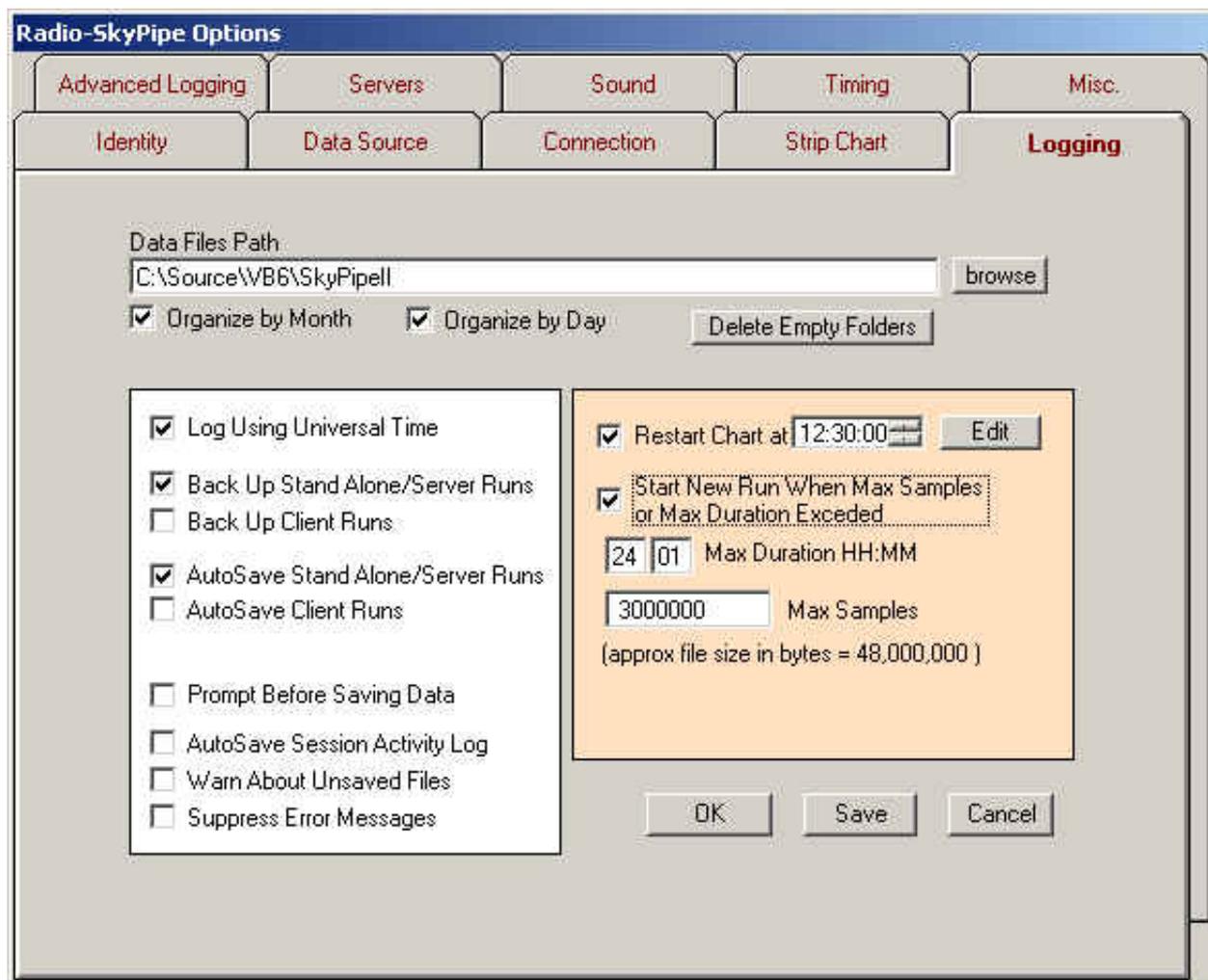
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## Radio-SkyPipe Help

# Configuring Radio-SkyPipe

## Logging

(For our purposes, logging refers to functions related to the storage of data on the R-SP computer.)



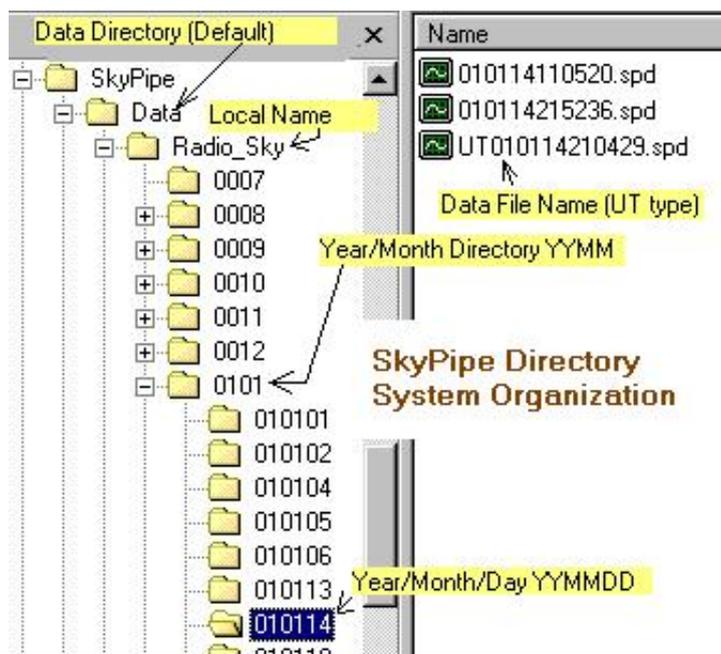
### Data Files Path

Saved copies of strip chart data are stored in a special format on your computers hard drive. Data File Path refers to the base directory for storage of these files. Depending on you organization method (see below) files may be stored in subdirectories of this base directory. You may use the browse button to find or create a suitable Data Files Path.

### Organize by Month and Day Options

When making large numbers of observations it becomes important to organize your data files in such a way that they can be easily retrieved. AutoSaved files are automatically saved in a Local Name subdirectory of the base directory, (the base directory = Data Files Path [see above]). This keeps data files from different sources from co-mingling. When using the Organize by Month/Day options, the computer automatically stores the files in next level subdirectories based either on the day the file was generated or further sorted into

directories based on month and day.



The picture above shows the directory structure when using both the Organize by Month and Organize by Day options. These files were created by the Radio-Sky Jupiter Observatory, locally. The selected files are found under a Month directory (0101) actually also includes year information formatted YYMM). In the directory tree separate directories are also created for individual days for that month (format: YYMMDD). To the right are the data file names which were captured on Jan 14, 2001 (format: YYMMDDHHNNSS.spd where NN represents minutes).

There is nothing sacred about the data file names and they can be renamed (though you should retain the **.spd** extension), however, it has been found useful to organize files in this manner. The **.spd** extension will allow the files to be associated with R-SP so that clicking on a file in Windows Explorer or on a web page brings Radio-SkyPipe up as the appropriate viewer for the file. See [Associating Radio-SkyPipe Files](#).

### Delete Empty Folders

This button recursively deletes empty file folders in the data directory. This is handy for removing folders that are created by the program in anticipation of data files that never get saved.

### Log Using Universal Time

Most scientific observations are based on Universal Time (closely related to Greenwich Mean Time) so that observers all over the world may easily relate when events actually occur. Selecting Log Using Universal time adds the value of your time zone to that supplied by your computer clock to the time stamp associated with each data point. For example the time zone in Hawaii is -10, so ten hours would be subtracted (adding a minus!) from the time supplied by my computers clock (my local time). Thus using this option implies that your computer clock is set to your local time and that you have correctly stated your time zone on the [identity page](#).

### Back Up StandAlone/Server and Client Runs

A separate real-time back up may be saved of your data as it is collected. In the case of a computer crash, you may use these back up files to recover your data the next time Radio-SkyPipe is started. Check these back up options to activate this system. Some performance degradation can occur from using the backup system. The next time you start R-SP after a crash, you will be presented with the file names of the backup files saved. These files are located in an automatically generated recovery directory under you default data directory.

### **AutoSave Stand Alone/ Server Runs**

Automatically save strip charts created when in Stand Alone or Server Mode. Files are saved using the naming convention: *YYMMDDHHNNSS.dat* where *YY* represents the last two digits of the current year, *MM* represents the month number, *DD* represents the day number in the given month, *HH* represents the hour in 24 hour format, *NN* represents the minute, and *SS* represents the second for the time when the strip chart begins. AutoSave does not over-ride the Prompt Before Saving Option.

### **AutoSave Client Runs**

Automatically save files when running in Client Mode.

### **Prompt Before Saving**

If you select Prompt Before Saving you will be presented with a dialog box allowing you to modify the name and location of the data you are saving. You will be prompted even if using the AutoSave options.

### **AutoSave Session Activity Logs**

Automatically save the Session Activity Log each time you run R-SP. While these logs are not needed under normal circumstances, they may be helpful in deciphering problems or keeping tabs on otherwise un-monitored activity.

### **Warn About Unsaved Files**

If selected the program will attempt to warn you each time newly collected data is going to be discarded by a computer user action.

### **Suppress Messages**

Check this option if you run an unattended installation and you want to minimize the chance that an error message will halt operation waiting for a user response. If you use this option when it is not necessary to do so you may miss problems that are arising. These messages should not be confused with messages generated by Message Manager.

### **Restart Chart at HH MM SS**

[You now may have the chart restart automatically multiple times a day.](#)

### **Start New Run When Max Samples or Max Duration is Exceeded**

When either of these parameters is reached the data is saved and a new run is automatically begun. If not selected, the program will stop upon reaching these limits awaiting user intervention. You should never set these limits too high as performance will suffer and it is possible to run out of computer memory.

### **Maximum Duration**

Enter the maximum length of time in HH:MM:SS format which you would like the program to collect data before ending or starting a new run (see above).

### **Maximum Number of Samples**

You should set a maximum number of samples which may be collected before a Save is enforced. Data samples eat up memory. When you use up all available memory the program will attempt to write samples to the hard drive. This is a very slow process and will probably degrade performance significantly. The value you assign to Maximum Number of Samples will depend on how much memory your computer has and how much of that memory you are willing to devote to this program. Each sample can consume about 16 bytes of memory. It is suggested that for computers with 64 megabytes of RAM or less that no more than 50% of the memory be used by this program. Thus the following table applies:

Total Available RAM	Suggested Max Number of Samples
16 M	500000
32 M	1000000
64 M	2000000

*If you are using multiple channels (Pro version only) then remember to multiply these values by the number of channels!*

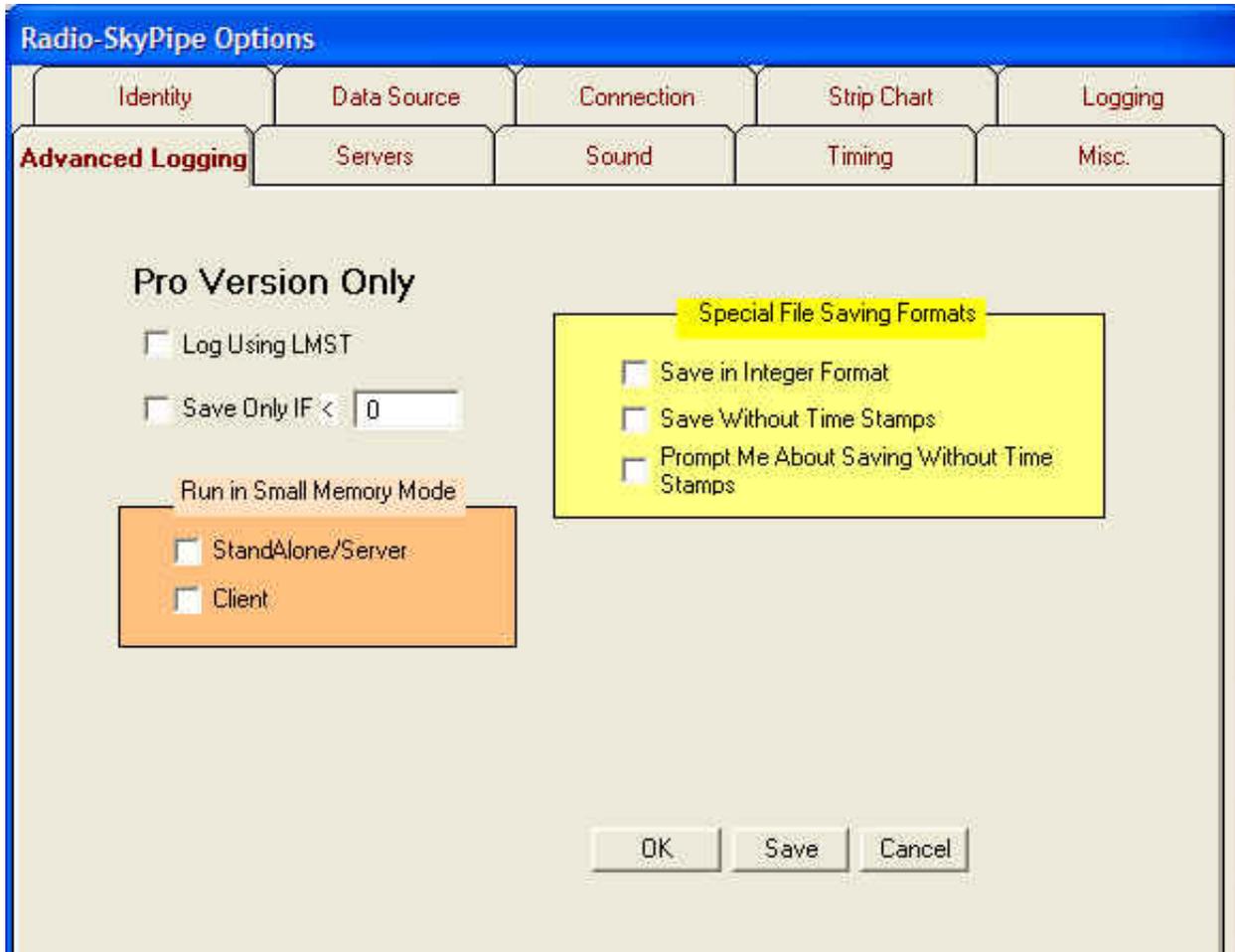
The best bet is to be conservative and use even lower values. If you are running two strip charts on the same computer, you should halve these values. An estimated time for the chart duration is presented, but can only be relied upon if the requested sampling rate is achieved.

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## Radio-SkyPipe Help

# Advanced Logging Options

## (Pro Version Only)



### Log Using LMST

Select this option to log observations using local mean sidereal time (LMST). This is useful for some types of astronomical observations. LMST is dependant upon your longitude and it is very import that you set the longitude correctly on the [Identity page](#) if you use this option.

### Save Only IF < > X

Select this option if you would like to automatically save files only if they contain a value less than (<) or greater than (>) a specified value. Use this option in conjunction with the **Autosave** and **Prompt Before Saving** options as is appropriate. The > symbol can be changed to the < symbol by clicking on it.

### Run Message Manager

[Message Manager](#) is explained elsewhere in the help files. It is only available to Pro Edition users. When this check box is selected, Message Manager will run when a chart is started.

## Special File Saving Formats

These formats can greatly reduce the size of saved data files. You should understand that for some types of observations these formats might not be appropriate. All Radio-SkyPipe users with recent versions have the ability to read these files, however only Pro Version users can save in these formats. While the saved file size is reduced by these methods, there is no reduction in the amount of RAM consumed in the loaded chart. This is due to the way the strip chart must handle data. For more information on [file formats](#) see that help page.

### Save In Integer Format

Saves files in two byte integer format. *If the file could contain values above 32767 or below -32767 OR if you need precision below the unit level (that is, decimal values) you should not use this format.*

### Save Without Time Stamps

If this option is selected a time stamp will NOT be recorded for each sample. Instead, the intervals between samples will be assumed to be equal throughout the observation. This interval will be calculated from the beginning and ending times of the observation. This assumption of equal intervals (that is, a constant sampling rate) is probably wrong! Windows does not do a good job of evenly spacing samples. In some types of observations, and on computers where a limited number of non-interfering background process are being run, this option may be fully appropriate. You must decide how important it is that the data be precisely time stamped.

### Prompt Me About Saving Without Time Stamps

If you change back and forth between time stamped and non-time stamped observations you may want to select this option to alert you of the time stamped status of the observation you are about to begin.

## Small Memory Mode Options

Data held within the scrollable strip chart consumes memory. A large multi-channel chart at a high data rate can consume *lots* of memory. Out of memory issues can sometimes result. The main advantage of having the chart contain all of the data during a live observation is that the observer can scroll back and forth through the chart while it is still being collected. Many types of observations do not have an observer present while data is being collected. In this case there is no advantage to having the chart eating up the computer's available RAM. Pro users can select the Small Memory Mode for this type of situation.

In **Small Memory Mode** Stand Alone / Server and/or Client charts reset each time they fill with data. Data is not held permanently in the chart. *If you need the data to be saved to disk, you must select the appropriate **Back Up** option for either Client or Stand Alone / Server modes.* You should also use the **AutoSave** feature in most situations. The entire chart will be saved in normal fashion if this is done.

Select **StandAlone/Server** and /or **Client** in the **Run in Small Memory Mode** box to use this method of data collection.

**Note:** If you use Small Memory Mode, the Full View Image is not available for [automatic FTP to a website](#).

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## Configuring Radio-SkyPipe

### Servers (Private Server List)

The screenshot shows the 'Radio-SkyPipe Options' dialog box with the 'Servers' tab selected. The 'Private Server: 1' section contains the following fields and controls:

- IP:** 166.122.43.82 (with up and down arrow buttons)
- Port:** 6300
- Name:** WCC Jupiter
- Desc:** http://jupiter.wcc.hawaii.edu/
- Buttons:** Add New Server, Save to File, Delete Server, Reload Servers
- Checkbox:**  Always show the Private Servers list when listing servers in Client Mode.
- Bottom Buttons:** OK, Save, Cancel

You may keep a list of strip chart servers to which you frequently connect. Some strip chart servers may not wish to publicly publish their presence on the web. These servers can only be connected to if you know their IP address and the Port number on which they listen for connection requests. An example of possible usage might be two experimenters, (let's call them Homer and Charlotte), who share data between their locations but do not want to share their data with others. If Charlotte and Homer do not click the Connect button when in Server Mode or if they have not selected Connect Via Web in their Connection options, others will not see the Charlotte and Homer Local Names and descriptions appear in the Available Servers List.

Homer and Charlotte must know two pieces of information about each other's internet connections in order to exchange strip charts. The IP address is a series of four groups of numbers which uniquely identifies your computer on the internet. Dial up users usually get a new IP address each time they access through their ISP (Internet Service Provider). Thus, if Homer and Charlotte are dial up users, they must somehow tell each other what their IP addresses are. If they have permanent connections or connections which maintain the same address for long periods of time (as with many Cable and DSL type connections) there is less of a problem.

The other bit of information that Homer and Charlotte must share is the Port number that they will be "listening" on for a R-SP strip chart connection. This is an arbitrary number (from 1 to a bit over 32,000), however, since each internet application uses a Port number, you must select one that is not used by another program. Once you find a free Port number you can keep using it. Your program will alert you if you have

picked a number that is already in use. It is suggested that you change this number from the default (6300) to another number in the range from 1025 to 9999.

Ok, now our two experimenters know the bits of information which uniquely identifies them. Charlotte puts Homer's IP address in the appropriate place on an unused entry in her Private Server List, which appears under the Servers tab on her Options page. She must be careful to use the proper notation for an IP address with periods separating the four groups of numbers. Next she enters the Port number which Homer has assured her he will be using. If Homer wants to receive Charlotte's strip chart data he does the same thing on his end but using the IP address and Port she has provided to him.

In the Name and Description boxes they can use any information which they feel is appropriate for quick identification.

Scrolling between the possible entries in the Private Server List is accomplished by using the arrow buttons beside the IP and Port boxes. Since this information is kept in a separate file from other R-SP options, you should use the Save to File button to make the changes permanent.

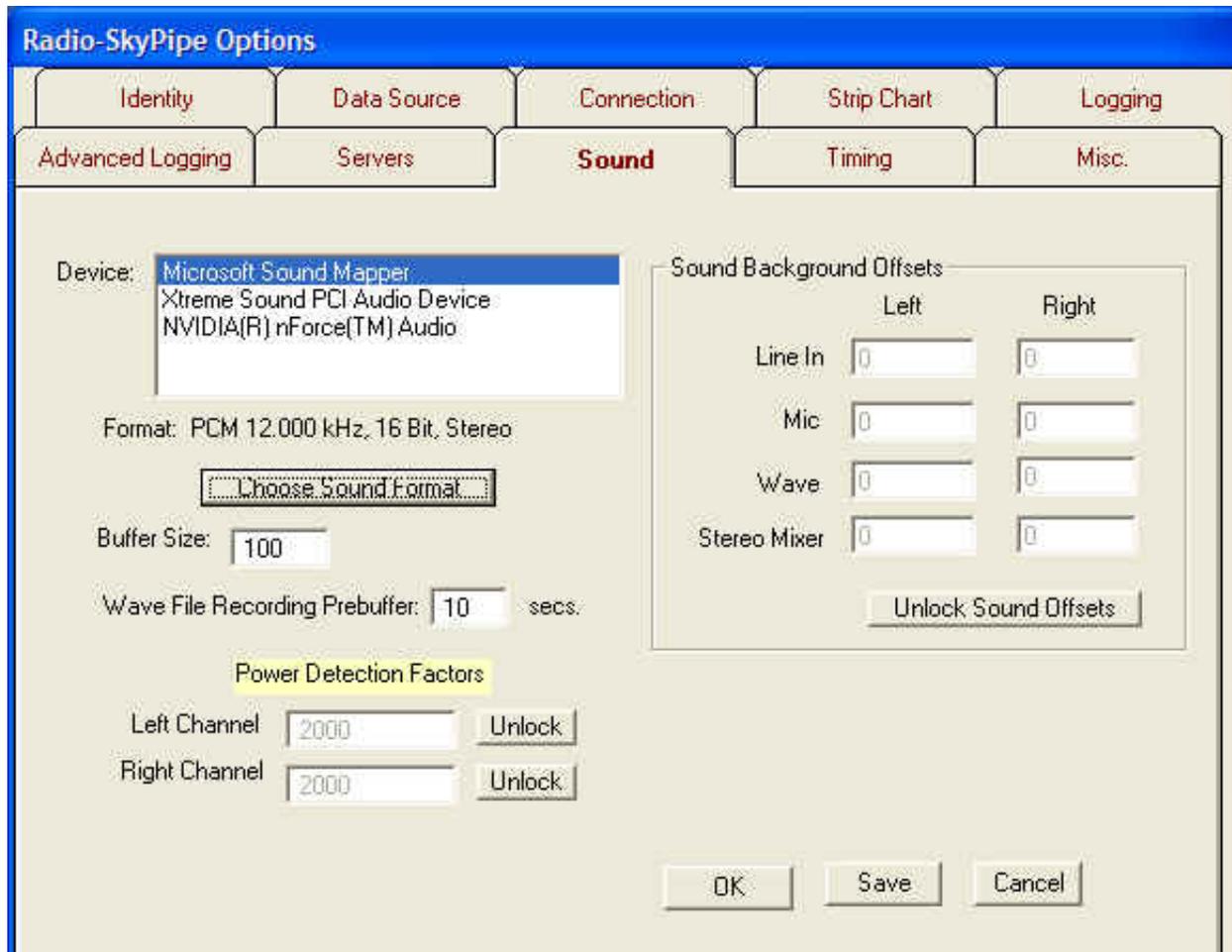
***To keep an entry in the Private Servers List from showing up when the list of available servers is displayed, delete the IP address for that entry and save the list.***

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## Radio-SkyPipe Help

# Radio-SkyPipe Configuration

## Sound Card Options



Configuration of most sound parameters occurs on the Options / Sound panel. There are several options associated with the sound card. These parameters support the three main functions of the sound card in Radio-SkyPipe II:

- Sound envelope data recording in the strip chart.
- Recording of the raw sound data in wav format.
- The use of the sound card as a timing source for consistent spacing of samples.

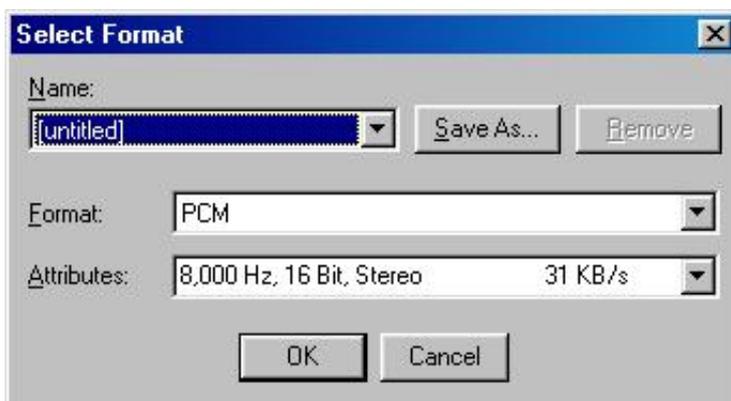
### Select a Sound Card

Radio-SkyPipe supports the use of multiple sound cards on a computer to the extent that it allows you to select which sound card to use when more than one is present. Radio-SkyPipe will only use one of the cards, though. That is, you could not use one card for the first two channels and a second card for the next two, for example. Available devices are selected from the Devices list box as shown above. Note there are three entries in this device list. The first entry, **Microsoft Sound Mapper**, is not really a sound card but rather is a

virtual device that maps to whatever sound card you have chosen as your default audio device in the Windows Control Panel Sound and Audio Devices applet. The following two cards really do exist on my PC.

### Select a Sound Format

You must then select the sound format which includes the sampling rate, mono vs. stereo, etc. This is done via the dialog box obtained by pressing the **Choose Sound Format** button.



The Select Format screen allows you to choose from the registered sound formats on your computer. However, not every format will work for you. For most purposes it is suggested you select **PCM** format. In the Attributes selection list you will find a variety sampling rates 16 bit vs. 8 bit, and stereo/mono options. Radio-SkyPipe is designed to work with 16 bit sound cards so never select 8 bit. Higher sampling rates are used for high fidelity recordings and are generally not needed. Higher sampling rates can degrade the performance of R-SP and take much more drive space when being saved as sound files. The suggested rates are 12000 or 11025 Hz. Use stereo when using 2 channel sound data collection (Pro Edition users only). In addition to the effects that choosing the appropriate sound format has on data collection, the selected format will be used for recording wav files (Pro Edition only).

You may give your sound format selection a readily identifiable name (such as "SkyPipe Format"), and save it so that it will appear in the "Name:" drop-down list for easy selection.

**Buffer Size** - This option can be ignored when using the Sound Card as the Timing Source as the buffer size is then calculated automatically. When the program samples the audio signal passing through the sound card, it does so in little chunks. These groupings of sound card readings are kept in a Buffer. When the Buffer is full, it tells the program to "read me!", and the average value of the samples in the Peak Buffer is saved as a single data point on the strip chart. What this means to the observer is that you can adjust the coarseness of the audio sampling. If the Peak Buffer Size is too large, you will not be able to use an rapid sampling rate. The suggested Peak Buffer Size for most uses is 100 to 1000.

### Wav File Recording Prebuffer

Radio-SkyPipe II can record wav files from audio being processed by the sound card. The Wav File recorder is designed for situations when the observer is present as well as unattended observations. When the observer is present he or she may record sound files of events as they occur. Reaction time when pressing the record button necessarily means that some of the sound event you want the record has passed by the time you start the recording. The wav file recording prebuffer solves this annoying problem by maintaining a circular buffer of the incoming sound. If you set the prebuffer to a length of 10 seconds for example, then when you press the record button the recording will also include the 10 seconds of sound that occurred prior to pressing.

### Power Detection Factors

When using the Power detection method with a sound card data source, a factor may be applied to scale the

output to some meaningful units. You need not worry about this factor unless you are calibrating the input. Calibration for simple radio sound output can be achieved using the Jove Calibration Wizard found under the Tools menu. [Read about detection methods here.](#)

### **Sound Background Offsets**

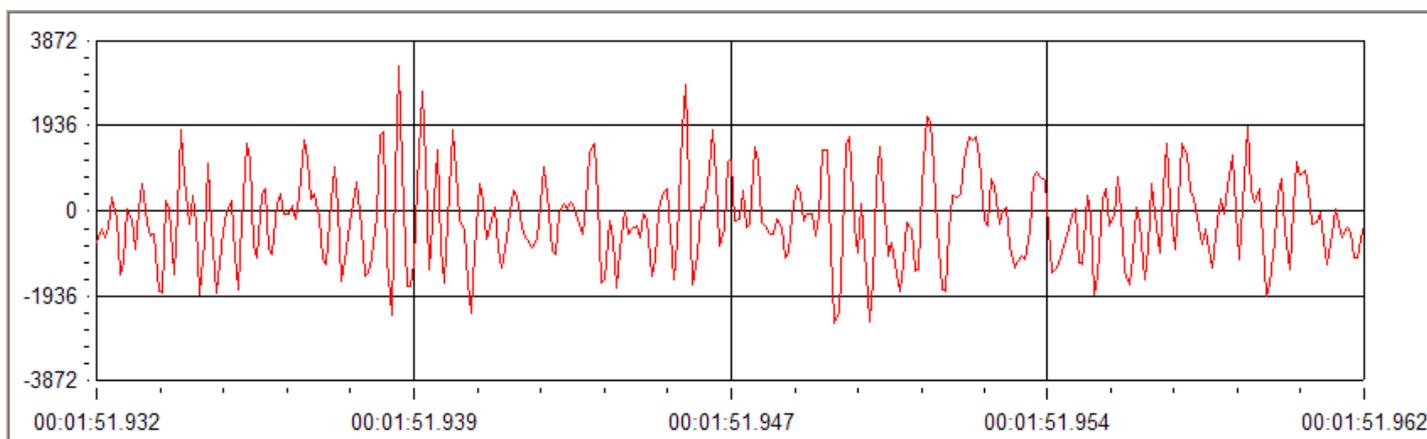
Some sound cards output a continuous value or a noise signal even when no signal is being processed by the card. This signal can produce significant errors in some times of data collection, especially those that use power detection where the soundcard output is squared. You can test your sound card for this issue very simply by creating a strip chart with no input to the sound card (by unplugging the line In, for example). If the resulting chart is close to 0 then there is no problem. If the result is above perhaps 20 or 30 then you might want to offset this value. This can be done manually or using the Sound Background Null tool. More information is contained on the help page for that tool.

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## Radio-SkyPipe Help

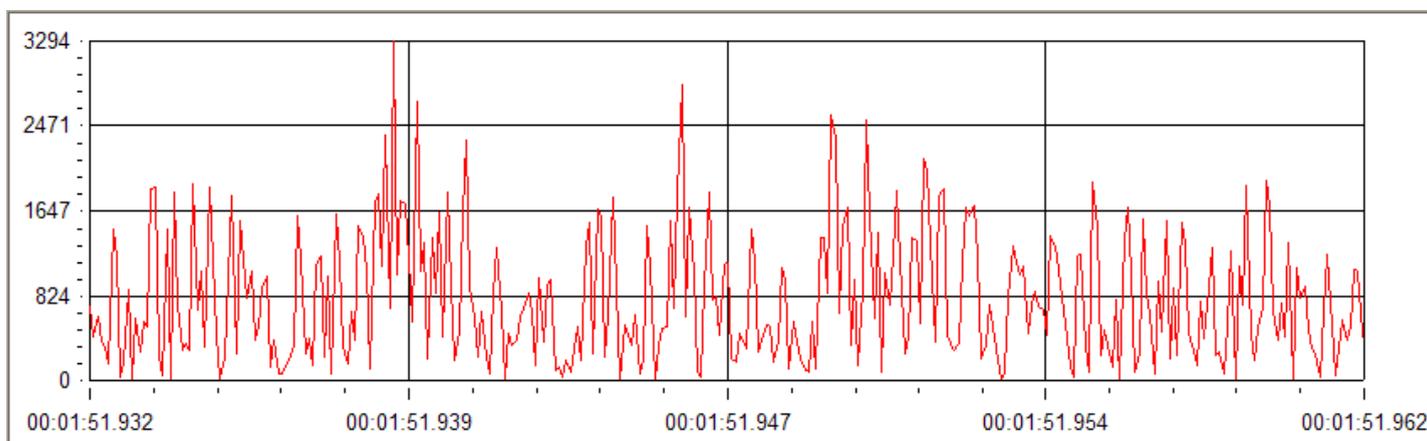
# Sound Card Detection Methods

In a computer, sound is recorded as a series of digital measurements. These measurements include both positive and negative numbers that fall within the range of the sound card analog to digital converter (ADC). Radio-SkyPipe uses 16 bit sound formats and thus the range of possible values include 32767 to -32767.



**Raw wav file values plotted over time showing positive and negative numbers recorded by the sound card ADC. Note that this is only 30 milliseconds of data.**

For most purposes we are interested in detecting the general trend of the incoming sound card data, not the values of the individual samples. We cannot just average all of the samples, however, as the positive and negative values tend to cancel each other out and the result will be zero. The first step in all of our sound detection methods is then to change all of the values to positive ones, that is, that the absolute value of each sample. (This is equivalent in the world of hardware to passing the signal through a full wave rectifier made of diodes.)



**The raw wav file values have here been converted to their absolute values. Averaging will no longer result in a zero outcome.**

Radio-SkyPipe is not designed for high speed sample rates (the data above was taken from a wav file). Many real world data recording tasks can be easily satisfied with rates of 25 samples /second or less. So the sound data shown above would ordinarily constitute less than one sample on an ordinary RSP II chart.

If we use the **Peak** detection method, the result reported on the RSP II chart for this point would be **3294**, the highest data point in the series of samples. This type of detection then accentuates the "spikes" in the data.

Applying the **Average** detection method we would get a resulting point on our chart of **795**, which is just the arithmetic mean of all of these samples (it would be zero if we had not taken the absolute value).

The **Power** detection method attempts to determine how much power is in the signal by taking the average of the squares of each sample. Here the total of the squares is 336491360 and the average of this huge number with 331 samples is **1016590**. The result is then divided by an additional number, the **Power Detection Factor**, to normalize it to some scale. If the input power to the sound card is known then the system can be calibrated and this becomes an absolute reading. Otherwise the Power Detection factor only is useful as a means to bring the squared numbers down to some easy to handle level. (They tend to be quite large otherwise as in this example.) Let us say that we knew this value represented 1 milliwatt of power to our equipment. We could then express the express our chart in milliwatts by using a Power Detection Factor of 1016590.

**Comparing Methods**

You select the sound card detection method on the Options / Data Source panel. Whenever you select the right or left channel of the sound card as the data source, you are also given a dropdown selection box for the sound detection method. It is possible to act on the same incoming sound data in all three ways, each in a different data channel. For example you could choose CH1, CH2, and CH3 to all have as their data source pointed to Sound Card Left. Then you could assign each of these channels a different detection method; Peak, Average, and Power. You can then easily compare the results of using each detection method. **(Of course, you need the Pro version of the software to record multiple channels simultaneously.)**

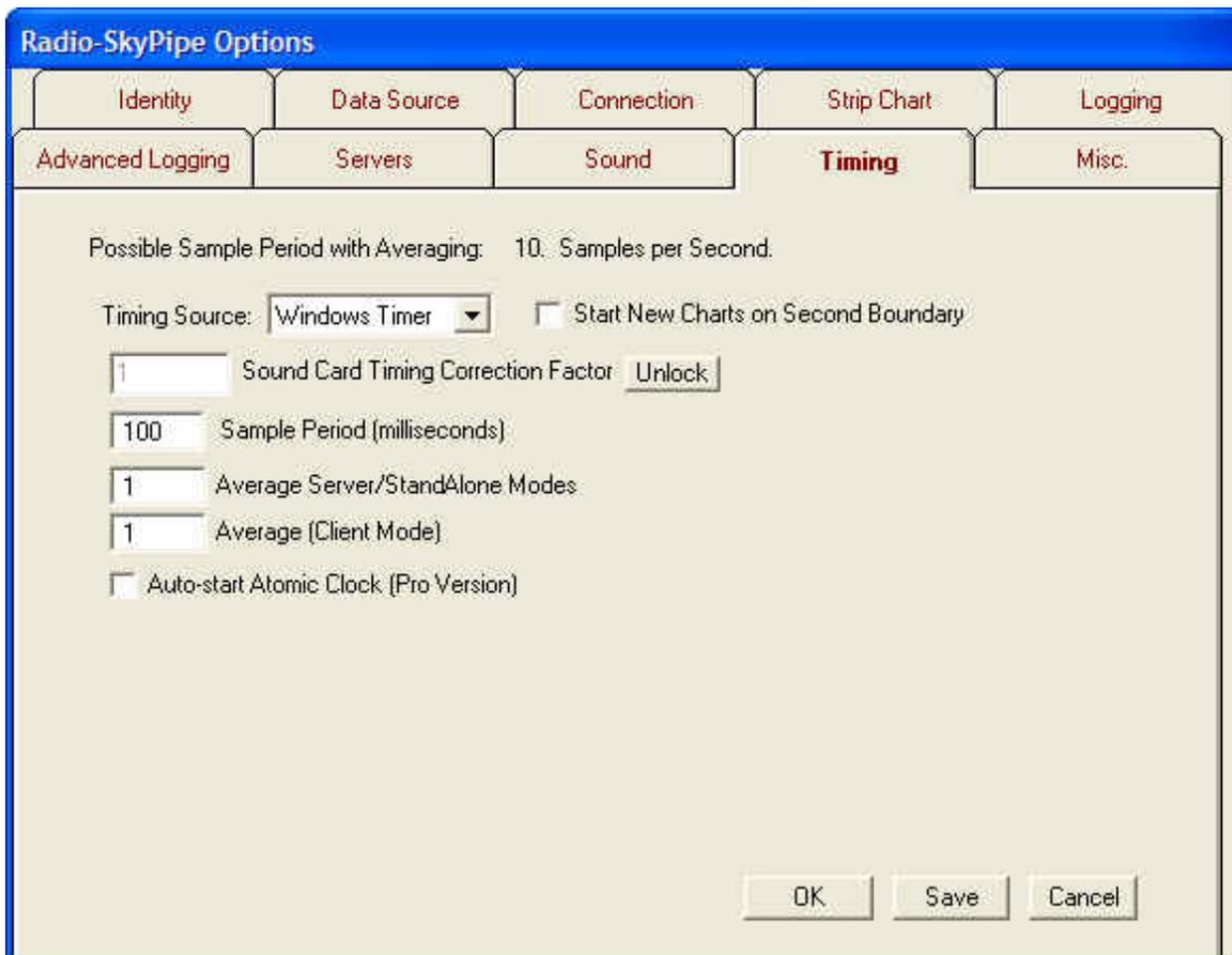
*Please note that this is just a description of how the detection methods operate in software and does not guarantee that any given piece of equipment connected to the sound input will produce a particular result. There are just too many factors that can affect the results of using the sound card to make a global prediction. You should test your sound card based measurements as thoroughly as possible to see if the results match your expectations.*

**Offset Bias**

Some sound cards even with no input produce a significant output. This can come in the form a more or less constant number or as a small noise signal. This bias can affect your results and so a method has been provided to remove most of its influence by subtracting a fixed amount from the absolute values being processed. [See the help page on Sound Card Offsets.](#)

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# Timing Configuration



Timing here refers primarily to the spacing between samples. The **Timing Source** is the trigger that tells the program when to sample a [data source](#). The Windows timer is intrinsic to the Windows operating system. This timer is capable of sampling at about 18 samples per second. It is not particularly reliable or regular but has low overhead in CPU usage. Selecting Sound Card as the Timing Source produces a much more regular sample rate. A sound card must be available to perform this duty. If the data source includes a sound card channel then the functions of data collection and timing are combined.

**Start New Charts on Second Boundary** - attempts to start data collection close to the transition of one second to the next as it appears on the system clock.

**Sound Card Timing Correction Factor** - Sound card timing is crystal controlled. Cards however have varying degrees of precision in their crystal oscillators. You can apply a small correction factor (a multiplier) here if you need to tweak your sound timing. The Unlock button allows you to access this parameter.

**Sampling Period** - The number of milliseconds between samples. There are 1000 milliseconds in a second so for example, a sample period of 100 would produce 10 samples /second. Sampling periods shorter than about 25 milliseconds (40 samples a second) can cause a failure on an average modern PC. If you have a slower PC you may need to stay below 20 or even 10 samples per second.

**Average Server/Stand Alone Modes** - The number of samples to average before creating a single data point on the chart. For example, if you had a sample period of 50 milliseconds and averaged 4, 1 point would be plotted every  $4 * 50 = 200$  milliseconds, or 5 samples per second.

**Average (Client Mode)** - Provides the same functionality as the option above when receiving other charts.

**Auto-start Atomic Clock** - Automatically start the Radio-Sky SNTP Client program to assist in keeping your computer time correct.

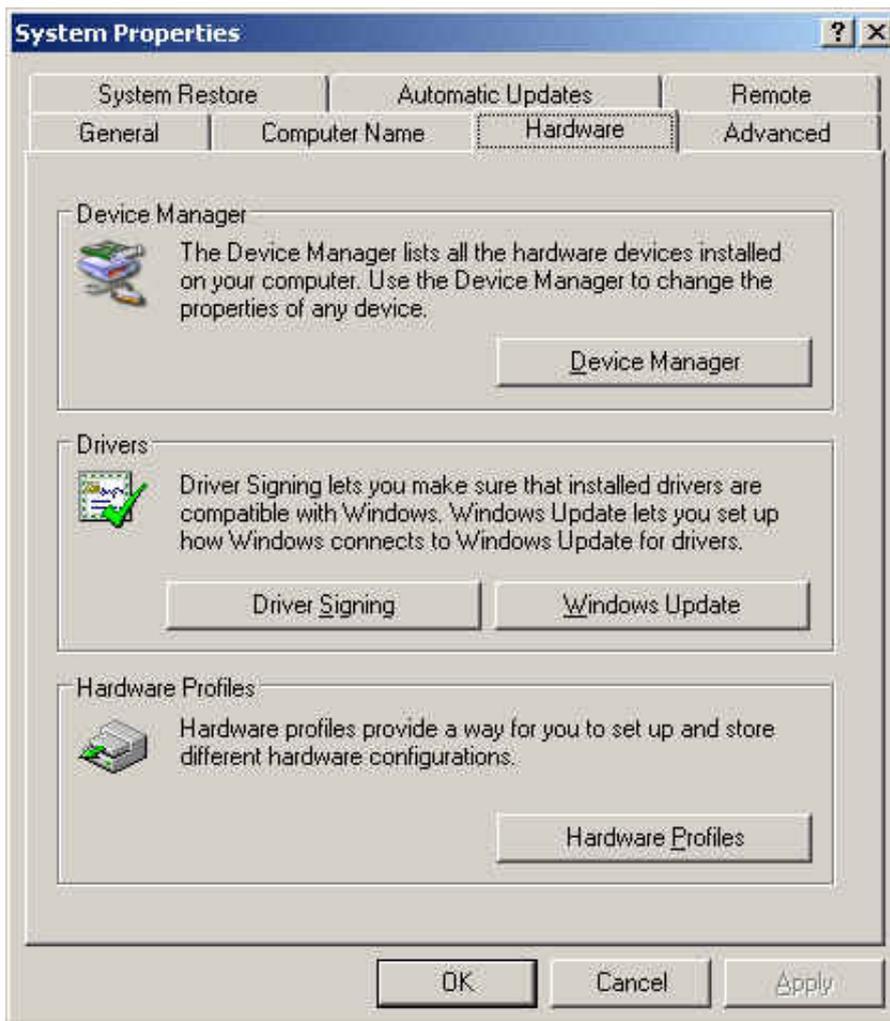
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## Radio-SkyPipe Help

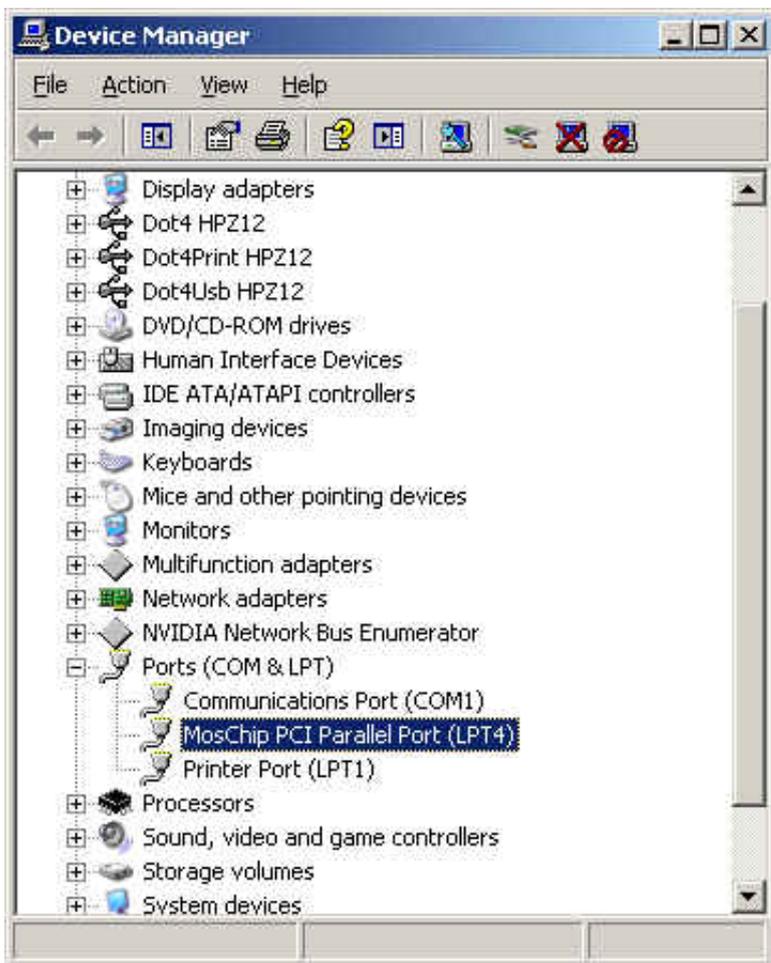
# Parallel Port Configuration

Beginning with RSP 2.1 parallel port access for ADC and Trigger functions is facilitated by a new driver. The old TVicPort driver was difficult to install and did not allow use of non-standard printer port addresses as supplied by some parallel port add-on cards. If you are still using an older version of RSP and are having trouble with Printer Port Not Found errors, see the Troubleshooting page or upgrade to the latest version of RSP and use the configuration information on this page.

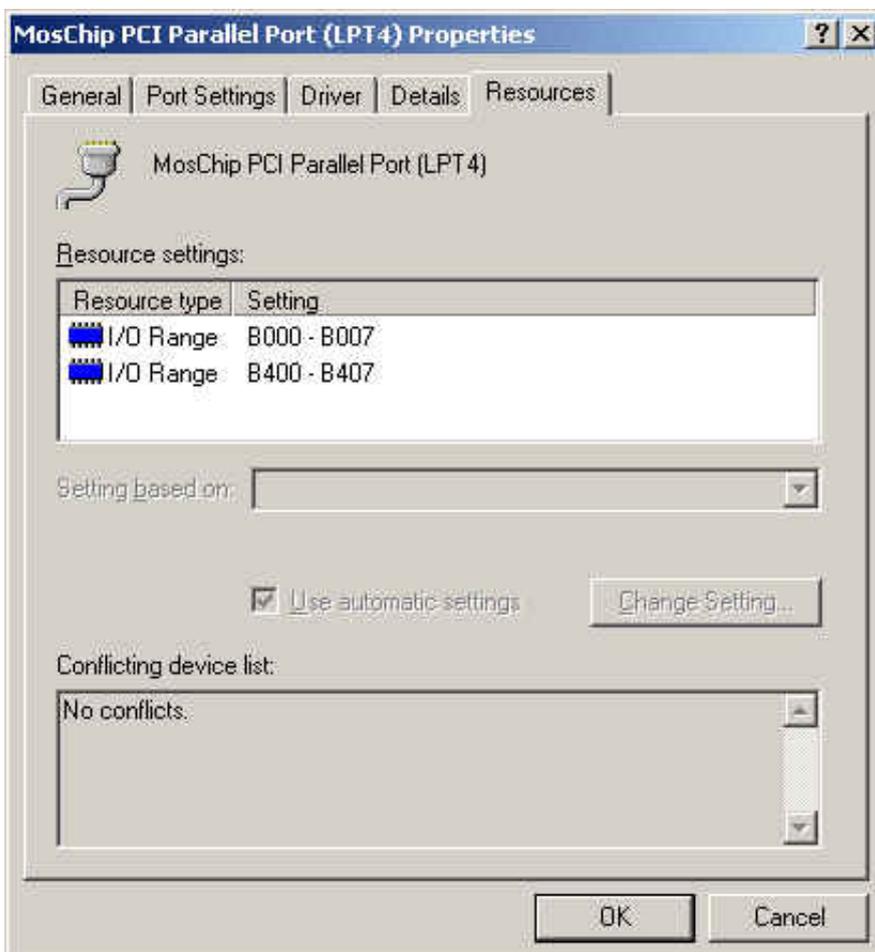
When using the parallel port for normal printing purposes, you don't have to consider the base address of the port. To use the parallel port for running an ADC or manipulating outputs as an action of a Trigger in Radio-SkyPipe 2 we do need to know this address. Most computers that come with a parallel port will use the base address of 378 (hex) . A few will use 278 or 3BC hex. Many computers are now coming without parallel ports, instead relying on USB based printer control. For desktop computers you can add a PCI bus parallel card for very little money. Unfortunately, many of these cards come with non-standard base port addresses. To discover the base address you can open Device Manager. The way I find Device Manager in Windows Xp is by looking in Control Panel and then selecting System.



Under the Hardware tab you will find the Device Manager button.



Under the category Ports (COM & LPT) double click on the parallel port you want to examine. The properties window of the device will appear.



Select the Resources tab. In the Resource Settings window you will see an I/O range. The base port of the parallel port will usually appear as the first number listed. In the picture above we see B000 as the address assigned to this add-on PCI parallel port. OK we have our address now lets apply it in RSP2:

Open the Options window in RSP2 and select the Data Source tab. Then click the ADC Setup button.

MAX186 LabJack U3 LabJack U12 **Parallel Port**

Parallel Port

378H       3BCH        H

278H        H        H  ?

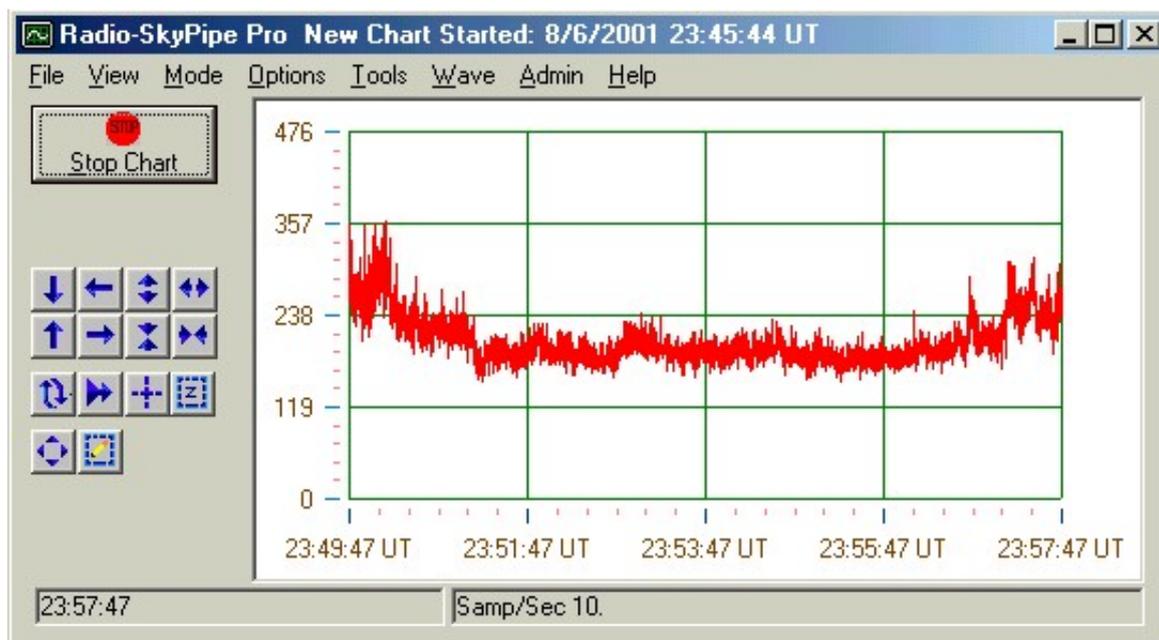
Select the parallel port base address. If you have added a card with a non-standard base address you can type the address in hex format in one of the boxes. You may determine the base address by inspecting the properties of the parallel port in Device Manager.

Select the Parallel Port tab. You will see the standard addresses mentioned above along with boxes where you may supply non-standard addresses. To add a non-standard address simply type it in the box and select the radio button associated with that box. Remember we are using hexadecimal format as is traditionally associated with these addresses. Click Done and click the Save button before leaving the Options window. That is all there is to it.

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# Using Radio-SkyPipe in Stand Alone Mode

You do not have to be connected to the internet to use R-SP. In Stand Alone Mode the system simply collects data and allows you to save it to your hard drive for later recall or editing.



Stand Alone Mode is the default Mode in which the program begins. You may also go to this mode when operating in either Client or Server Mode by selecting **Mode/ Stand Alone** from the menu at the top.

Operation is very simple once you have configured the program properly. To begin recording data just press the Start button. To end the observation press the Stop button. Whether or not you will be prompted to immediately save the data will depend on how you have set up your [Logging Options](#). A row of positioning and sizing buttons can be found to the right of the Start button. These are best used when the data collection process has been ended but may be used on-the-fly also. Using these buttons turns off your Auto-Scaling feature but it can be reactivated by pushing the A button.

See [Editing](#) for an explanation of the Full View and Save View and Toolbar buttons.

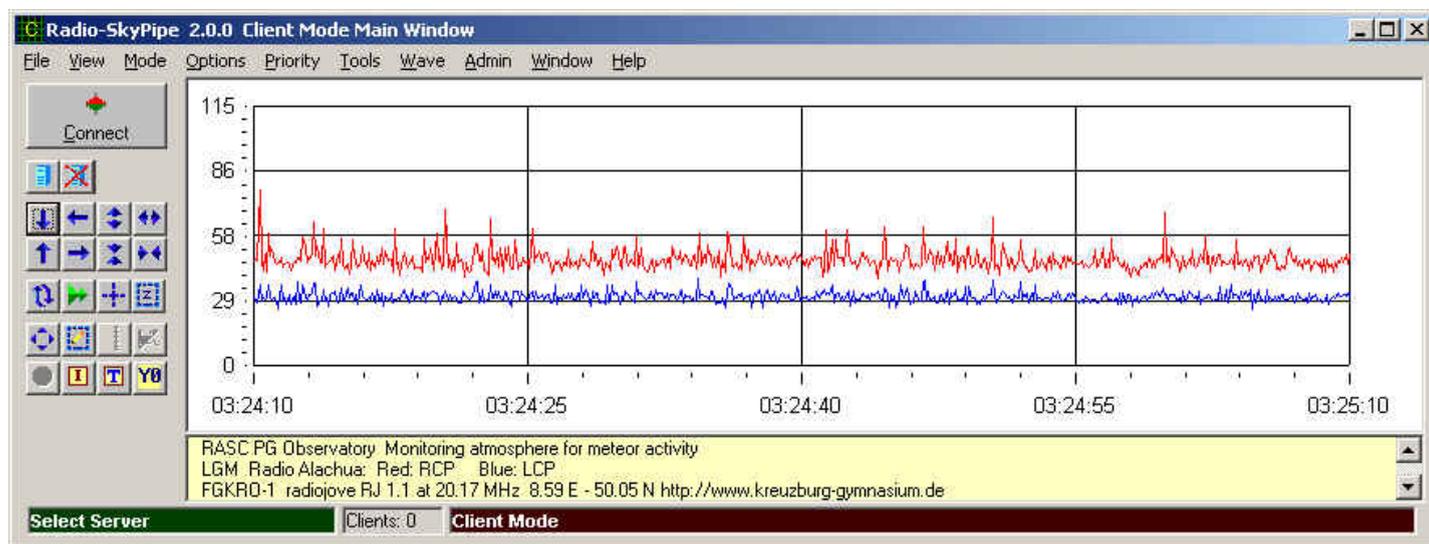
See [Running a Schedule](#) for an explanation of the Run Schedule Button.

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## Radio-SkyPipe Help

# Using Radio-SkyPipe in Client Mode

In Client Mode you can receive in real-time strip charts being generated by anyone connected to the internet or your local LAN. Of course, that strip chart must be made available by another R-SP user who is in server mode. Using the Second Client Mode Chart feature, you may even exchange strip charts simultaneously.



You enter Client Mode by selecting **Mode / Client** from the menu at the top of the screen.

On your screen will appear a list of available strip chart servers. If you have selected Check for Servers Online in your [Connection Options](#), the list shown will be those servers which have published themselves on our ILS so that others can connect to them. Your Private Servers List will appear below any published servers if you have so opted. The Show Servers  and Hide Servers  buttons control the display of this list. You can also manually enter an IP and Port number by right clicking on the available chart servers list and selecting Manually Enter IP and Port which will bring up the dialog box below:

Usually however you will simply begin receiving the strip chart by clicking on the server entry in the available servers box so that it is highlighted and then click the Connect Button, or by just double-clicking on the entry. To end the session click the Disconnect button.

Press the  button to see the data information page for the server you have connected to.

That's all there is to it! You will be prompted to save the strip chart in accordance with your [Logging Options](#) selections.

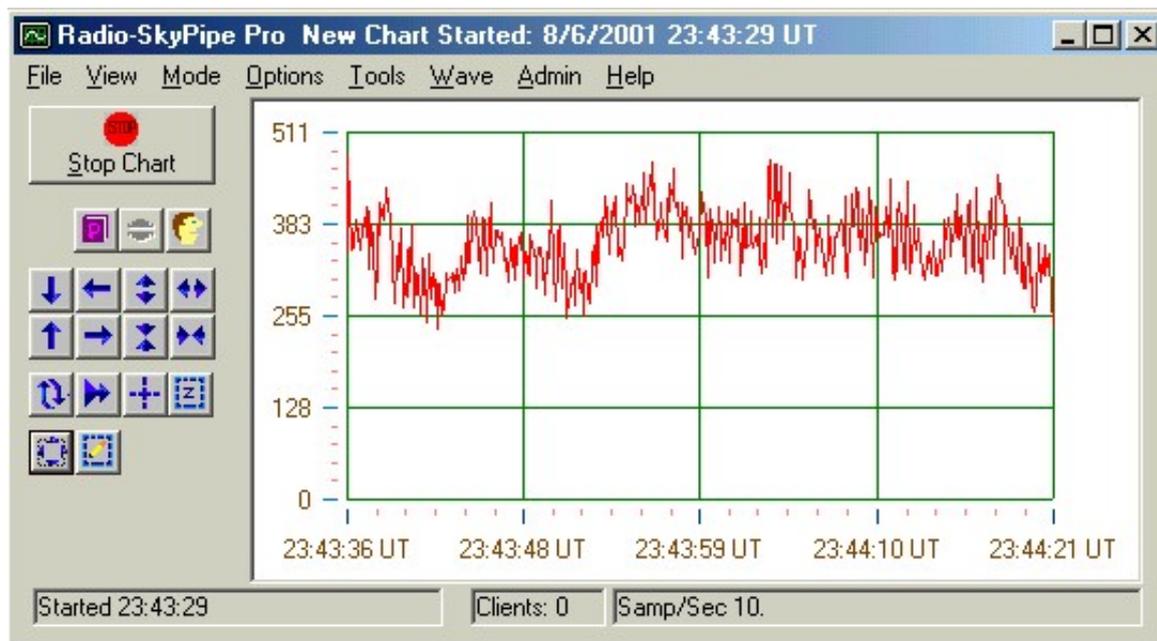
*Note that even though you are restricted to collecting data locally to a single channel when using the Standard Edition of Radio-SkyPipe, there is no such restriction on how many channels of data you may receive from a single remote server!*

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## Radio-SkyPipe Help

# Using Radio-SkyPipe in Server Mode

One of the exciting things about this program is that you can make your observations available to others in real-time. To do this, you must be collecting data via your soundcard or an analog to digital converter (ADC), and be connected to the internet. To share your data you must enter Server Mode by selecting Mode / Server from the main menu at the top of the screen.



It is important that you configure your [Identity](#), [Connection](#), and [Data Source](#) Options before you begin serving data.

The Server Mode screen appears little different from the Stand Alone Mode screen. An additional button labeled Publish has been added. Use the  **Publish** button to make your observation publicly available, that is, your server will be made to appear in the Available Servers List of anyone connected to the internet and running R-SP in Client Mode.

If you do not wish to make your data public, then you must through some means share your connection information with whomever it is you want to connect to your data.

At the bottom left of the screen is the Connection Status box, which displays recent information regarding your observation and internet connection. The Clients box displays the current number of connections others have made to your strip chart data stream.

You may [chat](#)  with your clients provided they have their chat windows open and that you have enabled chat in your [connection options](#).

Information about your connection activity may be found by selecting **View\ [Session Log](#)**. Additional information may be found in **View\ [Connection Info](#)**.

**Some important things to remember are:**

Set you Maximum Number of Clients to some reasonable number...say 10 to 30.

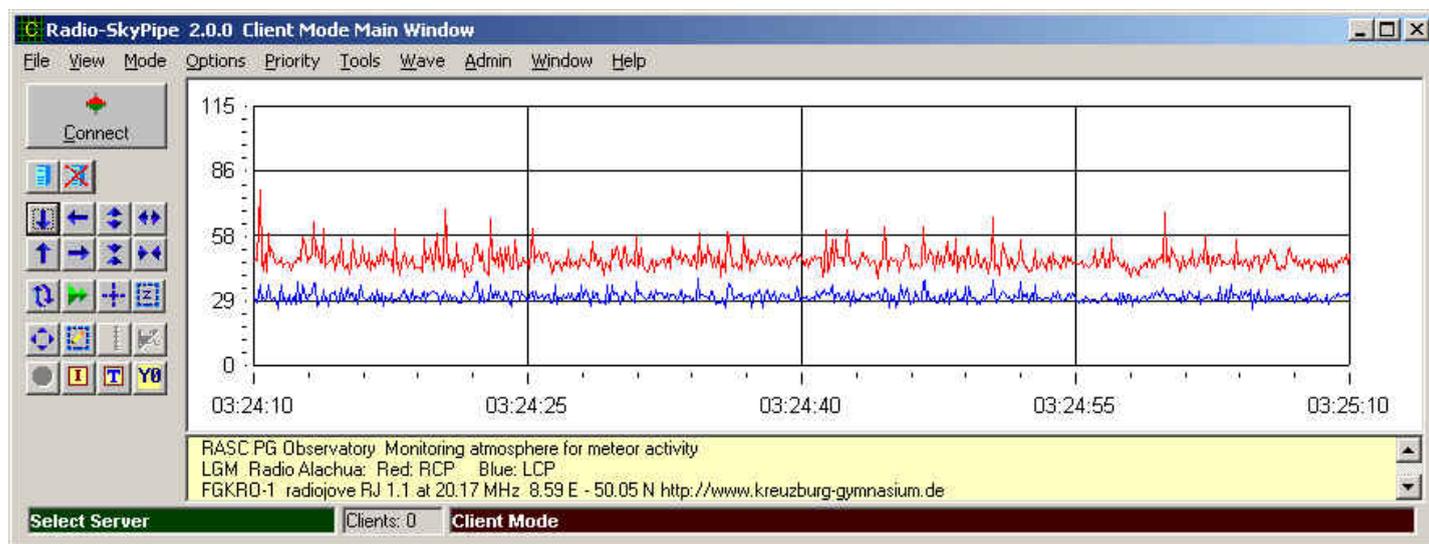
Redrawing your strip chart after each data sample is collected seriously degrades performance. See the [strip chart Options](#) page.

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## Radio-SkyPipe Help

# Using Radio-SkyPipe in Client Mode

In Client Mode you can receive in real-time strip charts being generated by anyone connected to the internet or your local LAN. Of course, that strip chart must be made available by another R-SP user who is in server mode. Using the Second Client Mode Chart feature, you may even exchange strip charts simultaneously.



You enter Client Mode by selecting **Mode / Client** from the menu at the top of the screen.

On your screen will appear a list of available strip chart servers. If you have selected Check for Servers Online in your [Connection Options](#), the list shown will be those servers which have published themselves on our ILS so that others can connect to them. Your Private Servers List will appear below any published servers if you have so opted. The Show Servers  and Hide Servers  buttons control the display of this list. You can also manually enter an IP and Port number by right clicking on the available chart servers list and selecting Manually Enter IP and Port which will bring up the dialog box below:

Usually however you will simply begin receiving the strip chart by clicking on the server entry in the available servers box so that it is highlighted and then click the Connect Button, or by just double-clicking on the entry. To end the session click the Disconnect button.

Press the  button to see the data information page for the server you have connected to.

That's all there is to it! You will be prompted to save the strip chart in accordance with your [Logging Options](#) selections.

*Note that even though you are restricted to collecting data locally to a single channel when using the Standard Edition of Radio-SkyPipe, there is no such restriction on how many channels of data you may receive from a single remote server!*

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## Radio-SkyPipe Help

# Opening a Second (Client Mode) Chart

To facilitate simultaneous operation in Client Mode and Server Mode, Client Mode and Stand Alone Mode, or Client Mode connections to two different strip chart servers, you may open a second strip chart window which is restricted to Client Mode operation. In other words, you can run the primary instance of R-SP in any mode, but you are allowed to open a second instance in Client Mode only. Pro users may open up to nine Client Windows at once, while Standard version users may open only a single additional Client Window.

To open this second strip chart select **View / New Client Chart** or press *Ctrl W*

Do not try to use the second chart to connect to the same server as you are connected to in a primary Client Mode window. The program will not allow this.

To view or edit the saved file from this chart you must close the second chart window and load it into a Stand Alone chart.

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## Radio-SkyPipe Help

# Running a Schedule with Radio-SkyPipe

You do not have to be at your computer to run a limited time observation with R-SP. Use the Run Schedule button to set up and initiate an observation between selected times. For example, you may want to record a predicted event at 3:00 AM which will last for about an hour. To do so:

**Stop any observations in progress.**

**Click File/ Run Schedule menu option.**

**If in Server Mode, you will be asked if want to make the observation Public.**

**Enter the beginning time and date in the date/time input box.**

**Enter the ending time and date in the date/time next input box.**

The program will begin watching for the assigned beginning time. When it occurs, the program will begin running in whatever mode it is set. After the ending time has passed, the observation will cease and the chart will be retained.

*Note: In versions prior to 1.2.8, schedules are started and ended using the computer clock local time even if you are using the Log Using Universal Time option. Starting with version 1.2.8 the schedule will be started depending on your logging option, including LMST.*

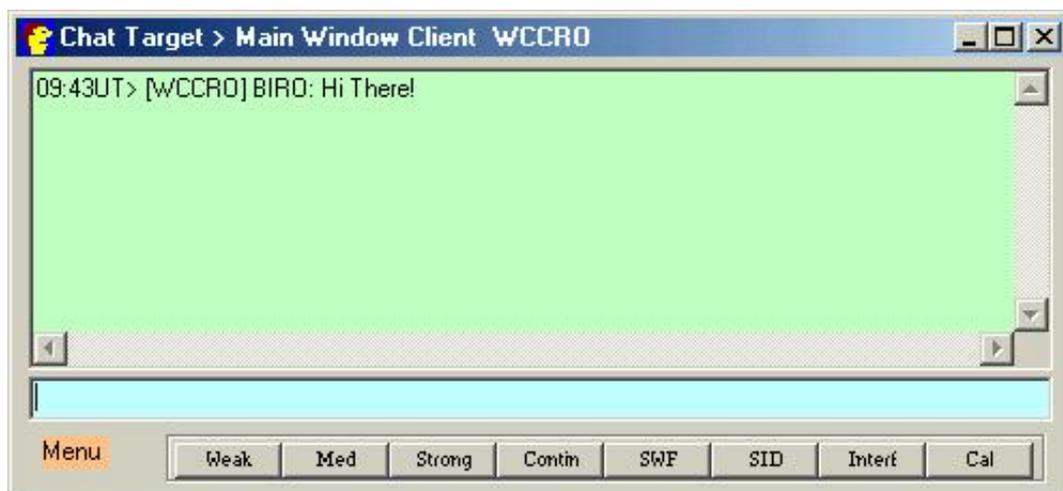
In [Server](#) and [Client](#) Modes, connection to the internet is assumed. If you have scripted dial-up networking installed, the computer will attempt to connect to the internet via your modem provided you have all of the settings in [Connection Options](#) appropriately made.

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## Radio-SkyPipe Help

# Using the Chat Feature

When connected in Client Mode or Server Mode you may chat with others connected to the same strip chart server or to the person running the server if they are present. The chat feature is intended to provide a simple way for observers to communicate about the observation. Chat is only available on strip chart servers where the administrator of the strip chart server has selected Enable Chat in their Connection options.



You may initiate the Chat window by selecting **View/Chat Window** from the menu, or by pressing the Chat button.  The Chat window is available only when you have at least one client window open or are in server mode.

### Receiving Chat

You may elect to receive chat from all Client connections or just the Client/Server connection which you have selected as your Send Target (see below). To receive chat from all active connections select the **View Received Chat from All Connections** checkbox located on the Options / Connection configuration page. You may also toggle this feature off and on right on the chat window by clicking on the orange Menu button and clicking **View Chat from All Connections**. Because chat text may arrive from any of multiple servers to which you might be connected, each newly received chat item is tagged with the time and the source server name in brackets [ ]. Chat is received in the upper green colored text window on the chat form.

### Selecting a Send Target

If you connected to more than one server, you must select which will be the destination for the chat you send. This is referred to as your Send Target. To select a new Send Target click the orange Menu label in the lower left corner of the chat form. The top item in the drop down menu will be Send Target. Clicking on this item will display the list of available Send Targets. The Send Target will always be displayed at the top of the chat form.

### Sending Chat

To send chat just type your text into the blue window and press enter. Limit the length of your comments. An upper limit of 255 characters is imposed per send. Note, if for any reason your line of send text fails to appear in the receive window, you may press enter a second time and the chat will reappear in the send box. Press enter one more time to re-send it.

### Get Users

You may find out the Local names of all users connected to your Send Chat Target by clicking the orange Menu button and selecting, **Get Users**. The user list will appear in your receive chat box. Note that just because a name appears in this list, it does not mean that they have their chat window open.

### Clear Chat

You can clear all of the received chat from the receive chat text box by clicking the orange Menu button and selecting **Clear Chat**. There is no way to retrieve this text once it has been cleared.

## Special Pro Edition User Features

### Chat Macro Buttons

Pro Edition owners will see a series of eight chat macro buttons across the bottom of the chat form as shown in the picture above. These can be very useful for sending often used phrases quickly. Chat macros can also send entries automatically to the Observer Log. To configure the text and button labels, right click on any of the buttons or select Configure Chat Macros from the drop down menu. See [Chat Macro Configuration](#).

### The Chat - Observer Log Connection

During many coordinated observing sessions, you may find that most of your time is spent in the chat window. Jumping back and forth to the observer log to keep good notes on the observation is very cumbersome. To overcome this problem there are ways to transfer info from the chat window into the observer log more directly

- You may configure the Observer Log Automated Entries to automatically log all Chat Macro buttons
- You may make an Observer Log entry from the send chat text box by pressing **F11** *instead of Enter*. In this case the entry will NOT be sent out to your chat target.
- You may send the text in the chat send box to the chat send target AND the Observer log by pressing **F12** *instead of Enter*.
- You can select and copy any portion of the text in the chat receive text box by selecting with the mouse, right clicking and selecting Copy. Then you may put the mouse cursor at the appropriate location in the Observer Log text window, right click, and select Paste from the drop down menu.

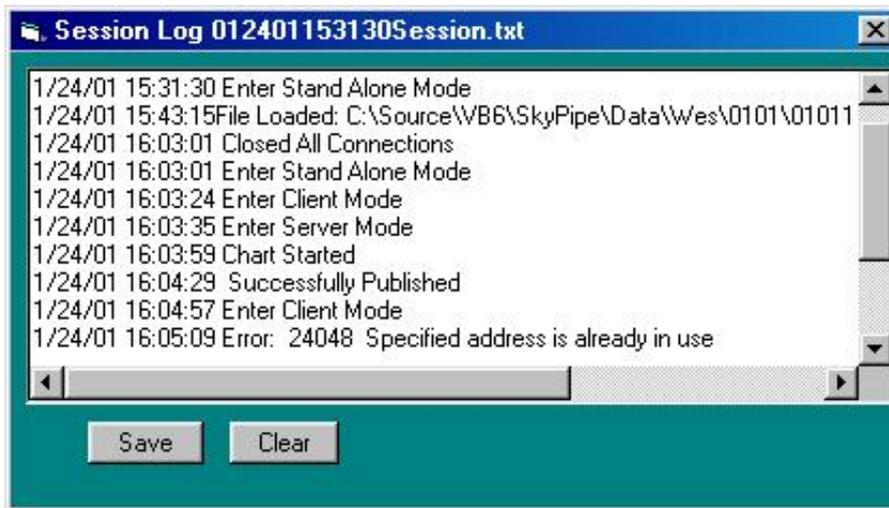
### A little Trick to Get Someone's Attention

Typing a user's Local Name (exactly as it appears, including capitalization), preceded by an asterisk (\*) will page that person by causing a beep and displaying a "Paged You!" message in the title bar.

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# Session Logs

Details of the activities performed by Radio-SkyPipe are kept in a text log called the session log. You may view this information at any time while the program is running by selecting **View / Session Log** on the menu at the top of the screen.



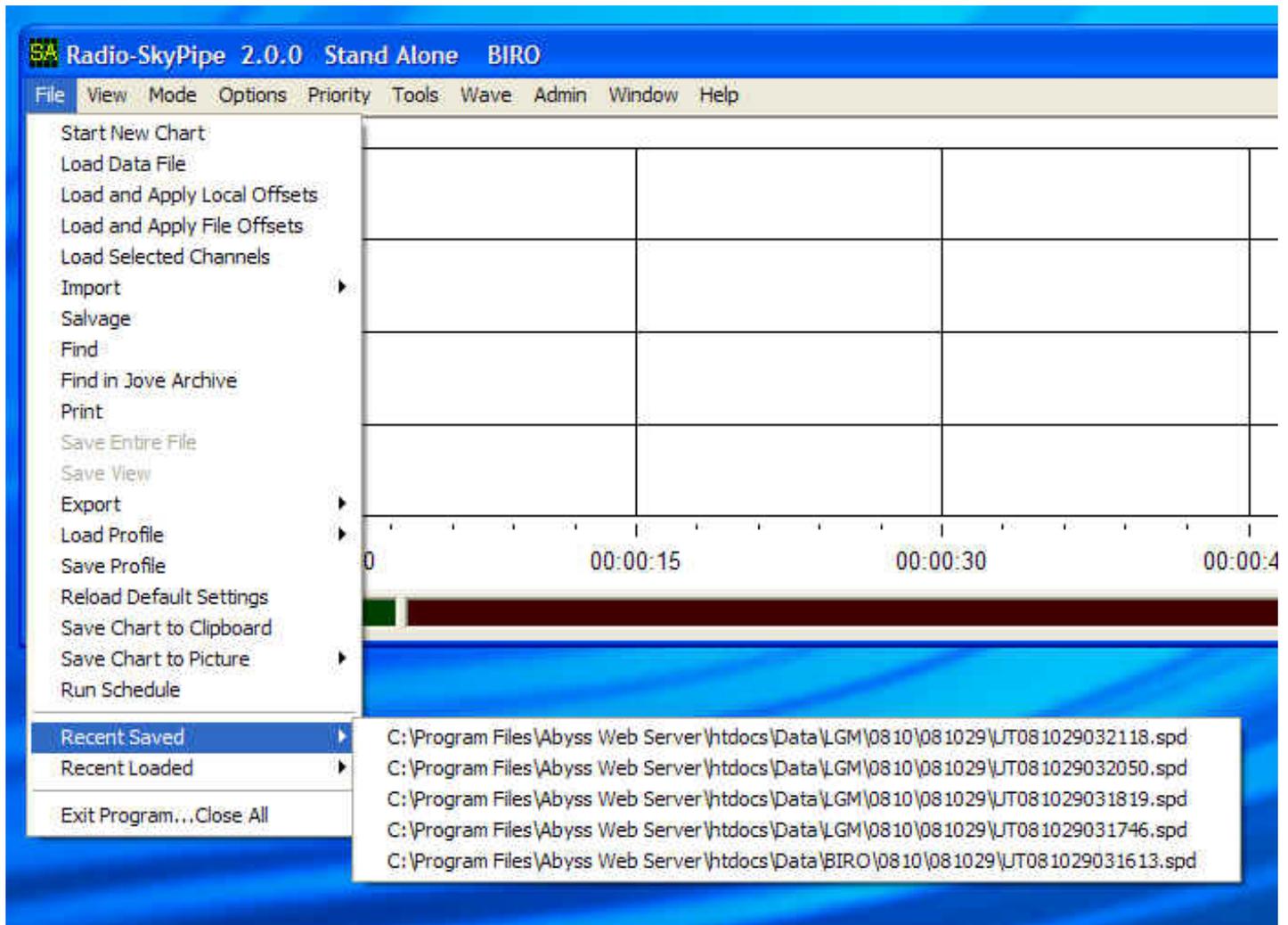
You may elect to have this information automatically saved by selecting AutoSave Session Log on the [Logging Options](#) page.

Clearing the log on long observation runs may slightly improve performance. You may also save the log at any time using the appropriate button on the Session Log window.

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## Radio-SkyPipe Help

# Loading Strip Charts from Disk



In the Standard version you must be in [Stand Alone Mode](#) in order to load a previously saved strip chart from disk. This is also an option for Pro version users, however, for these an additional option exists to view files using [Review Windows](#).

At the menu at the top of the screen select **File / Load**.

Depending on your version of Radio-SkyPipe, you may see the following panel:



This panel gives you the option to apply offsets that are hidden within the header of the file (those used on the machine which saved it), your own locally defined offsets, and/or to load selected channels of a multi-channel file. If the panel annoys you, you can elect to not have it show at all. You can get the panel back by clicking the File Loading Options button at the bottom of the Options/ Strip chart panel.

Long strip charts can take some time to load, so be patient. A [Data File Info](#) screen will appear showing the relevant header information for the strip chart.

You may [edit](#) the chart and save the modified information.

You can also load Recent Saved or Recent Loaded files as shown in the top figure.

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## Radio-SkyPipe Help

### Radio-SkyPipe Configuration

# Editing and Getting Around in Strip Charts

You may select specific portions of strip charts to be saved. Editing must be done in Stand Alone Mode. Any loaded strip chart may be edited.



Positioning and sizing buttons can be found below the Start button. Using these buttons turns off your Auto-Scaling feature but it can be reactivated by pushing the button rightmost button with two curved arrows. **Left and right Arrow buttons** turn off automatic scrolling when data is being collected. The data will still be received in the background but in order to start scrolling again you must click the **Plot/Autoscroll** button  Note, the buttons with the single arrows move *the view* of the imaginary chart paper up and down so pressing **up** will actually make the chart data appear lower in the chart.

The four leftmost buttons shown above expand or contract the chart width or height. Expanding the chart width actually makes the data appear smaller, just as if you were now using a larger piece of chart paper. Experiment with this and you will get the hang of it quickly.

*After **right clicking** one of these buttons you can drag your mouse on the chart to smoothly continue the process of scrolling or resizing. Its hard to explain, just try it! If you use the right click method any chart that is active, that is, having new data added, will cease to scroll automatically. Remember to use the Plot/Autoscroll button to re-enable scrolling.*

### Manual Entry

You may manually enter the area of the chart you wish to view using this button. The panel shown below will appear:

Press the apply button to jump to the area you want to see as described in the appropriate date/time and width boxes. You may initiate multiple Manual Entry panels. This is useful for jumping between several set views of the chart.

### Important : Re-enable scrolling!

Buttons *may be used while data is being collected, however you will have to press the Plot-Enable*

*Scrolling button* to have the chart again scroll with the newly arriving data.

### **Zoom Box**

The on-chart Toolbar also has a Zoom-Box feature shown highlighted above. This allows you to drag a rectangular region on the chart and zoom in on it. Resume plotting using the Plot button 

### **Cursor Button**

A cursor which may be selected by clicking on that option. The cursor is a vertical line which appears on the chart. The values for the data point where the cursor is positioned appear below the chart in the status bar. If more than one channel is on the chart the cursor can be applied to any channel you wish. **To switch to another channel simply click the right mouse button on the chart.** The cursor will appear in the color of the channel it applies to.

### **Full View**

The **Full View** button forces the entire observation onto a single chart window. The need for this will become apparent when dealing with long charts as it make the selection of a single portion of the chart much easier using the Toolbar's Zoom Box feature. Beginning with version 2.3, using the shift key alters the Zoom Box so that the Y values are retained but the full chart X range (time) is shown.

### **Save View**

The **Save View** button selects the time chunk of the chart data which appears on the screen at the the time the button is pushed. You are then prompted for a file name (though a suggested name is automatically generated). *This is your primary editing function and you you should experiment with using it.*

### **Set Y to Zero**

Sets the bottom of the chart at zero with a single click.

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# Saving strip charts to Disk

To save a strip chart to disk select **File / Save** from the menu at the top of the window. Note that this operation differs from Save View in that the entire chart is saved.

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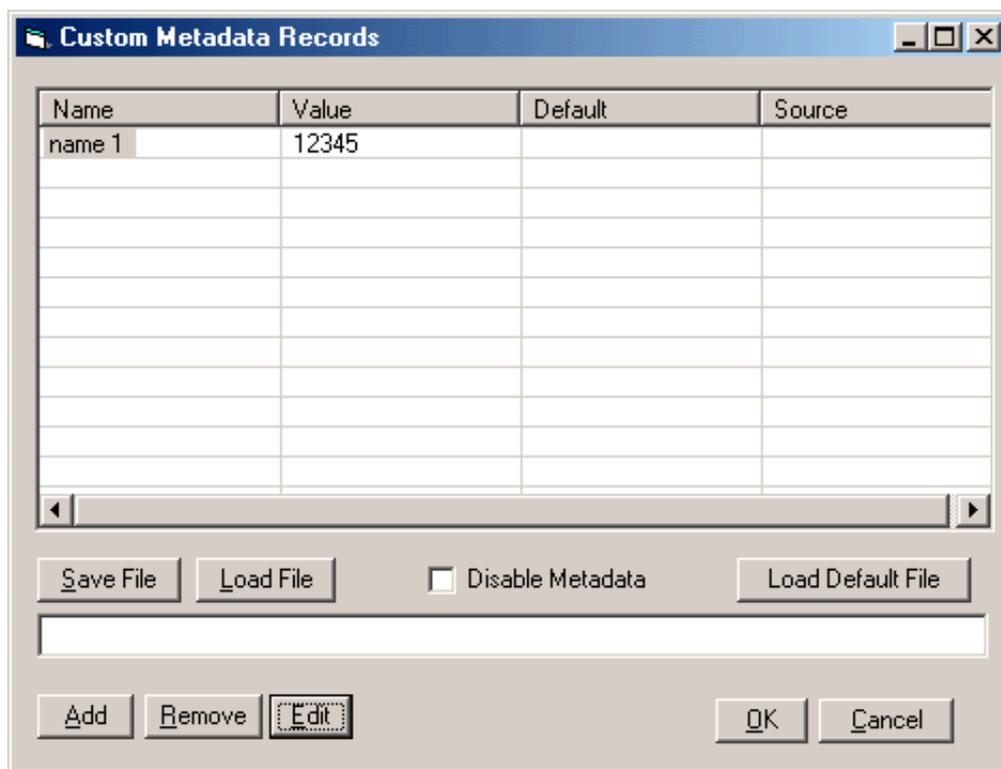
## Radio-SkyPipe Help

# Static Meta-Data

Metadata is information that is pertinent to the observation but not part of the actual observation data set. You may assign up to 200 name = value field pairs to be included in your file headers. These fields can be anything you want, for example, an observer might want to include the ambient temperature for all observations. The observer could create a field pair and assign its name as "Temperature". In the corresponding value the observer could place the value of the temperature for the appropriate time. In addition to this manually assigned metadata [Radio-SkyPipe II also assigns a number of metadata fields automatically](#).

Presently this addition of the value portion of the pair is a manual process, however, future editions of R-SP may have ways to add this custom data automatically.

To set up meta-data fields for your observations go to Option / Identity and click the Meta-data button. The following screen will appear:



Buttons are available for loading and saving meta-data files. To add, remove, or edit a meta-data field pair use the corresponding buttons at the bottom. A field must be selected by clicking on it in the name column to make it available for editing or deletion. The columns labeled Default and Source are for future use and should be ignored for now.

Notice the Disable Metadata checkbox. If selected, meta-data will not be included in your file header. This gives you a quick way to turn off meta-data inclusions when they are not appropriate for a particular observation.

You may edit the meta-data that is already present in file via the same route you would edit other header parameters, that is, the [Data File Info](#) panel accessible from the main screen menu as View / Data File Info.

A View/Edit Meta-data button has been added to that panel.

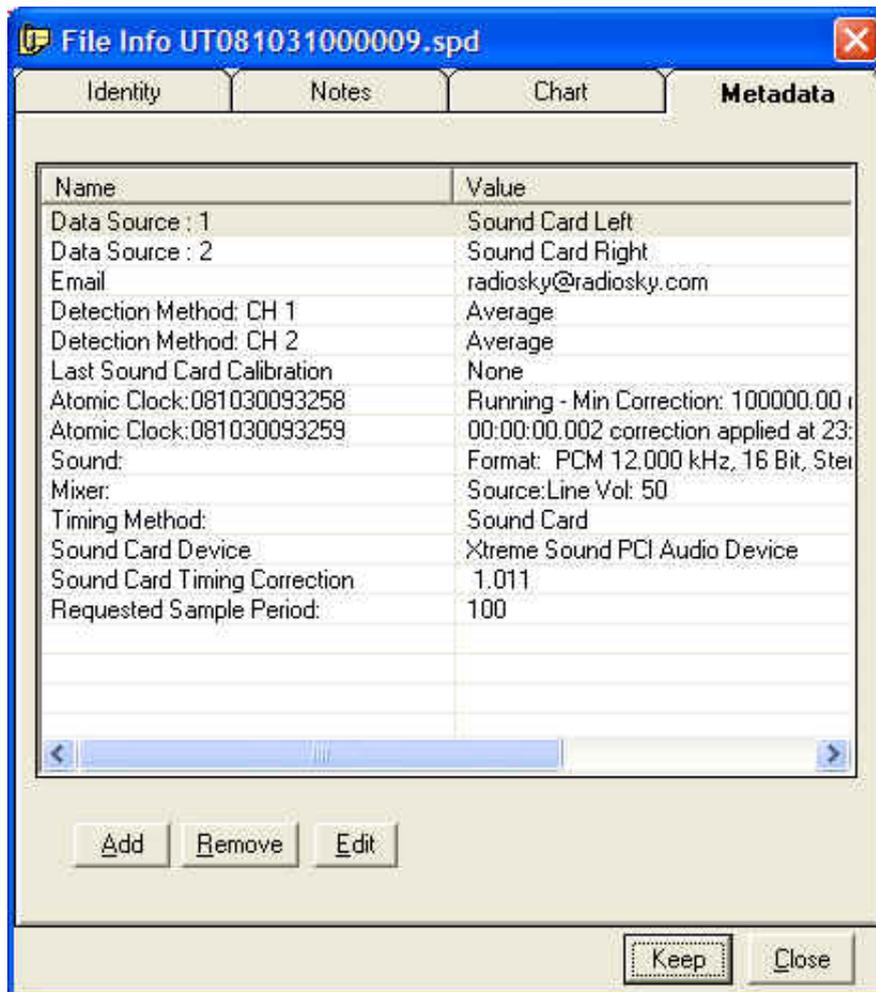
### [Automatic Metadata](#)

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## Radio-SkyPipe Help

# Automatic Metadata

In addition to metadata fields that you may manually assign to your charts, RSP II assigns a number of new fields automatically. These include information about timing, calibration, data source configuration and other items that may help in determining the quality and processing history that the data possesses. You can view these fields by using the Info button  and selecting the Metadata tab. These fields can be edited.

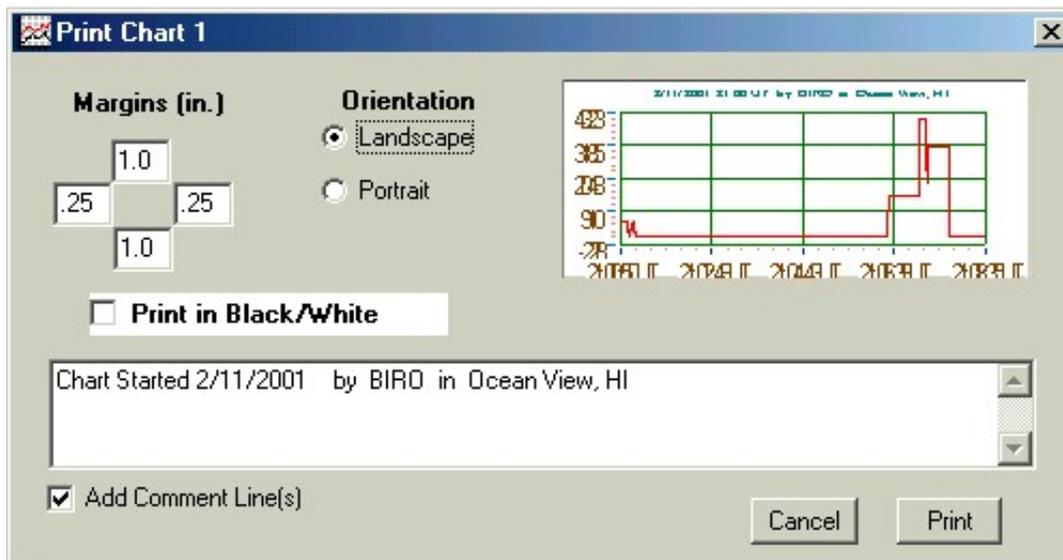


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## Radio-SkyPipe Help

# Printing a strip chart

You can send a copy of a strip chart to your printer. Simply select File/Print from the main page menu and the following dialog box will appear:



### Margins

Margins may be established by entering the desired values in inches in the four boxes appearing under the Margins (in.) heading. The position of the boxes corresponds to the page margin position.

### Orientation

Select either Landscape or Portrait.

### Print in Black/White

Checking this box can save you lots of ink if you are using colored backgrounds on your strip chart. If selected the chart will be printed as black lines on a white background.

### Add Comment Line(s)

If selected the text entered in the bottom text box will be printed below the chart on the page.

Use the **Print** button to send to the printer or **Cancel** to abort.

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# Terminating Radio-SkyPipe

For best results it suggested that you terminate the application in a smooth and logical fashion.

Stop any data collection that may be ongoing.

Close any connections with strip chart clients or servers.

Close the [Second Client Chart](#) if it is open.

Choose **File / Exit** from the main menu at the top of the screen.

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## Radio-SkyPipe Help

# Additional Display Features

## Chart Titling

2/10/01 04:54 UT by BIRO in Ocean View, HI

You can display a title on the chart containing any description you desire, or have the program automatically generate a title based upon the time, Local Name, and Location of the observer.

To get to these functions select **View / Chart Text / Chart Title** from the main menu. If you select **Auto Title** the text will be generated by the computer when a file loads or is saved. To enter a title you compose select the **Text** option. You also have selections for **Color** and **Font**. These apply to both types of titles. The real value of this feature comes into play when you print or save the image of the chart for incorporation into documents.

**X and Y Axis Labels** were introduced in version 1.2.14. These can be defined under **View / Chart Text / XY Axis Labels** which brings up this window:



The font and color for these labels can also be defined from the Chart Axis Labels entry window. **Use True Type fonts to insure that the Y axis label will be displayed vertically!**

**Numeric Fonts and Colors** - You can define the fonts and colors of the chart grid numerical values under **View / Chart Text / Numeric / Font** and **View / Chart Text / Numeric / Font**.

## Channel Labels

When receiving multiple channel charts, it is important to know what each channel represents. Each channel is represented by a different color pen on the chart. Optionally, you can display a color keyed label for each channel in the right hand margin of the chart. To make these labels visible select **View / Channel Labels**

from the main menu.

Channel Labels are configured from **Options / strip chart / Channel Labels** (button). The Channel Labels will be displayed in the Pen Color for the associated Channel.

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## Radio-SkyPipe Help

# Special Keystroke Features

ALT+Channel Number - Gets recent average of data for the channel. Use the number keys across the top of the keyboard to create a beep and blip on the chart if you are collecting data through the sound card. To avoid the beep, turn on the Numlock and use ALT plus the channel number (1-8) on the keypad.

ALT+ F-key corresponding to the channel number. This begins displaying in text format the data for the channel number in a space on the chart as the data arrives. Use Escape to make this go away.

CTRL+V Opens a new review Window (Pro Edition)

CTRL+L Opens the Observer Log (Pro Edition)

CTRL+O Toggles the display of the graphical controls.

CTRL+S Opens the Session Log.

CTRL+T Opens the Chat Window.

CTRL+W Opens a new Client Window.

CTRL+R Restores the XY defaults.

Shift+F4 Displays the Local IP Address you are using.

Shift+F5 Redisplays the last Message Manager message received in the Status Bar.

F11 Stores the XY coordinates of a chart.

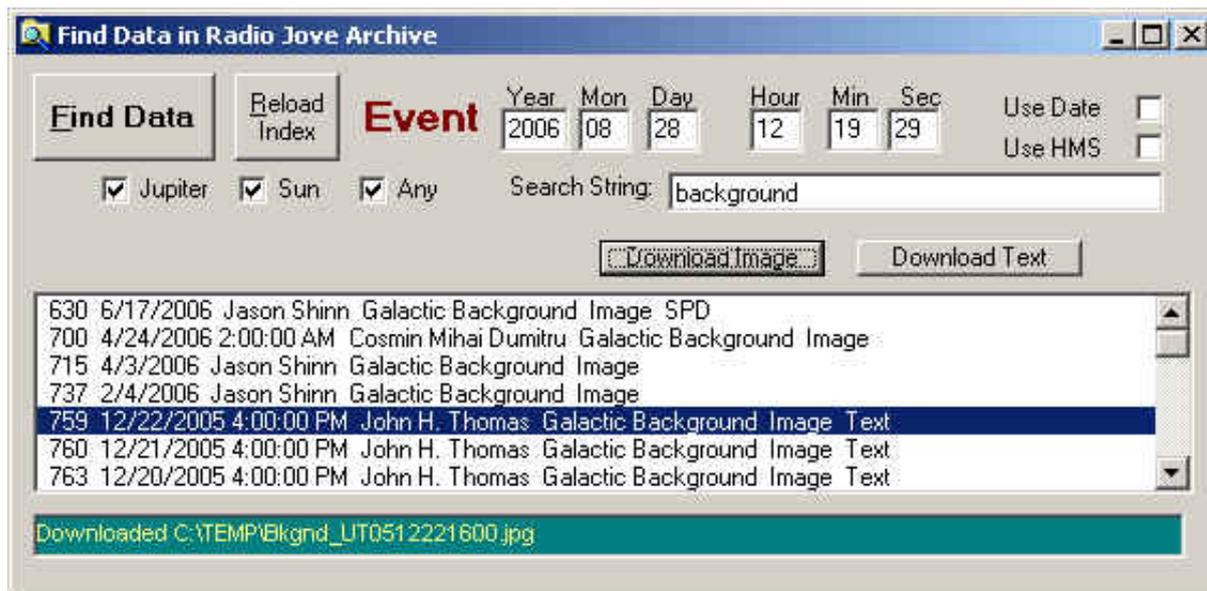
F12 Sets the chart to show the coordinates saved with F11. The chart must not be scrolling.

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## Radio-SkyPipe Help

# Find Data in Jove Archive

Radio-SkyPipe has a special feature for users who participate in the [Radio Jove](#) project sponsored by NASA. You can search the Radio Jove Archive for observation data right from Radio-SkyPipe. SkyPipe data can be downloaded directly to a strip chart and other forms of data such as text files and images can be saved or viewed in associated programs. Start the Find in Radio Jove Archive utility from the main menu: **File / Find in Jove Archive**.



SkyPipe maintains a database of the available archived files locally on you PC. If it has been a while since you downloaded the archive database (or never have) you will want to click the **Reload Index** button shown above. The download utility window shown below will start.



This will download a list of available files from the archive. The program will then index the data for quick retrieval of records. This can take a few minutes in which you will be entertained by the rapid flashing of file names in the status bar of the **Find Data in Radio Jove Archive** window.

Now you are ready to search the archive for observations that occurred on a given date and/or time and/or observations that contain a given search string in their description. You can also select whether the observation is designated as a **Jupiter**, **Solar**, or **Any** type observation. If you are going to search on a given date/time be sure to click the appropriate **Use Date** and/or **Use Time** checkboxes at the upper right. Note the date format is the more logical European format of YYYY / MM / DD.

After you have made your choices click the **Find Data** button and a list of matching observation submissions will appear. Select one of the files in the list and buttons will appear above the list indicating the types of files

that are available for download. In the example above a **Download Image** and **Download Text** button is displayed for the selected observation. You might also see a **Download SPD** file button or a **Download Sound** button when these file types are available. Click on the button you want and you will be prompted for a place to save the file. The file then downloads and displays.

Presentation of the file is based upon the file type's associated program. In some cases, the program may not be able to load the file this way and you might have to manually start the program to view or hear the file. Of course if the file is an SPD file the chart will load directly into SkyPipe. In fact if you specified a particular time for the event, the chart will center on your indicated time so you can quickly see if the chart contains an expected signature.

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## Radio-SkyPipe Help

# How to Get Data Into Radio-SkyPipe

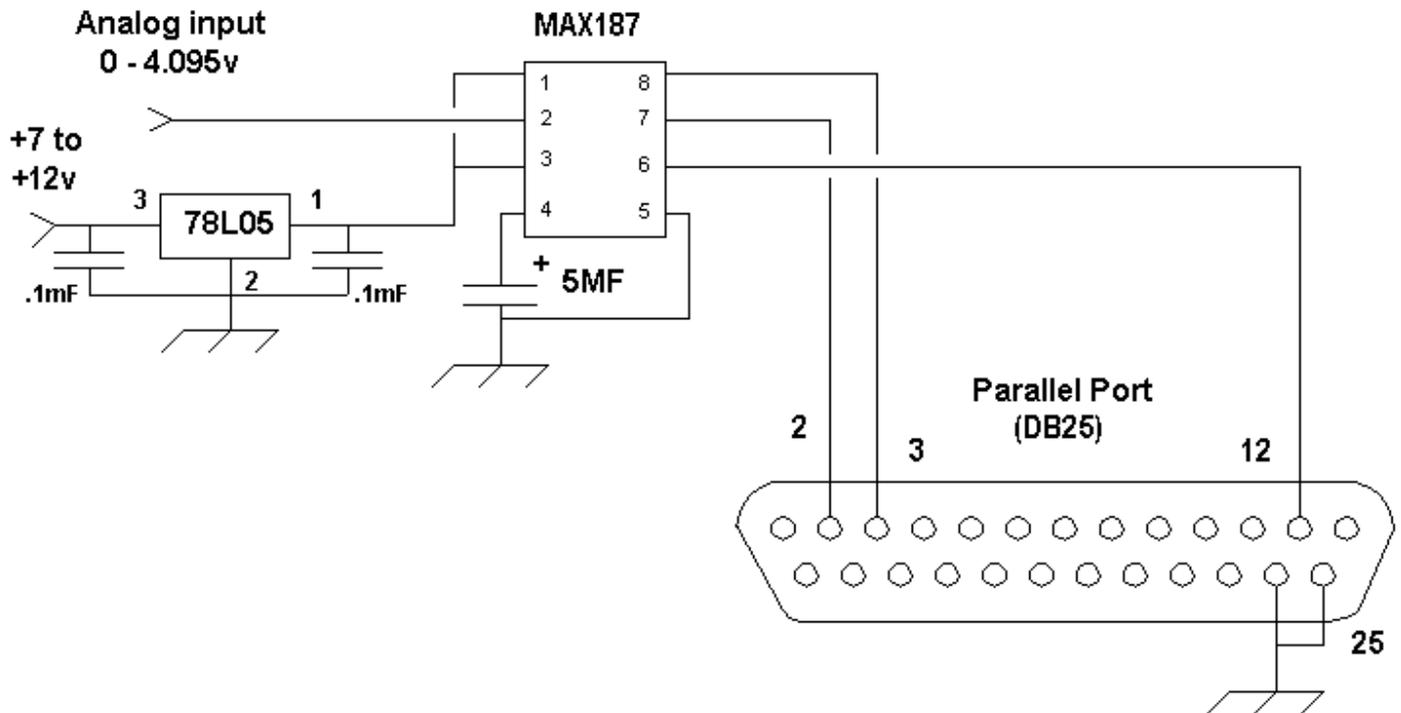
There are multiple paths for getting data into a RSP chart.

Data Source	Data Type	Route	Destination
Sound Card	Numerical (amplitude or frequency)	<a href="#">Direct</a> and via <a href="#">Spectral Display</a>	Channel Data
MAX 186/7 and LabJack ADCs	Numerical	<a href="#">Direct</a>	Channel Data
Text and CSV files	Numerical	<a href="#">Text Import Tool</a>	Channel Data
Other Programs	Numerical	<a href="#">Message Manager</a> to Equations	Channel Data
Any Source	Numerical	<a href="#">UDS interface</a>	Channel Data
Other Programs and Manual Entry	Text	<a href="#">Message Manager</a>	Chart Annotations / Metadata
Other Radio-SkyPipe Users	Numerical and Text	<a href="#">Client Mode</a>	Channel Data / Metadata
Equations and Random	Numerical	<a href="#">Equations</a>	Channel Data

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# Analog to Digital Converters You Can Build

While these devices were designed to be used with [Data Collect Lite](#) software and [Radio-SkyPipe](#) (Max187 only), there is no reason why you could not write your own program in BASIC to run them. Below is the preferred, 12 bit version which uses a \$14 MAX187 chip.



Construction of either circuit can be done on a small IC breadboard available from Radio Shack. The power source should be well filtered or a battery. One neat way to package the units is inside a two way parallel port manual switch box. These can be bought for about \$10 at computer shows. One of the DB25 connectors is removed from the back of the switch and replaced with a power and a analog input jack. Leads 2, 3, 12, 24, and 25 from the removed DB25 are soldered directly to the appropriate places on the AtoD board. The switch can then be used to pass through to the printer when the AtoD is not in use.

The chips and voltage regulators can be purchased from [DIGIKEY](#). I have been very happy with their mail order service.

[Click here for an idea on constructing this ADC in a printer switch box.](#)

[Click here for the Maxim Integrated Circuits Application Note on interfacing to the serial port.](#)

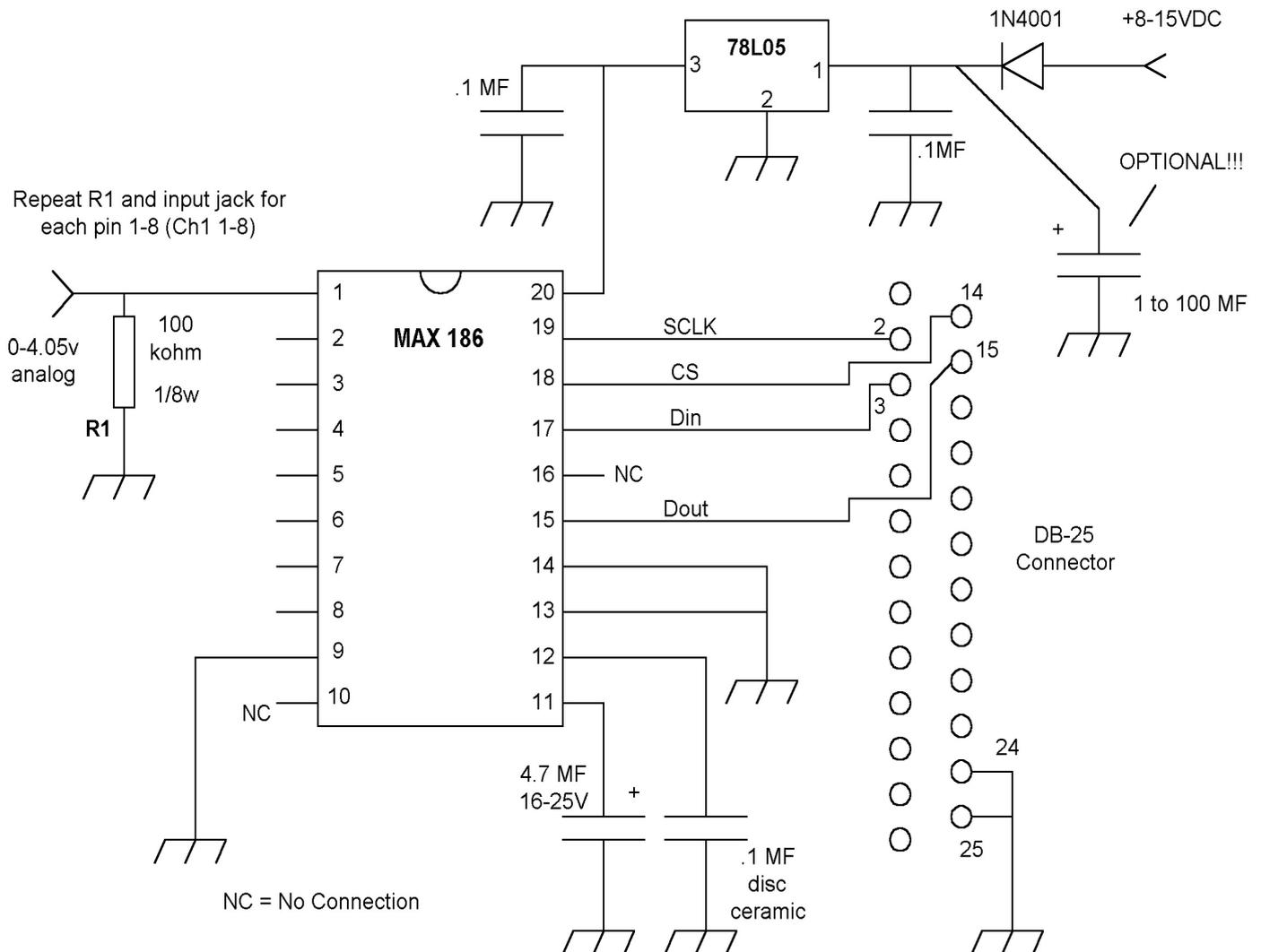
[Click here view the schematic for the 8 bit version using the TLC548 IC.](#)

# Simple 8 Channel ADC for Use with Radio-SkyPipe

The schematic below depicts an 8 channel 12 bit analog to digital converter (ADC) which will work with [Radio-SkyPipe](#) software. Pins 1 through 8 of the MAX 186 integrated circuit correspond to Channels 1 through 8. The 100 kohm resistor to ground shown on Channel 1 (pin 1) should be repeated for all inputs even if there is no intention to utilize that many channels. The circuit attaches to the computer via the parallel port. The appropriate parallel port address must be selected in the Radio-SkyPipe software. All .1MF (microfarad) capacitors are non-polarized types, typically disc ceramic capacitors. They should be rated for at least 15 volts. The circuit may be powered by a battery or other external well filtered DC power supply. (You may order the MAX186 IC from Radio-Sky Publishing below on this page.)

The circuit may be built on a small IC type Radio-Shack breadboard circuit board. For this circuit, I recommend using a socket for the MAX 186 IC. Insert the IC in the socket only after the rest of the wiring has been completed and double checked for accuracy. Be especially careful to orient the IC so that the notch in in IC package corresponds to pins 1 and 20 of the socket.

The circuit will work in the Standard version of Radio-SkyPipe, but only Channel 1 will be available. The Pro-Upgrade allows you to use any number of channels up to 8. The channels used must be sequential. Analog inputs should be restricted to the 0 to 4.095 V range.



The optional 1 to 10 MF capacitor is only necessary if the power supply is not adequately filtered.

If you have already built the similar circuit for the 8 channel ADCMAX project, you can quickly modify it by changing just three connections to the DB-25 connector. [Click here for instructions on modifying that circuit.](#)

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