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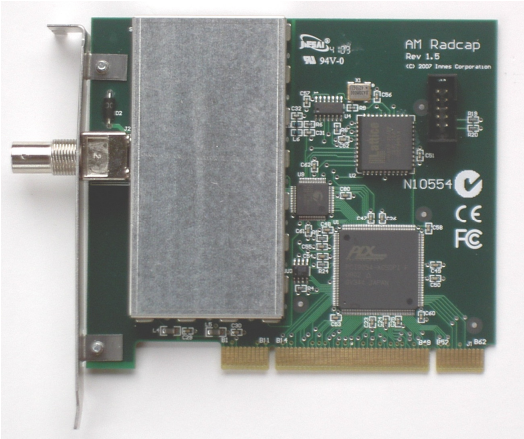
# AM Radcap




## Manual

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## Introduction

The AM Radcap is a radio capture card designed for simultaneous recording of multiple AM radio stations. The frequency of each individual station may be set in software and its audio appears as a standard Windows audio input device.

The card uses a high speed analog-to-digital converter to digitise the entire AM band, and then uses advanced digital signal processing utilising the MMX instruction set of PC's processor to extract the audio for each individual station. It can be configured to either create a separate audio stream for each station or to pair stations together as stereo streams.

## System Requirements

| | |
|---|---|
| Platform: | Windows 2000, XP, Server 2003, Vista, Server 2008, 7, Server 2008-R2, 8, Server 2012 |
| Processor: | 500MHz Pentium II or better (for 8 stations)[1] |
| Memory: | 128MB minimum |
| Motherboard: | ATX-style PCI 2.2 compliant[2] |
| Other: | Sound card or motherboard sound port for monitoring |

**Notes:**

1. The driver requires the equivalent of about 40MHz of CPU time for each station plus an initial overhead of about 200MHz of CPU time.
2. The card relies on the 3.3V supply being available on the PCI connector which became mandatory under the PCI 2.2 specification. Older AT-style motherboards generally do not support this.

## Specifications

| | |
|---|---|
| Tuning range: | 500kHz to 1700kHz in 1kHz steps |
| Sensitivity: | 50uV for 40dB S/N |
| RF input impedance: | 50 ohms |
| Filter attenuation: | 82dB at 15kHz or more from centre frequency |
| Audio bandwidth: | 5kHz (wide) or 3kHz (narrow) |
| Audio distortion: | < 0.1% |
| Audio sampling rate: | 22.05 kHz (other rates supported via Windows SRC) |
| Number of stations: | Factory configured (up to 32) |


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## Installation

The AM Radcap card uses static-sensitive components. Observe the usual precautions against static electricity when handling the card and do not touch the PCI edge connector contacts.

Ensure that Windows 2000, XP, Server 2003, Server 2008, Vista, 7, Server 2008-R2, 8 or Server 2012 is installed on the PC. The AM Radcap card cannot be used under Windows 9x or Windows ME. It is recommended that the latest Service Pack be installed.

Switch off the PC and unplug the power lead. Insert the card into any vacant PCI slot.

Restart the PC and allow Windows to boot up.

**Windows XP, Server 2003, Vista, Server 2008** - Windows will report that new hardware has been found and the New Hardware wizard will start. Insert the driver CD supplied with the card and proceed through the wizard. Allow Windows to search for the driver – do NOT specify a driver location or file name.

**Windows 8, 7, Server 2012, Server 2008-R2** – Windows no longer searches removable media for drivers. Open Device Manager, where the Radcap will be shown under Other Devices as a Multimedia Audio Controller. Right-click on it, select *Update Driver Software*, then click on *Browse my computer for driver software* and click on the Browse button to navigate to the driver's location. Click on *Next* to install the driver.

Windows may warn that the driver that it is installing has not been certified by Microsoft, which is true. Click on **Continue** to complete the installation.

Because the Radcap hardware digitises the entire AM band, only one card should ever be used in a single PC. The number of stations that can be simultaneously recorded is determined by the digital signal processing that is carried out in the driver software, and cannot be increased by installing multiple cards.

Some modern processors offer **hyperthreading**, which is a limited form of multiprocessing. However, some elements of the processor, such as the floating point unit and memory cache, are shared between the executing threads, and this can cause a high priority thread, such as an audio processing thread, to be blocked by a lower priority thread that's using the shared resource. This can result in skipping during audio recording and gaps during playback. If this problem occurs, we recommend that hyperthreading be disabled in the motherboard BIOS. Note that this problem does not occur with true multi-core processors.


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## Antenna

The AM Radcap requires an external antenna to receive the stations. The type of antenna needed depends on the signal levels in the area in which it is being used. The card has a low input impedance (50 ohms) and is better suited to a loop antenna than a whip antenna, although the latter can be used. An amplified antenna may be needed in some situations.

As a guide, a whip antenna one metre in length at a distance of 10km from a 5kW transmitter at 1MHz will produce a signal level of about 100uV into the card's 50 ohm input. A shielded loop antenna enclosing a one square metre area under the same conditions will produce about 600uV and will offer better immunity to local electrical noise.

A suitable shielded loop antenna is the Belar model LP-1 which is available in Australia through Innes Corporation Pty Ltd.

**We strongly recommend fitting an external lightning suppressor to minimise the risk of damage to the card.**

A utility called AmSpectrum is supplied on the driver CD. This displays the RF spectrum across the AM band from 500kHz to 1700kHz and may be useful in selecting the best location for the antenna or resolving interference problems.

To run the program, insert the driver CD, click on Start – Run and type in d:\ AM & FM Radcap AmSpectrum.exe where d: is the drive letter for the CDROM drive.

While every effort has been made to shield the Radcap input from internal PC noise, in some situations such interference may be experienced. Trying different PCI slots may help to minimise such interference. The use of PCI extender cards is not recommended because of the increased potential for interference.

## Configuration

The AM Radcap card can be configured to produce a separate mono audio stream for each station, or alternatively to pair stations together as the left and right sides of a stereo audio stream. Which is best will depend on the application software that is being used.

To change the configuration, open **Control Panel** and double-click on **Sounds and Multimedia**, click on the **Hardware** tab, select **AM Radcap** and click on **Properties**. In the Properties window click on the **Configuration** tab and select either **Single** or **Paired**. Click on **OK** to complete the change. Once the configuration has changed it may take up to a minute for Windows to reconfigure itself – be patient, it hasn't crashed!


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Windows 2000 limits the total number of audio input devices to ten, while Windows XP and Server 2003 limit this to 32. Please be aware of this limit, particularly if there are other audio input devices present in the PC. There is no device limit in Vista, Windows 7, Windows 8 or Server 2008 / 2008-R2 / 2012.

The receiver bandwidth can be set to **wide** (default) or **narrow**. The narrow setting restricts the audio response to about 3kHz, and may be useful in noisy environments.

## Setting Station Frequencies

A utility program called Tuner is supplied on the driver disc (this replaces the earlier AmTune utility). This can be used to set the frequency of each station and also to monitor each station through the PC's standard sound card or motherboard sound port.

To run the program, insert the driver CD, click on Start – Run and type in d:\AM & FM Radcap\Tuner.exe where d: is the drive letter for the CDROM drive. To set the frequency of a station, click on the Set button for that station, type in the frequency (in kHz) and click on OK. To monitor a station, click on the Monitor button for that station. Note that there is a delay of about one second in the audio heard via this monitor, due to the amount of audio buffering used.

The frequencies set are stored in the Windows Registry by the driver and are automatically restored whenever the PC is started. It is not necessary to re-run Tuner or to leave it running once the frequencies are set.

Alternatively, if you write your own software, there is a DLL supplied on the driver disc that can be used for setting and retrieving the station frequencies. Refer to Appendix A for details.

The Tuner program also provides relative signal strength indicator bars which may be useful in adjusting antenna placement. These indicators don't take into account the action of the card's front-end AGC, and so should not be used as an absolute signal strength reference.

Note also that the AM Radcap does **not** support AM Stereo, as the use of this mode has largely gone out of favour, and so the Stereo indicators in the Tuner program don't operate on AM stations.

## Recording

Any application that records from standard wave input devices can be used to record the audio streams from the AM Radcap. The native sampling rate of the card is 22.05kHz with 16 bit resolution and, all other things being equal, this rate should be used. Other rates can be used as Windows automatically provides a sampling rate converter, but this converter will consume some additional CPU time.

Make sure that the recording software you are using allows you to select the audio input devices. The Radcap virtual devices have names like “AM Radcap Ch. 1” (or “AM Radcap Ch. 1/2” if stations are paired).

A recording level control, mute control and peak meter are provided for each station (or pair of stations) through the devices’ mixer ports (peak meters are not supported under Windows 2000, and in Windows Vista can only be accessed through the mixer API if the application is running in XP-SP2 compatibility mode). The default level setting is 50%, and at this setting 100% modulation will produce an audio level 9dB below clipping.

## Support

For all support matters, go to www.innescorp.com.au and click on Support – Help Desk. Software and driver updates may also be made available from time to time and these will be placed on this website.



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# Appendix A – Programming the Radcap

On the driver CD you will find Radcap.dll, Radcap.exp, Radcap.lib and Radcap.h, which can be used to read and set the frequency of each station or read the received signal strength indicator. The DLL exports the following functions:

**enum RadcapTunerType {** RadcapAM, RadcapFM **};**

**UINT __stdcall RadcapStationCount (**enum RadcapTunerType Mode**);**

**Parameters**

*Mode*

Specifies AM or FM tuners.

**Return value**

The return value is the number of stations available.

**Comments**

This function will fail if the monitor program (Tuner.exe) or the AM spectral display program (AmSpectrum.exe) is running.

**BOOL __stdcall RadcapGetID (**UINT DeviceID, enum RadcapTunerType *pType, int *pTunerID, BOOL *pPaired**);**

**Parameters**

*DeviceID*

waveIn device ID

*pType*

Pointer to RadcapTunerType variable to receive the returned device type

*pTunerID*

Pointer to int variable to receive the returned Tuner ID number

*pPaired*

Pointer to BOOL variable to receive the returned tuner configuration

**Return value**

If the function succeeds the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call GetLastError ().

**Comments**

This function takes the Device ID number of a waveIn audio stream and returns the tuner type, identifier and configuration information for the corresponding tuner. If the audio stream does not correspond to a Radcap tuner the function returns FALSE.

**UINT __stdcall RadcapGetFrequency (**enum RadcapTunerType Mode, int TunerID**);**

**Parameters**

*Mode*

Specifies AM or FM tuner.

*TunerID*

Index of the station to be read, beginning at zero for the first station.

**Return values**

If the function succeeds the return value is the frequency in kilohertz.

If the function fails, the return value is zero. To get extended error information, call GetLastError ().

**Comments**

This function will fail if the monitor program (Tuner.exe) or the spectral display program (AmSpectrum.exe) is running.

**UINT __stdcall RadcapSetFrequency (**enum RadcapTunerType Mode, int TunerID, UINT Kilohertz**);**

**Parameters**

*Mode*

Specifies AM or FM tuner.

*TunerID*

Index of the station to be set, beginning at zero for the first station.

*Kilohertz*

The frequency (in kilohertz) that the station is to be set to. For AM, this must lie between 500 and 1700, and for FM this must lie between 87500 and 108500.

**Return values**

If the function succeeds the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call GetLastError ().

**Comments**

This function will fail if the monitor program (Tuner.exe) or the spectral display program (AmSpectrum.exe) is running.

**UINT __stdcall RadcapGetRSSI (**
enum RadcapTunerType Mode,
int TunerID**);**

**Parameters**

*Mode*

Specifies AM or FM tuner.

*TunerID*

Index of the station to be read, beginning at zero for the first station.

**Return values**

If the function succeeds the return value is the received signal strength indicator.

If the function fails, the return value is zero. To get extended error information, call GetLastError ().

**Comments**

The received signal strength indicator is not available on the original 2-channel FM Radcap cards. This function will succeed with those cards but will always return 0.

The received signal strength indicator is a relative indication only and should not be taken as an absolute measurement of signal strength.

This function will fail if the monitor program (Tuner.exe) or spectrum display program (AmSpectrum.exe) is running.

**BOOL __stdcall RadcapGetStereo (**
enum RadcapTunerType Mode,
int TunerID**);**

**Parameters**

*Mode*

Specifies AM or FM tuner.

*TunerID*

Index of the station to be read, beginning at zero for the first station.

**Return values**

The return value is TRUE if the station is being received in stereo.

**Comments**

The stereo indicator is only available on the 6-, 12-, or 24-channel FM Radcap cards, and then only if the card is configured for stereo reception. This function will fail if the monitor program (Tuner.exe) or spectrum display program (AmSpectrum.exe) is running.