# INSTALLATION & OPERATION MANUAL

# AX250i

## Two Zone:
Two Stereo Pre-Amplifiers & Amplifiers
With RS232, Keypad & IR Control

# Axium

Total In Home Connectivity

# Congratulations!

You have purchased one of the most advanced, dedicated multi-room amplifiers on the market. The AX250i like other Axium products is designed to maximize control, simplify functionality, & expedite installation. Axium products are built to the highest standards of quality and reliability.

To view Axium's product line of Multizone Amplifiers, controllers, & accessories please visit the Website at www.axium.co.nz  You may also download the latest control software.

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# INTRODUCTION

The AX250I Multizone amplifier combined with Axium Controllers, and/or a Home automation system enables you to individually adjust the Power status, volume and audio source in up to two rooms, and On status in a further two rooms.
There are many advanced control features that may be accessed via the RS232 interface, some of which are monitoring of any controlled parameter, maximum volume limit setting, zone tracking - See the features section of the manual.
A utility program called AMPCTRL is available from the Axium website, this gives users complete access, and control of all Axium networked components, and even provides the ability to schedule events from your personal computer.
Axium Multizone amplifiers may be interconnected via the expansion bus, providing up to 32 zones of control, and vastly simplifying installation cabling.
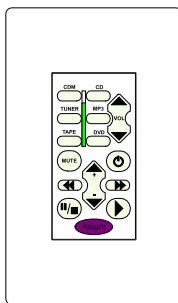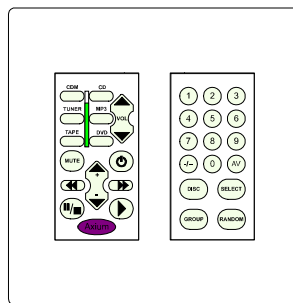


**Multizone Amplifier**
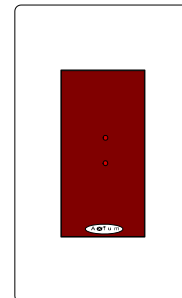


**IRX receiver**

## Integrate Controllers freely throughout the system.
## Decide what control best suits each room.



**KRX – keypad**



**KDX – Keypad**



**PRX – Remote**

# FEATURES

- **Two Zone with two speaker switched outputs**
  Two pre-amplifiers and amplifiers, each with two speaker switched outputs.
  Speaker A & B outputs are Zone 1, Speaker C & D outputs are Zone 2.

- **Remote controlled via Infra-red and Wired IR**
  The front panel is equipped with an IR receiver, so the AX250i may receive IR directly from a PRX remote control, or other learning remote. The wired IR is decoded directly by the AX250i (IR is not re-emitted out of the front panel)

- **RS232 Control**
  Full control and monitoring is available via RS232 of any Axium multizone amplifier or KRX keypad. Only one RS232 connection is necessary to an Axium amplifier stack.

- **Audio Inputs**
  Four stereo inputs (CD, Tape, Tuner, & Aux) and one mono Input. (Utility)

- **Amplifier Power and Protection**
  50 Watts RMS into 8 ohms, capable of driving into 4 ohms. The amplifiers are protected against short term output shorts, and high ambient temperatures.
  *Care should be taken to ensure adequate ventilation – see "installation guide"*

- **Amplifier ON Status - "Amp-On"**
  Each Speaker output has front panel On status indication, and 12VDC outputs on the rear panel connector. *The output's are protected against shorts and back EMF voltage surges which may occur if powering a relay.*

- **Summed Amp-On**
  A "Summed Amp-On" 12VDC output is provided on the rear panel connector. This is typically used to switch the Audio source component's AC power.
  If any amplifier Zone or Speaker output in an Axium amplifier stack is ON, then this output will be 12VDC. *The output is protected against shorts and back EMF voltage surges which may occur if powering a relay.*

- **Power failure Restoration**
  After an AC power outage the AX250i restores it's settings to the pre-interrupted state. All internal settings are stored in non-volatile memory.

- **Direct wiring Keypads & IR receivers**
  An IR input is provided on the rear panel connector, this is separately buffered both to the IR output jack, and to the Axium expansion Bus (Axium amplifier stack)

- **Pre-amplifier output**
  The Zone 1 line level post fader output is provided on the rear panel
  Typical applications are: Active sub-woofers & for connecting to higher-powered amplifier.

- **Source select output**
  The Zone 1 line level (pre-fader) source select output is provided on the rear panel.
  Typical applications are slave amplifier driven passive volume controlled speaker networks.

- **Axium Bus**
  Axium Bus provides inter amplifier & Keypad control and monitoring.
  The Bus is protected from shorts to both 0V and +12VDC.

- **Bass, Treble, Balance, and Loudness controls**
  Bass, Treble, and Balance controls may be accessed via the front panel or RS232. The loudness control - which is a low frequency boost whose level is dependent on volume – is controlled via the AMPCTRL set up utility (RS232)

- **Expansion Bus**
  Data, IR, Amp-On & Audio Sources are interconnected via the expansion bus to other Axium amplifiers, thus simplifying the Axium amplifier stack wiring.
  The expansion bus uses the simple 20-way ribbon cable connector system

- **32 Zones**
  32 zones of control is available. On the AX250i each Zone must be different, however in a multiple amplifier stack same Zone amplifiers are possible – they simply mimic every parameter.

- **Zone Tracking**
  A Zone may be programmed to track one other Zone. When Zone tracking is selected, the source selection is tied together, but Standby, Mute, and volume control are independent. This is useful for closely coupled audio areas where it is advantageous to have different volume control but the same source.

- **Maximum volume limiting**
  A volume limit may be set on any Zone, typically this is to prevent reckless use of the system, or prevent destruction of speakers when powered by a slave amplifier.

- **Global IR commands**
  There is a range of Global IR commands available for turning All amplifiers either On, Off, or selecting various audio sources. There are also Force and Release Preset commands that invoke a user programmed Amplifier preset.

- **Global Preset**
  One Preset may be programmed for every Zone, wherein any controlled parameter may be set. A Preset may be invoked either by the Preset IR command, RS232, or by a contact closure at the panels "preset input utility" connector on the rear panel. When a preset is invoked all Zones go to their programmed preset state. Upon release from the preset the amplifier Zone returns to it's previous state. A typical application is phone paging.

- **Firmware upgradeable**
  The AX250i's microcontroller may be updated with the latest operational firmware via the RS232 port and a boot-loader program. The ability to enhance the functionality of installed Axium product's provides a degree of future proofing, and flexibility.

- **Toroidal transformer power supply**
  An impressive toroidal transformer ensures stable power supply performance and minimal magnetic field interference.

- **Restore factory defaults**
  Remove AC power, push and hold down Function & Tuner Keys and reconnect AC power. The Amplifier will be reset to factory defaults, and memory cleared.

# INSTALLATION GUIDE

Immediately upon receiving your AX250i inspect the carton for evidence of mishandling during shipment. Then carefully unpack the unit and inspect for damage.
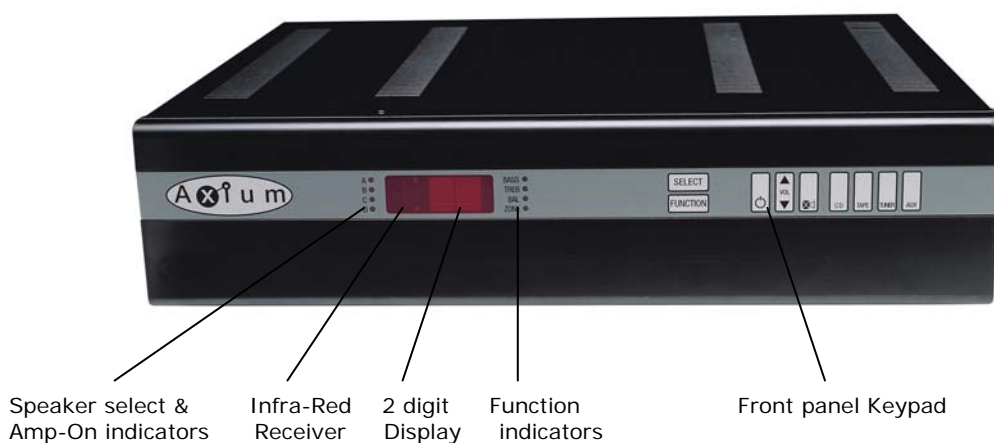
Please save the shipping carton and all inner packing materials in the event that the AX250i needs to be shipped for service or moved to a new location.
Should you discover that the AX250i has been damaged during shipping please contact your dealer immediately.

## PRECAUTIONS

1) Never expose the unit to moisture

2) Avoid restricting the airflow around the AX250i. Good airflow is necessary to help ensure proper operation. Not only should you provide enough free space around the unit, but also ensure that air can flow freely and escape from the amplifier surroundings. Failure to do so may cause intermittent channel cutout and reduced life expectancy.

3) Under no circumstances should the speaker output terminals of the unit be short circuited, or connected to another output.

4) Never plug the RS232 cable into the unit while power is connected.

5) Never short the 10 way controller connector terminals. These should all be connected before the AX250i is powered.

6) Avoid installing the AX250i in positions where the front panel is exposed to direct sun light. This may intermittently slow down the response of the unit to commands.

7) Never connect more than four controllers to the unit's 12Vdc-power supply terminals. The supply is internally poly-fused (self-resetting) and will open circuit.

8) Never connect the AX250i's +12Vdc power supply to an external power supply or other Axium amplifier's +12Vdc output.

# FRONT PANEL OPERATION

Speaker select &          Infra-Red    2 digit    Function          Front panel Keypad
Amp-On indicators         Receiver     Display    indicators

## SELECT
The SELECT button toggles the amplifier zone/speaker for which the front panel keypad is addressing.
This is indicated by the Green Zone select LED'' (A, B, C & D)
It is also used as an 'enter key' when setting the amplifier zone.

## FUNCTION
The FUNCTION button toggles between BASS, TREBLE, BALANCE & ZONE.
Once a function is selected (corresponding LED FUNCTION indicator) the parameter may be edited using
the VOL UP & DOWN buttons. For example to adjust the BASS settings on zone 1, make sure that the
Speaker A or B indicator LED is lit (green) and the Zone is ON. Press the FUNCTION button until the BASS
indicator LED is illuminated. You can then increase or decrease the BASS by pressing the VOL UP
(increase) or DOWN (decrease). The FUNCTION level/value is indicated on the 2-digit display.
The Zone is selectable between 0 – 31 and must be set in memory by pressing the SELECT button.
FUNCTION mode is terminated after 4 seconds of inactivity or by toggling past the last FUNCTION (ZONE).

## STANDBY
Standby toggles the selected speaker output ON or OFF.
Amp-On indicators (RED LED's) provide standby status.

## VOL UP & DOWN
VOL UP & DOWN control the selected Zone's volume in 2.5db steps.
If the zone is muted, then pushing either VOL Up or DOWN will un-mute the amplifier.

## MUTE
The MUTE button toggles the selected Zone's muting.
The 2-digit display flashes while muted.

## CD
Selects the CD input source
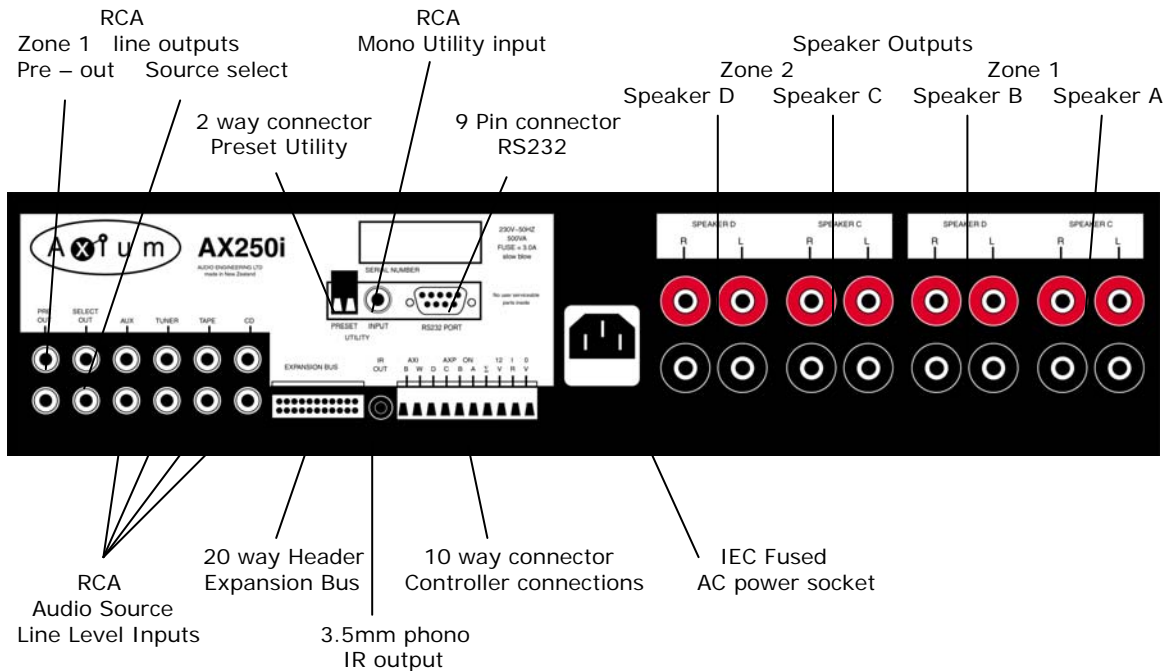
## TAPE
Selects the TAPE input source

## TUNER
Selects the TUNER input source

## AUX
Selects the AUX input source

# REAR PANEL CONNECTIONS

RCA
Zone 1    line outputs
Pre – out    Source select

RCA
Mono Utility input

Speaker Outputs
Zone 2            Zone 1
Speaker D    Speaker C    Speaker B    Speaker A

2 way connector
Preset Utility

9 Pin connector
RS232

20 way Header
Expansion Bus

10 way connector
Controller connections

IEC Fused
AC power socket

RCA
Audio Source
Line Level Inputs

3.5mm phono
IR output

## Audio Source Inputs
**CD, TAPE, TUNER, AUX** & **Utility** are common to all zones.
The utility input is mono and connects to both left and right channels. Typical applications are paging, or where a mono source is required (AM radio)

## Line Outputs
**SOURCE SELECT** is the Zone 1 pre-fader output - independent of the volume control.
A typical application for this output is where speakers have volume pads installed and a slave amplifier is required to operate the network at full power.
**PRE-OUT** is the Zone 1 post fader output **–** Output level is dependant on the volume control.
The output is muted when Zone 1 is muted**.**
PRE-OUT may be used to drive a high power Slave amplifier or Active Sub-Woofer.

## IR Out
A 3.5mm phono socket provides direct connection for IR emitters. The output is individually buffered and current limited, this ensures that a damaged emitter does not short out the IR system.

## Expansion Bus
Axium amplifiers may be connected together via a 20 way IDC ribbon cable connection.
This simplifies the Audio source component connections. – CD, TAPE, TUNER, AUX & Utility are connected to only one Axium amplifier!
The summed Amp-On output, Axium Bus, and buffered IR input are linked through the Bus.
Axium Bus is a 2 wire serial communication interface which provides inter-amplifier and controller monitoring and control.

**RS232 Port**

The RS232 Asynchronous serial port provides data acquisition and control of Axium networks by a Home Automation System, or personal computer. Only one RS232 connection is necessary when interfacing with an Axium network.

The lead must be 'Null modem' : 9 pin female 'D' connectors at both ends (pin connections 2 and 3 swapped at one end)

See appendix1: RS232 protocol for more information.

**PRESET Utility**

A voltage free contact closure forces all Axium amplifiers (Zones) into their PRESET mode.

Open circuiting the terminals restores the amplifiers to their previous states.

**10 way Terminal Block**

| | |
|---|---|
| **0V** | 0V connection to Axium controllers and accessories. |
| **IR** | Infra-Red input from Axium controllers. |
| **12V** | Self-resetting Poly fused +12Vdc power supply for Axium controllers and accessories. The maximum number of controllers is four. If this is exceeded it is likely that the internal fuse may trigger open circuit. |
| **Σ** | The logical 'OR' of the Amp-On outputs. If any speaker output is ON, then Σ is On (12V). This is used to switch power sockets for connecting AC power to Audio source components. i.e. CD players, Tuners etc. |
| **Amp-ON A** | If Speaker A (Zone 1) is ON then output will be +12V. Current limited (25mA) |
| **Amp-On B** | If Speaker B (Zone 1) is ON then output will be +12V. Current limited (25mA) |
| **Amp-On C** | If Speaker C (Zone 2) is ON then output will be +12V. Current limited (25mA) |
| **Amp-On D** | If Speaker D (Zone 2) is ON then output will be +12V. Current limited (25mA) |
| **AXI – W** | Axium Bus (Clock) for connecting to Keypad controllers |
| **AXI – B** | Axium Bus (Data) for connecting to keypad controllers. |

**IEC Fused AC Power Socket**

An IEC AC power socket provides the possibility of international power connectivity.

The operating voltage may be changed internally to 110VAC.

Fuse = 1.6Amp Slow blow, size =20mm. Replace only with same rated fuse!

**Speaker Outputs**

Speaker A, B, C & D outputs are BANANA sockets.

If both A & B are used then the maximum load on each output is 8 ohms. (4 ohms min/amp)

If both C & D are used then the maximum load on each output is 8 ohms. (4 ohms min/amp)

The BLACK outputs are all common.

The RED outputs must never be connected together. It is not possible to operate the amplifiers in parallel or "Bridge Tied Load".

# SPECIFICATIONS

## Audio Performance

**Preamplifier:**

| | |
|---|---|
| Input impedance (all inputs) | = 180Kohms |
| Frequency response | = 20Hz – 20KHz |
| Signal-Noise ratio (relative to 1V @1KHz) | = >90db |
| Channel separation | = >90db |
| Max pre-out before clipping | = 2.3V RMS |
| Max input level (Tone control defeated) | = 2.0V RMS |
| THD  (Vin = 1V; Gain = 0db) | = < 0.05% |
| Bass control range | = ± 12db |
| Treble control range | = ± 12db |
| Balance control range | = ± 19db |
| Loudness boost (Gain < -50db) | = +6db @ 40Hz |
| Volume control range | = -86db  - 0db (2.5db steps) |
| Mute attenuation | = 100db |

**Amplifier:**

| | |
|---|---|
| Output power -8 ohm load | = 50W RMS |
| Output power – 4 ohm load | = 75W RMS |
| Slew Rate | = 10V/µs |
| THD (8ohm load, 1KHz @ 5Watt) | = <0.01% |

## IR range
9 m @ 30degrees off horizontal axis.

## Dimensions
Width  =  435mm (17″)
Height =  112mm (4-2/5″)
Depth  =  340mm (13-2/5″)

## Weight
7.8Kg  (17-1/16 lbs)

## Certification
This device complies with AS/NZS 1053, Edition 5, 1999

# APPENDIX1: RS232 PROTOCOL

Baud Rate = **9600**
Command Structure: <**command**><**zone**><**data**>**line feed**.
Characters are all **ASCII**.

## Command

| Command | Description |
|---------|-------------|
| **01** | Standby |
| **02** | Mute |
| **03** | Source Selection |
| **04** | Volume |
| **05** | Bass |
| **06** | Treble |
| **07** | Balance |
| **09** | Send All parameters |
| **0B** | Cause key press on Keypad |
| **0C** | Amplifier features |
| **0D** | Volume Limit |
| **0E** | Preset Call |
| **0F** | Track Zone |
| **10** | Unsupported IR command received |
| **60 – 6F** | User defined IR commands, no data byte |
| **70 – 7F** | User defined IR commands, one data byte |

## Zone

Axium amplifiers and keypads are encoded with up to 32 zones (**00 – 31**)
All amplifier zones may be addressed by sending the **FF** characters

## Data

| Command | Content |
|---------|---------|
| Standby | **00** – Standby A OFF<br>**01** – Standby A ON<br>**02** – Standby B OFF<br>**03** – Standby B ON |
| Mute | **00** – Mute<br>**01** – Un-mute |
| Source Selection | **00** – Select CD<br>**01** – Select Tape<br>**02** – Select Tuner<br>**03** – Select Auxiliary<br>**04** – Select Mono utility input |
| Volume | **00 – A0** range |
| Bass | **F4 – 0C** (-12db - +12db) |
| Treble | **F4 – 0C** (-12db - +12db) |
| Balance | **EC – 14** (Left –20db – Right –20db) |
| Amplifier features | **00** – Loudness enabled<br>**01** – Loudness disabled |
| Volume Limit | **00 – A0** range |
| Preset | **00** – Standard mode<br>**11** – Force Preset |
| Track Zone | **00 – 31** zone to be tracked<br>**FF** – for no zone tracking |

**Notes:**

- Commands are used as notifications. If an amplifier is switched ON, it will notify the other devices on the Axium Bus by sending the Standby command (01). Any amplifiers with the same zone will take the notification as a command and also switch ON.

- When a command is sent to an amplifier it will first be transmitted on the Axium bus and then returned to the PC (Home automation system). If an error occurs an error will be returned instead of the original command. The PC (Home automation system) needs to ignore its command when it is returned.

- Standby B commands are ignored by AX450i amplifiers.

- A Standby A or B ON command implies that the amplifier is not muted, if the amplifier was previously OFF. A Mute command must follow the Standby command if it is muted.

- The 'Track zone' command tells the zone specified to follow the source selection of the "Zone to be tracked". This does not imply that the "Zone to be tracked" will also track the Zone amplifier. It is normal that the program setting up the zone tracking will send two commands, one to get Zone X to Track Zone Y, and another to get Zone Y to track Zone X.

**Example strings:**

| | |
|---|---|
| 010801 : | Standby A ON command for Zone 8 |
| 060002 : | +2db Treble setting on Zone 0 |
| 033102 : | Tuner source selection on Zone 31 |
| 0B0311 : | Volume down continuous push on Zone 3 keypad |

## Keypad key codes

An Axium Keypad may be directed to emit its learnt IR commands via RS232 control.
This is achieved by sending a 'Cause key press on Keypad' command, followed by the zone, and the Keypad key code (data).
The Keypad key code is encoded with IR string repeats. (See table below)
To terminate a continuously repeating 'Key press', command a **00** keypad key code must be sent.

| | REPEATS | | | | | | | KEY |
|---|---|---|---|---|---|---|---|---|
| Continuous | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 00 | xx | xx | xx | xx | xx | xx | xx | Stops repeating the current key |
| 01 | 21 | 41 | 61 | 81 | A1 | C1 | E1 | Aux |
| 02 | 22 | 42 | 62 | 82 | A2 | C2 | E2 | Tuner |
| 03 | 23 | 43 | 63 | 83 | A3 | C3 | E3 | CD Bank |
| 04 | 24 | 44 | 64 | 84 | A4 | C4 | E4 | CD |
| 05 | 25 | 45 | 65 | 85 | A5 | C5 | E5 | Vol Up |
| 06 | 26 | 46 | 66 | 86 | A6 | C6 | E6 | Ch Up (2) |
| 07 | 27 | 47 | 67 | 87 | A7 | C7 | E7 | Random (1) |
| 08 | 28 | 48 | 68 | 88 | A8 | C8 | E8 | Play |
| 09 | 29 | 49 | 69 | 89 | A9 | C9 | E9 | Power |
| 0A | 2A | 4A | 6A | 8A | AA | CA | EA | + Track skip (0) |
| 0B | 2B | 4B | 6B | 8B | AB | CB | EB | - Track skip (9) |
| 0C | 2C | 4C | 6C | 8C | AC | CC | EC | Disc skip |
| 0D | 2D | 4D | 6D | 8D | AD | CD | ED | Mute |
| 0E | 2E | 4E | 6E | 8E | AE | CE | EE | Fast Forward (8) |
| 0F | 2F | 4F | 6E | 8F | AF | CF | EF | Rewind (7) |
| 10 | 30 | 50 | 70 | 90 | B0 | D0 | F0 | Pause (6) |
| 11 | 31 | 51 | 71 | 91 | B1 | D1 | F1 | Vol Down |
| 12 | 32 | 52 | 72 | 92 | B2 | D2 | F2 | Ch Down (5) |
| 13 | 33 | 53 | 73 | 93 | B3 | D3 | F3 | Band (4) |
| 14 | 34 | 54 | 74 | 94 | B4 | D4 | F4 | Stop (3) |

# APPENDIX2: AMPCTRL PROGRAM

**Overview:**
AMPCTRL is an Axium amplifier setup utility program.
Full control, and tracking of any Axium amplifier zone if provided.
The program also has a scheduler. A wake up alarm clock is a typical function for the scheduler
Multiple amplifier setups may be programmed and scheduled to run either periodically or as single events.
A keypad Macro may also be programmed as part of the Schedule.
An Axium Keypad (connected to an amplifier) may be controlled, causing the keypad to emit it's learnt IR strings. Thus Audio Source (CD, Tuner etc) control may be achieved via the AMPCTRL program.
The Keypads programming file may be imported from AxiumIR (Keypad and Remote control program) providing button ID's.

**For a full AMPCTRL users guide please visit the Axium Website**: www.axium.co.nz

**System requirements**: Win95/98 or Win2000 PC with Com port