



# MiniCube MC-5053

## TRAMCAR AUDIO PLAYER

G/06169A  
Draft 1.1, 29/09/2009



**DRAFT ONLY**

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## 1. Document Overview

This document describes the operation of the **MiniCube** MP3 Tramcar Messages/Music player. This includes:

- Power input
- Line-level analogue audio output
- Indicators
- Serial communication
- How to update the Message/Music played to passengers
- Secure Digital (SD) memory card

## 2. Description

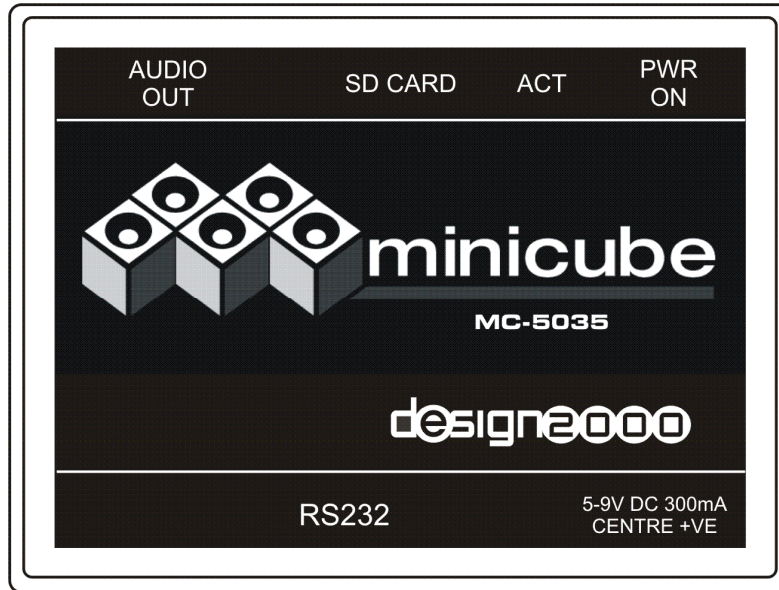
**MiniCube** is a specialized MP3 audio player for playing messages & music to tramcar passengers. MP3 stands for MPEG Layer-3 audio-compression format. It is the most popular audio-coding scheme on the Internet. MP3 allows efficient compression of audio files by a factor of up to 12 with little loss in perceivable quality from the original source material. By ripping down audio files into MP3 format, file sizes are significantly reduced, less memory is required, files can be sent more quickly, and yet a high standard of audio quality is maintained.

Audio files are stored on the Secure Digital (SD) Card. Multiple MP3 Audio files can loaded directly onto the SD card using a card reader Playback is serially controlled. The audio files are played back using the RS232 PLAY command – see page 8.

### 2.1 Features

- MP3 playback
- SD Card file storage (hot-swappable)
- Multi-file support
- Auto-Start on power-up
- RS232 Serial comms (USB via optional RS232 to USB converter cable)
- Supplied preloaded with test messages





### 3. Connections

#### 3.1 Power

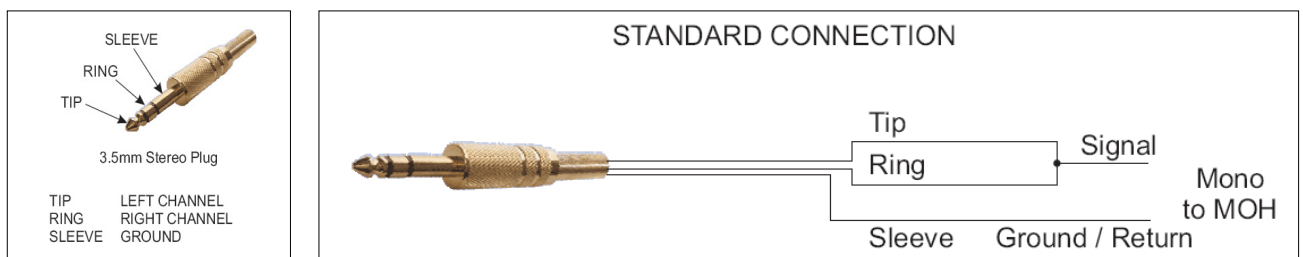
The **MiniCube** runs from a 24Vdc power source. It draws less than 100mA . As standard, the unit is supplied with a concentric dc power plug, 2.1mm centre pin positive.

#### 3.2 Audio Out

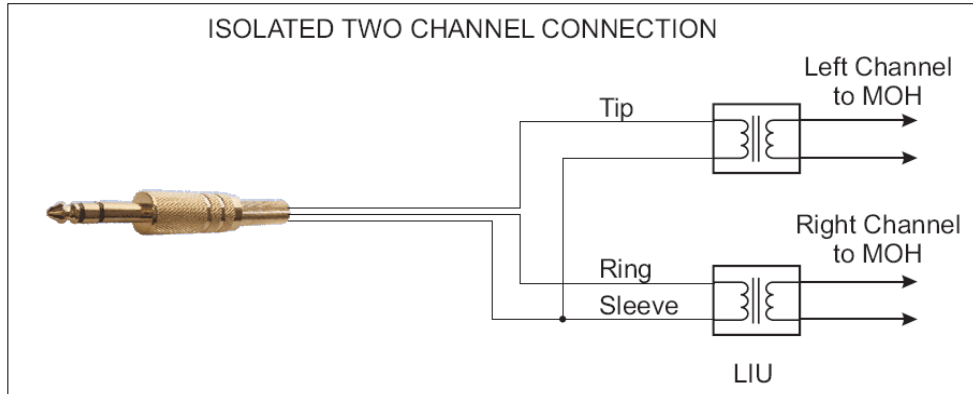
The audio is output on the 3.5mm stereo phono socket for connection to the Tramcar PA system. The default output is around 1V p-p to suit most PA line inputs however this can be adjusted using the RS232 VOL command – see page 8.

There are three audio output configurations possible.

1. Standard Single Feed – this is the most common configuration with either mono or stereo (combined to mono) audio.



- Dual Mono feed - use the stereo output and external LIUs to feed two isolated inputs of the phone system(s) with the same synchronised (dual mono) audio.



- Dual Discrete Feed - use the stereo output and external LIUs to feed two isolated inputs of the phone system(s) with separate (independent) audio tracks – see wiring diagram above.

Note : In order to get a different sound track playing on each stereo channel, the MP3 file would have to be edited with one message on the left channel, and another on the right channel, prior to loading. The two channels will need to have tracks of the same length to avoid silence periods on the shorter channel.

### 3.3 RS232 Serial Comms/USB Comms

This is the interface to the Host PC running the **MiniCube** Client software called **MiniCube** Communicator. It is a DB9 female socket with pins 2, 3 & 5 carrying the Tx, Rx and ground signals respectively. Connect the **MiniCube** to the PC using the DB9 to DB9 cable supplied. The Client software allows you to configure the COM port settings. If your PC does not have a spare COM port, the **MiniCube** can be connected to a USB port using an optional RS232 to USB cable (Altronics part number D2340 is recommended and shown here).



## 4. Indicators

### 4.1 Power (PWR ON)

The red **PWR ON** LED indicates that power is connected.

### 4.2 Activity (ACT)

The blue **ACT** LED can be in one of the following states:

- Steady: An SD card is inserted and an MP3 audio file is loaded.
- Slow flash: No SD card is inserted.
- Off: This indicates an error condition where no audio can be played, eg. there is no audio file on the inserted SD card.

## 5. Uploading New Messages

Audio files are written to the SD Flash Card by:

- Removing the card and placing it in a card reader (format FAT16 or just FAT) where files can be 'dragged and dropped' within Windows.

### 5.1 Using an External Card Reader

The SD Card can be ejected from the **MiniCube** by applying gentle pressure, causing it to pop out of the slot. It can then be inserted into a card reader and be seen as a mass storage device. MP3 files can simply be 'dragged' across to the card. If you need to delete or add files, the card will need to be re-formatted as a FAT or FAT16 file system before new file(s) are dragged and dropped' within Windows.

Note that the SD cards are not 'hot swappable'. You need to either power cycle the unit or send the **##RESET\*\*** command to the MiniCube after an SD Card is inserted.



## 5.2 RS232 Protocol

**MiniCube** is connected to a Personal Computer (PC) or Server via the RS232 serial COM port. The RS232 Control Messages and Acknowledgements are as follows:

### RS232 Comm's

Fixed at 115,200 baud, 8N1 format, RS-232 levels ( $\pm 12V$  nom.)

### Command Format

**##COMMAND [ :OPTION1 [ ,OPTION2 ] ] \*\***

ACTION	COMMAND	ACKNOWLEDGEMENT
STATUS REQUEST	<b>##STATUS**</b>	<b>##STATUS: IDLE**</b> <b>##STATUS: PLAYING**</b> <b>##STATUS: PAUSED**</b> <b>##STATUS: ERROR**</b>
SET OUTPUT VOLUME	<b>##VOL: L, R**</b> <i>L, R</i> = left and right channel volumes. 0 = highest volume 50 = lowest volume	<b>##VOL: SET**</b>
RETRIEVE VOLUME	<b>##GETVOL**</b>	<b>##GETVOL: 0, 0**</b> as an example
RESET TO IDLE	<b>##RESET**</b>	<b>##STATUS: STARTUP**</b>
PAUSE PLAYBACK	<b>##PAUSE: state**</b> state = ON or OFF	<b>##PAUSE: ON**</b> <b>##PAUSE: OFF**</b> <b>##PAUSE: ERROR**</b>
STOP PLAYBACK	<b>##STOP**</b>	<b>##STOP: OK**</b> <b>##STOP: ERROR**</b>
PLAY	<b>##PLAY: nnnn**</b> <i>nnnn</i> = 0001→0500	<b>##PLAY: START**</b> <b>##PLAY: END**</b> <b>##PLAY: ERROR**</b>
FIRMWARE VERSION	<b>##FW-VER**</b>	<b>##FW-VER: 1.10**</b> as an example

Note:

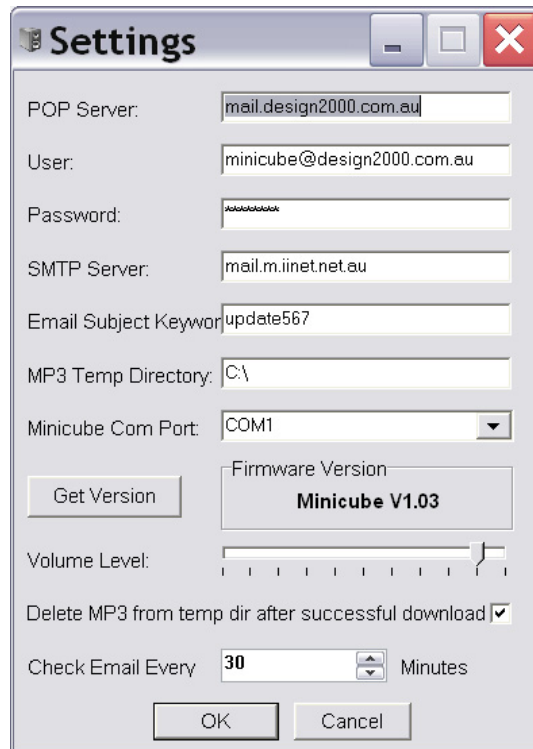
- At the completion of each message playback, the **MiniCube** responds with **##PLAY: END\*\***.
- If a message is playing and it needs to be interrupted with another message, you can simply send the **##PLAY: nnnn\*\*** command. The **MiniCube** responds with **##PLAY: START\*\***.



### 5.2.2 Remote Upload

The **MiniCube** can be Web enabled (as described above) with the Client software provided. It is able to periodically check a designated email account and automatically load an attached MP3 file. From the central dispatch site, you or your content provider can email file updates to individual email addresses or an address book of Customer stores for simulcast updating. The **MiniCube** (as long as it is connected to a web-enabled PC) will take care of the rest. It will automatically check for the Specified keyword in the Subject title before proceeding and then check that the attached file is in the MP3 format before loading it.

Before **MiniCube** can receive emails and attached MP3 file updates, there are several settings that need to set locally. The parameters in the Settings box are mostly self explanatory:



Specify POP Server, User Name & Password and SMTP Server	Enter the information using your own Server, User & Password details
Email Subject Keyword	The keyword is entered as the subject when emailing an MP3 attachment
Temporary MP3 directory with delete option after successful download	This is where emailed MP3 updates are stored and deleted.
MiniCube Com Port	Usually COM1, 115,200 baud, 8N1 format
Get Version	Used to read firmware version number and to test comms
Volume Level	Use the slider to obtain a suitable volume for your phone system
Check Email Every... Minutes	The interval at which the <b>MiniCube</b> checks for new emails - from every 30 to 44,640 minutes

Once set, the **MiniCube** Client checks, verifies & downloads valid emails, automatically uploading the new MP3 audio file to **MiniCube** and it starts playing.

## 6. Email Sending & Receiving Hints

- Email updates should be scheduled to occur after hours as no audio is output while the SD card is receiving a new MP3 file.
- Some email accounts have a limit on the size of attachments receivable. The **MiniCube** Client software (**MiniCube** Communicator) does not currently support attachments that have been broken apart.
- The **MiniCube** Client software does not currently support emailed multi-file attachments.
- If the SD card contains multiple files, a valid email update will overwrite all of them with the new one.
- Some firewalls block attachments of certain types.
- Text in the body of email updates is allowed.
- An existing MP3 file can be overwritten with a new one of the same (or different) name.
- If multiple emails are waiting, the **MiniCube** Client software will process them one at a time until the last one is finished, leaving only the last MP3 file playing.
- The **MiniCube** Client software must be left running (minimised if you wish) in order to receive email updates.
- Treat the email subject keyword as a security password which prevents unauthorised access to the unit. Good passwords are at least 8 characters in length and contain a mix of letters and numbers (eg. RPS82QZ9). It is more secure if the keyword is not a human-readable word or common sequence of characters that may accidentally appear in an email subject.
- In the settings window, filling out the SMTP server field is optional. This will be required in later versions of the software where the user will be able to request a return confirmation email that the mp3 has loaded and is playing.

### 6.1 MP3 Volume Normalization

MP3 files should be 'normalized' prior to uploading or emailing. This is to maintain consistent output levels. An MP3 normalization program called MP3Gain is recommended for this purpose. It is freeware however it would be appreciated if you made a donation to the authors:

Download page:

<http://mp3gain.sourceforge.net/download.php>

Direct link to download current version:

[http://optusnet.dl.sourceforge.net/sourceforge/mp3gain/mp3gain-win-1\\_2\\_5.exe](http://optusnet.dl.sourceforge.net/sourceforge/mp3gain/mp3gain-win-1_2_5.exe)

Tip! Use the default settings ('Volume 89.0') when applying track gain to MP3 files. Use 'Track Gain' rather than 'Constant Gain' if your message requires some dynamic range.

## 7. Installing the MiniCube Client Software (MiniCube Communicator)

To install the **MiniCube** software, insert the supplied CD-ROM into your computer's CD-ROM drive. In many cases your computer will detect the disc and start the installation automatically. If it doesn't, you will need to locate the install program on the CD-ROM and start it yourself. To do this you must view the disc contents by double-clicking the icon of your CD-ROM in the "My Computer" window. The install program is called "**setup.EXE**" and resides in the root (top) directory of the CD-ROM. Start the installation by double-clicking "**setup.EXE**".

The installation program will take you through some simple steps and then install the **MiniCube** software and place a "shortcut" icon on your Windows desktop. The install works the same way as many other Windows installation programs and will be familiar to anyone who has previously installed Windows software, however you should seek technical support if you are unsure about any aspect of the install.

Once the installation is complete the **MiniCube** software can be started by double-clicking the **MiniCube** shortcut icon on your Windows desktop. The icon will appear similar to this:

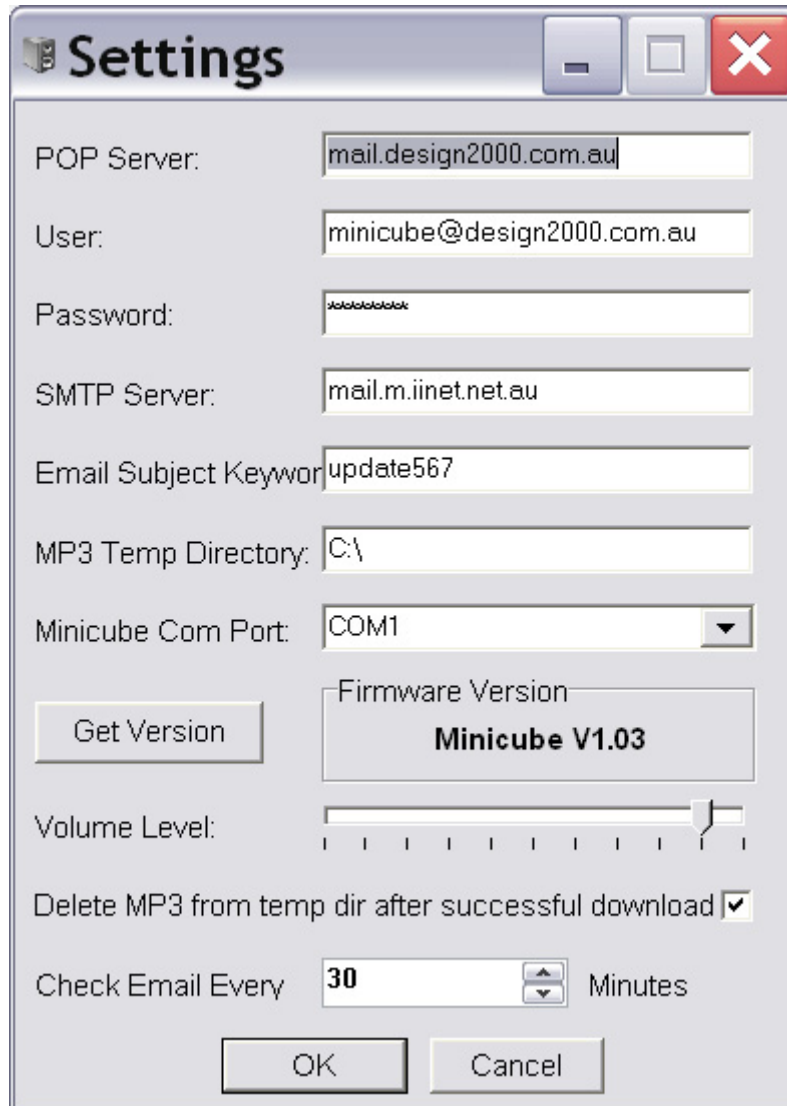


When the **MiniCube** program starts you will see a window similar to the following:



*The MiniCube Software Interface*

Make sure that your **MiniCube** RS232 port is connected to your PC COM port (usually COM1) correctly. A USB to RS232 adaptor may be used if your Notebook does not have an RS232 COM port. Configure the COM port for 115,200 baud, 8N1 format. Click the “Settings” button and enter the information using your own Server, User & Password details:



Click the “Get Version” button. This will test the serial link between your PC and the **MiniCube**. If a firmware version number does not appear then the Comms settings or serial cable is not configured properly.

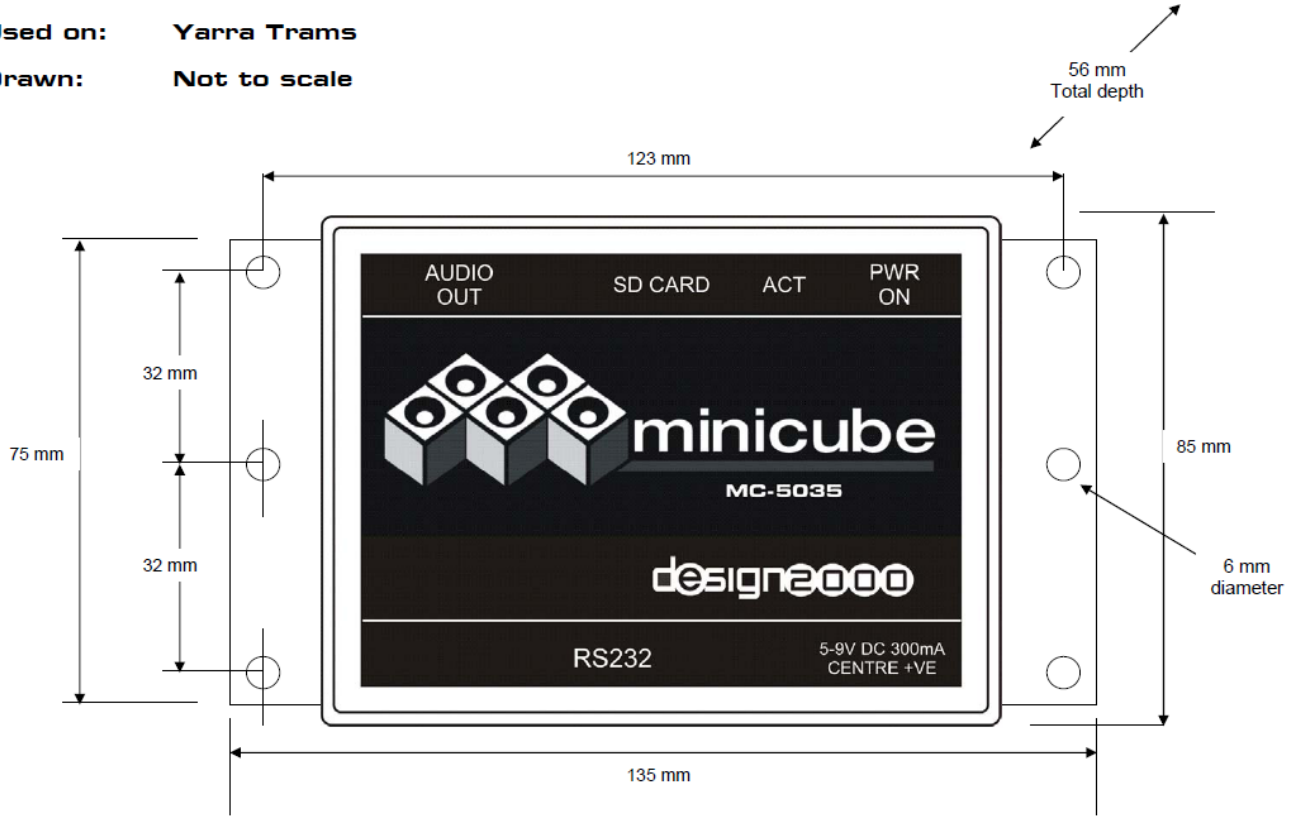


## 8. Mounting Detail

MiniCube: **Mounting Detail**

Used on: **Yarra Trams**

Drawn: **Not to scale**



## 9. Specifications

<b>Enclosure</b>	
Material	Injection moulded ABS (acrylonitrile-butadiene-styrene)
Dimensions	50 mm x 110 mm x 80 mm
<b>Operating Environment</b>	
Operating Temperature Range	-10 → +60 ° C
Storage Temperature Range	-20 → 80 ° C ambient
Humidity, Storage and Operating	To 98% non-condensing
Mean Time Between Failure	> 20 years
<b>Processor</b>	
Type	PIC18F452
Processor Speed	20 MHz XTAL, internally multiplied to 48MHz
On Board RAM	2KB
On Board FLASH	32KB
On Board EEPROM	256B
<b>Message Upload/Playback</b>	
MP3 decoder	MPEG Audio Layer 3 ( ISO11172-3) Supports MPEG 1 & 2 and 2.5 extensions. All sample and bits rates in mono or stereo
MP3 Encode Rate	8 kbits/s to 320 kbits/s CBR (Constant Bit Rate). Supports VBR (Variable Bit Rate) to a peak of 320 kbits/s
Upper pass band	10 kHz.
Message retention	> 100 years
Upload Cycles	> 100, 000. writes to any one memory cell
Read Cycles	Unlimited
Messages length	SD card dependent, encode rate dependent
Message Size	SD card dependent
Output level	< 4.4V p-p, 500mV p-p default (software adjustable)
Frequency range	300 Hz → 3.4 kHz (on telephone line)
<b>Power</b>	
Power requirement	24Vdc nominal, 100mA, centre positive
Power connector	2.1 mm concentric
<b>Audio Out</b>	
Recommended MP3 bit rates	64 kbits/s mono for messages, •128 kbits/s for music
Audio Out connector	3.5 mm stereo phono
<b>Data Communication</b>	
RS232 Comms	Fixed at 115,200 baud, 8N1 format, RS-232 levels (± 12V)
USB Comms	Via USB to Serial converter cable, Altronics Part No. D2340
RS232 connector	DB9 Female
<b>Indicators</b>	
Displays	Power LED (Red), Activity LED (Blue)
<b>General</b>	
Included software	MiniCude.exe Client and supporting material
Isolation	Complies to ACMA TS001
NZ Telepermit	PTC 212/92/005
ACMA Supplier's Code Number	N468
Warranty	Two years



## 10. Acronyms

RS232	Recommended Standard number 232 for connecting DTE & DCE data communication devices.
Serial	Another name for RS232
DTE	Data Terminal Equipment (eg. PC)
DCE	Data Communication Equipment (eg. <b>MiniCube</b> )
USB	Universal Serial Bus
COM Port	RS232 Communication port on a PC
MP3	<u>M</u> oving <u>P</u> icture <u>E</u> xperts <u>G</u> roup (MPEG)-1, Audio Layer 3
SD Card	Secure Digital Card
POP Server	Post Office Protocol Server
User	User Account details
SMTP Server	Simple Mail Transfer Protocol Server
MOH	Music On Hold
LIU	Line Isolation Unit





# MiniCube MC-5053

## MP3 ON-HOLD PLAYER



*Note: Specifications are subject to change without notice.*

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N468



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