

AUTONOMIC

MIRAGE M-401E

Multi-Zone Digital Amplifier Manual



eSERIES

MIRAGE
AUDIO SYSTEM

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Important Safety Instructions

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including other amplifiers) that produce heat.
9. Use the apparatus only in Moderate climates. (not in tropical climates)
10. Do not defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other, a grounding type plug has two blades and a third grounding prong, the wide blade or the third grounding prong are provided for your safety. If the provided plug does not fit onto your outlet, consult an electrician for replacement of the obsolete outlet.
11. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
12. Only use attachments / accessories specified by the manufacturer.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. If you install the apparatus in a built-in installation, such as a bookcase or rack, ensure that there is adequate ventilation. Leave 20cm (8") of free space at the top and sides and 10cm (4") at the rear. The rear edge of the shelf or board above the

apparatus shall be set 10cm (4") away from the rear panel or wall, creating a flue like gap for warm air to escape. 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 thermal shutdown of the unit, and reduced life expectancy.

15. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as:
 - a. When the power supply cord or plug is damaged.
 - b. If liquid has been spilled, or objects have fallen into the apparatus.
 - c. If the apparatus has been exposed to rain or water.
 - d. If the apparatus has been dropped or damaged in any way.
 - e. If the apparatus does not operate normally by following the instructions. Adjust only those controls that are covered by the operating instructions.
 - f. When the apparatus exhibits distinct change in performance this indicates a need for a service.

WARNING!

Do not expose the apparatus to dripping or splashing. Do not place objects filled with liquids near the apparatus.

WARNING!

To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

WARNING!

Equipment must be connected to a Mains socket outlet with a protective earthing connection.

WARNING!

Never push objects of any kind into the apparatus through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock.

IMPORTANT!

Ensure adequate ventilation. Do not install in a cabinet that is smaller than 60cm (24") wide x 45cm (18") deep x 20cm (8") high. If you do the device may overheat.

WARNING:

TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.

CAUTION:

TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Precautions

1. AC Fuse

The AC fuse inside the unit is not user-serviceable. If you cannot turn on the unit, contact the dealer from whom you purchased this unit.

2. Care

Occasionally you should dust the unit all over with a soft cloth. For stubborn stains, use a soft cloth dampened with a weak solution of mild detergent and water. Dry the unit immediately afterwards with a clean cloth. Don't use abrasive cloths, thinners, alcohol, or other chemical solvents, because they may damage the finish or remove the panel lettering.

3. POWER WARNING: Before plugging in this device for the first time, read the following section carefully.

AC outlet voltages vary from country to country. Make sure that the voltage in your area meets the voltage requirements printed on the unit's rear panel. e.g. ~ 110V / 240V, 50/60HZ.

The power cord is used to disconnect this unit from the AC power source. Make sure that the plug is readily operable (easily accessible) at all times. If you do not intend to use the unit for an extended period, remove the power cord from the AC outlet.

4. Earth

The unit is defined as Class1 in EN60065 (low voltage directive) and MUST BE EARTHED. Connect only to a mains socket outlet with protective earth, and only use the power cord supplied.

Finland: "Laite on liitettävä suojamaadoituskoskettimillä varustettun pistorasiaan"

Norway: "Apparatet må tilkoples jordet stikkontakt."

Sweden: "Apparaten skall anslutas till jordat uttag."

5. Never Touch This Unit with Wet Hands

Never handle this unit or its power cord while your hands are wet or damp. If water or any other liquid gets inside this unit, have it checked by your Automatic dealer.

6. Handling Notes

- a. If you need to transport this unit, use the original packaging.
- b. Do not leave rubber or plastic items on this unit for a long time; they may leave marks on the case.
- c. This unit's top and rear panels may get warm after prolonged use. This is normal.

7. Speaker Shorts

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

8. Direct Sun light

Avoid installing the amplifier in positions where the front panel is exposed to direct sunlight – may cause control to become sluggish

9. Controller Connection

Never connect more than eight Autonomic controllers. The supply is internally fused (self-resetting) and may open circuit. Never connect the unit's 12VDC terminal ('Bus Run' port) to an external power supply.

Declaration of Conformity

We declare under our sole responsibility that this product, to which this declaration relates, is in conformity with the following standards:

- EN60065
- EN55013
- EN55020
- EN61000-3-2
- EN61000-3-3

Following the provisions of Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC, the EC regulation 1275/2008 and its frame work Directive 2009/125/EC for Energy-related Products (ErP).

TUV Certification

This product has been certified and conforms to UL60065 and certified to CAN/SSA, IEC 60065.

For North American Models

FCC interference statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT!

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

For Canadian Models

NOTE: THIS CLASS B DIGITAL APPARATUS COMPLIES WITH CANADIAN ICES-003.

For models having a power cord with a polarized plug:

CAUTION: TO PREVENT ELECTRIC SHOCK, MATCH WIDE BLADE OF PLUG TO WIDE SLOT FULLY INSERT.

Modèle pour les Canadien

REMARQUE: CET APPAREIL NUMÉRIQUE DE LA CLASSE B EST CONFORME À LA NORME NMB-003 DU CANADA.

Sur les modèles dont la fiche est polarisée:

ATTENTION: POUR ÉVITER LES CHOCS ÉLECTRIQUES, INTRODUIRE LA LAME LA PLUS LARGE DE LA FICHE DANS LA BORNE CORRESPONDANTE DE LA PRISE ET POUSSER JUSQU'AU FOND.

A Note About Recycling

This product's packaging materials are recyclable and can be reused. Please dispose of any materials in accordance with the local recycling regulations.



When discarding the unit, comply with local rules or regulations. Batteries should never be thrown away or incinerated but disposed of in

accordance with the local regulations concerning battery disposal.

This product and the supplied accessories constitute the applicable product according to the WEEE directive.

Features

Thank you for purchasing an M-401e Mirage Multi-Zone Amplifier. Please read this manual thoroughly before making connections and plugging in the device. Following the instructions in this manual will enable you to obtain optimum performance and listening enjoyment from your new Multi-Zone Amplifier. Please retain this manual for future reference.

Multi-Zone, Multi-Source Switching

The M-401e amplifier has four separate amplifiers, providing 4 independent zones with integrated control. There are 6 input sources comprising the following:

- Sources 1 – 4 are either Analog Stereo, or Coax Digital Audio (PCM) Digital Coax has priority if both are connected.
- Sources 5 - 6 are either Coax (PCM) or Optical Digital Audio (TOSLINK) Only one connection is permitted to each source.
- Sources 1 -6 have a programmable delay: up to 600ms - 5ms steps.

eAudioCast

Four separate amplifiers independent yet integrated control. Multiple remote sources may be assigned, originating from a connected eSeries amplifiers and streamers.

Amplifier Physical Stacking for Zone Expansion

Additional zones may be added by physically linking amplifiers in a stack through the Digital Coax connections. Use sources 1-6 Digital Coax outputs for connection to the Digital Coax inputs of additional Autonomic amplifier(s).

As an alternative to physically linking amplifiers together, eSeries amplifiers support adding zones over Ethernet via Autonomic's proprietary eAudioCast technology.

Pre-amplifiers and Outputs

Each zone has bass, treble, balance and loudness control. These are accessed from the front panel or Mirage Web Interface. A feature called "Maximum Volume limiting", is useful for protecting connected speakers. It may be applied to both amplifier and preamplifier outputs.

Amplifier Power, Protection, and Clipping Indicators

55 Watts into 8 ohm loads, and 75 Watts into 4 ohm loads with < 1% THD. The amplifiers are protected against output shorts, and have algorithms that prevent hard clipping when the zone amplifiers are overdriven.

Thermal Control

There are two progressive levels of thermal control:

- The amplifier volume is reduced 20dB.
- The amplifiers are shutdown until the temperature reduces below the first level.

Care should be taken to ensure adequate ventilation. See "Important Safety Instructions" on page 2.

IR Emitter Ports

There are 8 Buffered IR emitter Ports. Ports 1 – 6 have IR routing, and are intended to control specific input source components.

Ethernet and IR Control

The M-401e amplifier may be controlled and monitored via Ethernet. An M-401e amplifier may receive IR directly from the front panel receiver. There are zone specific IR commands and also a set of global IR commands. The commands are:

- ON
- OFF
- Standby (toggling)
- Mute
- Volume Up
- Volume Down
- Source Selects
- Discrete Audio Source Selects
- On with Source Specific commands

Amplifier Zone ON Status – "Amp-On"

Each zone has AMP-ON status: 12VDC OUT on the rear panel connector: (1, 2, 3, 4, 5, 6, 7, 8).

Discrete Audio Selection

Audio selection may be independent. There are IR Discrete control commands available.

Zone Linking

A zone may be programmed to be linked with other zones. Zone linking ties the source selection together. Optionally, it may also be configured to tie the zone group's volume and power. In your specific listening area(s) it may be advantageous to have different volume control but the same source, or the same volume with separate power control. Zone linking is setup via the amplifier's web interface.

96 Zones

There are 96 zones of possible control. On an M-401e amplifier each zone must be different, however in a multiple amplifier stack, same zone amplifiers are possible (they simply mimic every parameter).

Power Failure Restoration

After an AC power outage the M-401e amplifier restores its settings to the pre-interrupted state. All internal settings are stored in non-volatile memory, except the clock that runs for at least 48 hours on stored power.

Restore Defaults

The M-401e amplifier may be set to the default settings. Restoring defaults clears all memory and resets the zone allocations to zones 1 – 4. It will also reset any custom zone and source names to default (Zone 1 and S1, for example).

Firmware Upgradable

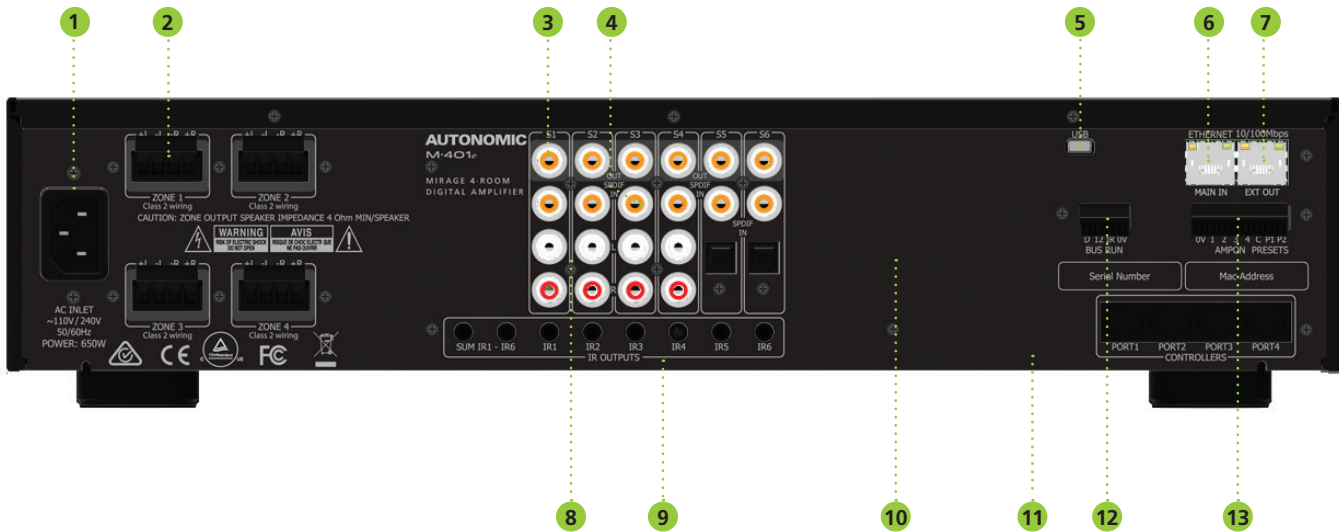
The M-401e amplifier may be updated with the latest operational firmware. See www.Autonomic-Controls.com for support.

Front Panel Guide



- 1. Front Panel**
Solid Aluminium front Panel.
- 2. Infra-Red Receiver**
Receiver for front panel IR control (Used only for amplifier control, not IR pass through). No IR Remote supplied, however an IRC profile is located at:
www.Autonomic-Controls.com/Support/
- 3. Power Indicator**
The power indicator glows blue whenever AC power is applied.
- 4. Chassis Feet**
Set high enough to provide unrestricted air-flow through the chassis for convection cooling.
- 5. Rack Mount Ears (Optional)**
Rack mount ears not depicted.

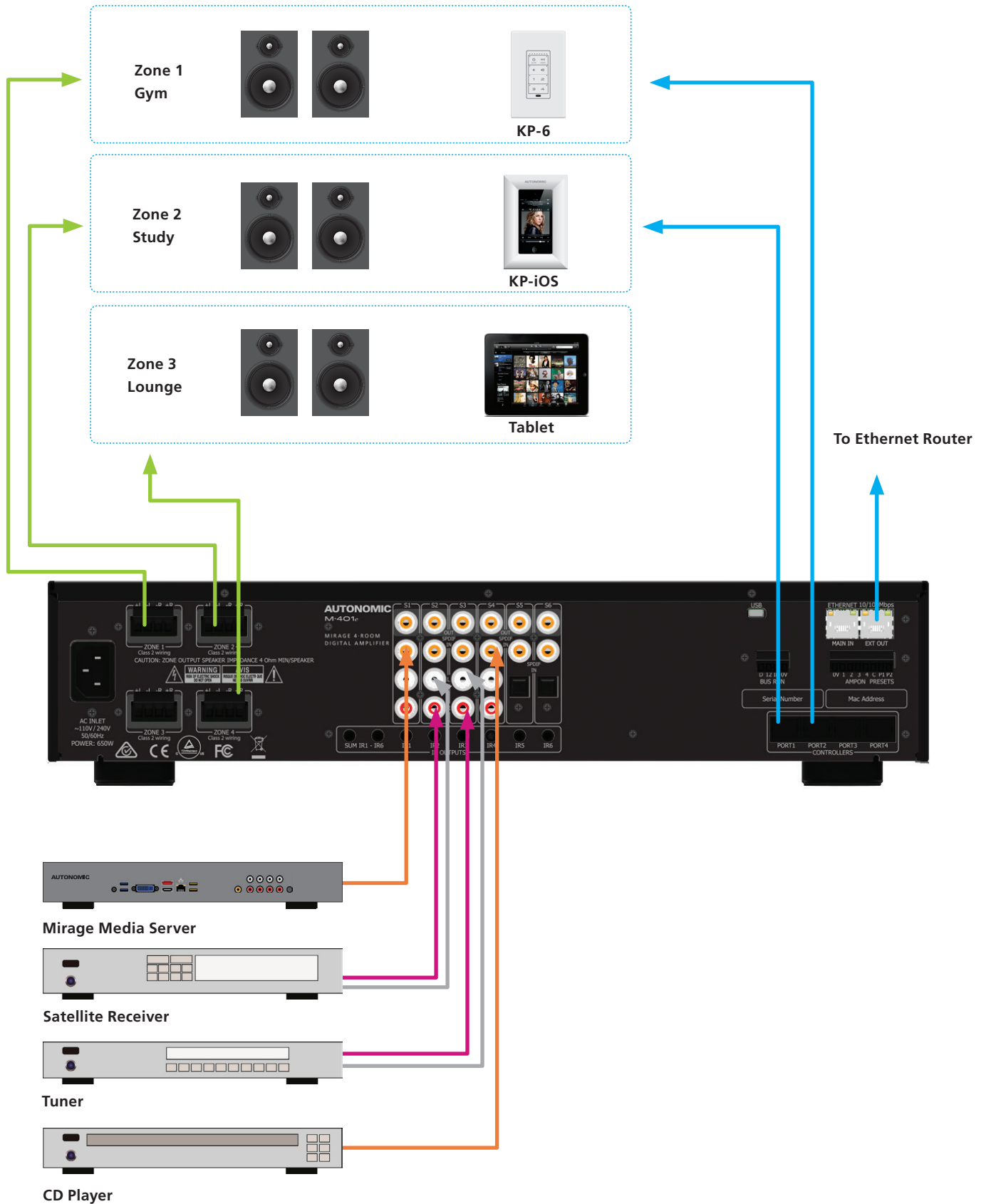
Rear Panel Guide



1. **AC Inlet**
IEC socket
2. **Speaker Terminals**
Plug in terminal clamp connectors accept 1.5mm² speaker wires.
3. **Coax Digital Input Terminals**
Coax digital (SPDIF) inputs.
4. **Coax Digital Source Output Terminals**
Coax digital outputs for expansion to further amplifier zones.
5. **USB for Programming**
USB mini B socket for firmware updates.
6. **Ethernet Port – MAIN IN**
MAIN IN is 10/100 Base T primary Ethernet port for connection to the Home network.
7. **Ethernet Port – EXT OUT**
EXT OUT is 10/100 Base T secondary port for connection to another eSeries Amplifier's "MAIN IN" Ethernet Port.
8. **Analog Input Terminals**
Analog audio L/R inputs
9. **IR Emitter Ports**
3.5mm mono jacks. IR9 & IR10 ports output the combined IR1 – IR6 infra-red strings. Ports are not usable but are future ready for IR routing.
10. **Optical Digital Inputs**
Optical (TOSLINK) digital inputs.
11. **Controller Interface**
For connection to keypads and IR receivers. 4 controller interface ports - RJ45 sockets.
12. **AMP ON Control**
AMP-ON 1 - 4 output 12VDC when Zone is ON.
13. **PRESETS – Door Bell**
12 – 24V AC/DC powered doorbell trigger terminals.

Typical System Configuration

FIGURE 1



Typical System Configuration (Continued)

Fig. 1 depicts a typical configuration where the M-401e amplifier is providing audio into six of the possible eight listening zones. Only three of the zones are depicted.

Each zone consists of a room with a pair of speakers and a suitable controller. Each zone may be listening on any of the connected sources:

- Mirage Media Server
- Satellite Receiver
- Tuner
- CD Player

Controllers

Each zone has a specific control requirement. Choose controllers that best suit the application.

Zone 1 – The Gym: Speakers & KP-6 Keypad

Zone 2 – The Study: Speakers & KP-iOS Keypad

Zone 3 – The Lounge: Speakers & Tablets

1. The KP-6 Keypad may be plugged into any of the four controller ports.
2. Source control IR emitters are plugged into the IR ports. There are ten IR ports: IR1 - IR8, and IR9 & IR10.
3. IR 1 – 6 route source specific IR signals from connected controllers, while IR9 & IR10 output the common IR or the sum of all received IR signals.
4. These ports may be used for source equipment that is common to all zones.

When controlling a stand alone M-401e using an iPad or other web tablet, the M-401e must be connected to a wi-fi enabled ethernet router and the web tablet browser must be directed to the M-401e's IP Address. The M-401e's web application also provides source control functionality.

Speakers

Speakers in each zone are connected to the amplifier by "Home Run" speaker cables.

Source Equipment

The M-401e amplifier has eight stereo RCA audio inputs for connecting to source equipment. These input channels feature coax digital inputs.

If a signal is present on the digital input, it takes precedence over the analog input. There are four additional Digital only input channels featuring both coax and Optical inputs. Any source can be listened to in any zone, simultaneously.

All eight zones may select the same source, in such circumstances there is a possibility that all four zones may be trying to control that source (not always desirable) so a system should be well planned and where appropriate additional source equipment installed.

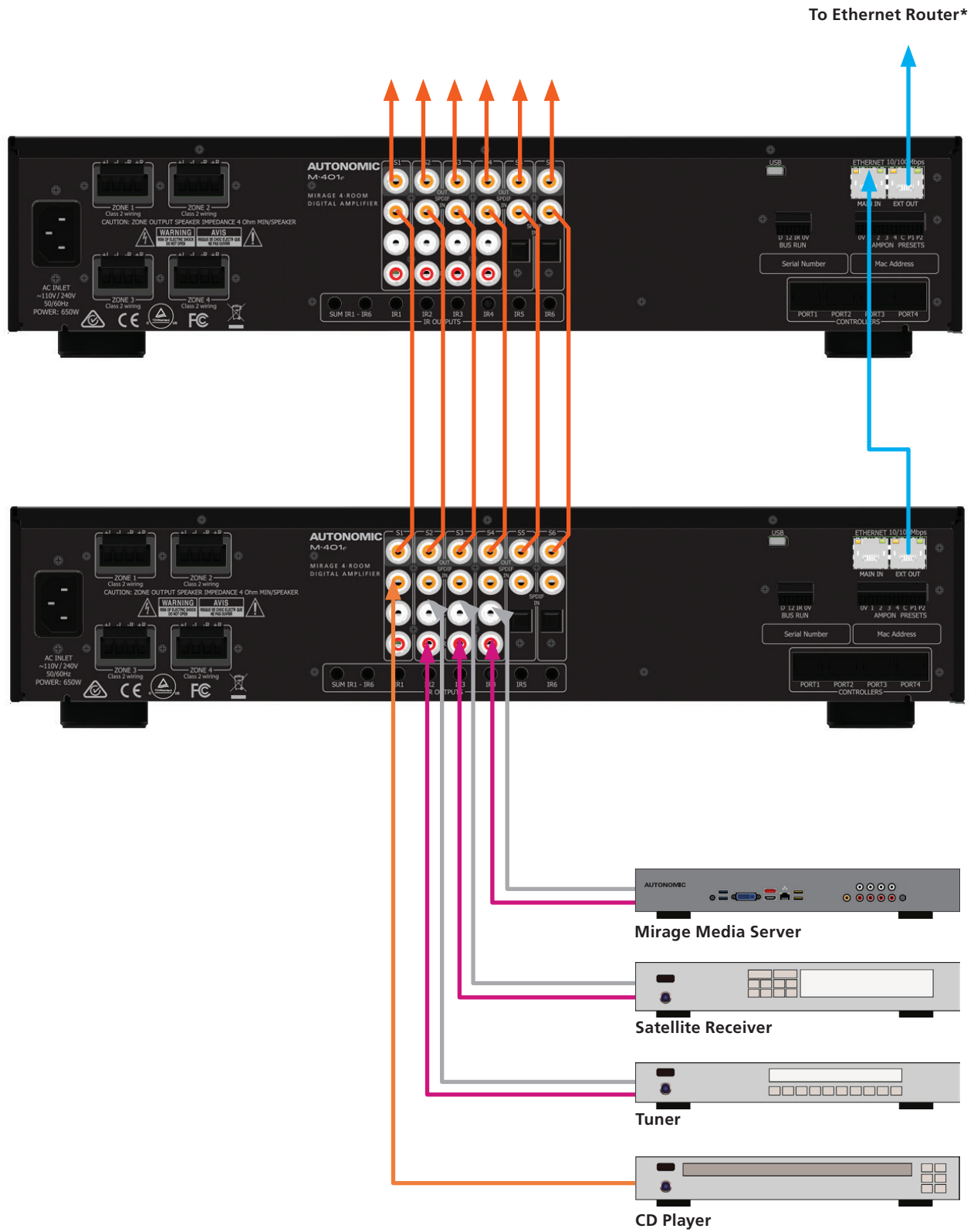
Mirage Media Server

When pairing your M-401e amplifier with a Mirage Media Server, be sure to use the Mirage Media Server's web configuration Sources page and follow the pairing process there. This will ensure full control via the Mirage iOS and Android applications.

Multiple Amplifier Stacks

FIGURE 2

Linking to the Next M-401e or M-801e Multi-Zone Amplifier



Multiple Amplifier (Continued)

In large installations where multiple M-401e amplifiers are required, Ethernet conveys amplifier control, and link to other Media sources if connected to the Home network Router or Switch. Ensure all amplifiers using same the amp ID in the stack.

The source equipment audio inputs must be plugged into the first amplifier where they are buffered and sent to the next amplifier in the stack. The maximum recommended expansion is 24 units.

*Fig 2 shows a stack of M-401e with Source connections to first amplifier where they are converted to Digital audio, buffered and sent to the next amplifier in the stack. Use good quality Coax Digital Shielded RCA cables for the interconnection, cables should be no more than 3 meters or 10 feet. The maximum recommended expansion is twelve units. This chaining of Ethernet is an option but a direct connection to the router is the best option.

Controller Wiring

The M-401e is packed with control options:

- **USB:**
Used for firmware update.
- **ETHERNET:**
Two 100BaseT connections to a home network or to daisy chain other amplifiers.
- **CONTROLLERS:**
Conveys +12VDC, IR and data between the M-401e and KP-6 keypad controllers, connected using CAT5 cables.
- **BUS RUN:**
For future use.
- **TRIGGERS:**
+12VDC 100mA trigger output when a zone is on.

Ethernet Protocol

The Ethernet port provides data acquisition and control of the Mirage amplifiers by a home automation system, or PC Via TCP port 17037.

Command Structure: <command> <zone> <data> <line feed>

Please see online support documents under the amplifiers section.

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	Maximum Volume Limit
11	Volume Up
12	Volume Down
14	Request Device information
1C	Zone Name
1D	Preamplifier Volume Mode
26	Volume BCD format



FIGURE 3

Zone

Amplifiers are encoded with up to 96 zones. The zone byte is used for checking if the command is applicable to the device receiving the command and if so, for optionally selecting a **sub-device**, e.g. a bank or part of a device. All Zones are addressed using FF. The lower 5 bits of the zone byte represent the zone 0 – 31.

Selection:

- 00000 bin = 00 (hex) = zone 0
- 00001 bin = 01 (hex) = zone 1
- 01010 bin = 0A (hex) = zone 10
- 11111 bin = 1F (hex) = zone 31

Examples:

Addressing a zone 10 amplifier:
Binary 000-01010 or 0A hex
Send ASCII "0A"

Addressing all Zone amp & preamplifiers:
FF hex Send ASCII "FF"

Data

COMMAND	CONTENT			
Standby (01)	00	Standby OFF		
	01	Standby ON		
	04	Toggle		
Mute (02)	00	Mute		
	01	Un-mute		
	02	Toggle Mute		
Source Selection (03)	00	S5	04	S8
	01	S6	05	S1
	02	S7	06	S2
	03	S4	07	S3
Volume (04)	00	A0 range		
Bass (05)	F4	0C (-12db - +12db)		
Treble (06)	F4	0C (-12db - +12db)		
Balance (07)	EC	14 (Left -20db - Right -20db)		
Send all parameters (09)	XX	value ignored		
Amplifier features (0C)	00	Loudness Disabled		
	01	Loudness Enabled		
Maximum Volume Limit (0D)	00	A0 Range		
Volume Up (11)	XX	Value Ignored		
Volume Down (12)	XX	Value Ignored		
Zone Name (1C)		Data field contains the ASCII string.		
Preamplifier Volume Mode (1D)	00	A0 Range		
	FF	Independent Mode		

Notes

- When a command is sent to an amplifier it will first be transmitted on the control 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.
- A Standby 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.
- Not all Command and Data commands are covered in this document.
- The expected reply for the "Send all Parameters" command (09) is >144 bytes. All command fields listed in this document are contained in the reply. The reply also contains advanced commands not listed in this document. The home Automation or PC's buffer should be large enough to receive and process the 144-byte reply.
 - Zone 2 links to Zone 3.
 - Since Zone 2 is no longer linked to Zone 1, Zone 1 will no longer be linked to Zone 2.
 - Since Zone 3 is no longer linked to zone 4, Zone 4 will no longer be linked to Zone 3.

Example strings:

- 010A01: Standby ON command for Zone 10 amplifier.
- 012A01: Standby ON command for Zone 10 preamplifier.
- 060002: +2db Treble setting on Zone 0.
- 03IF02: Select Source 7 on Zone 31.

Acknowledgments – FreeRTOS – uIP

The M-401e firmware is based in part on FreeRTOS.org™ V5.0.2 and the uIP TCP/IP stack. For more information on FreeRTOS.org™ please visit <http://www.freertos.org>. Source code for FreeRTOS.org™ can be downloaded from their official website. The following copyright and statements for uIP TCP/IP stack are required by license: Copyright © 2001-2003, Adam Dunkels. All rights reserved.

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Specifications

M-401E	
Rated Output Power (FTC) All Channels	55W per channel / 8Ω loads 75W per channel / 4Ω loads
Total Harmonic Distortion (THD)	0.1% (50 Watt, 8 Ω load)
Damping Factor (8Ω load)	10
Speaker Impedance (Z1 - Z6 L/R)	4Ω–8Ω
Analog Input Sensitivity (S1 - S8 L/R)	0.75V RMS (Vol 100, Gain 0dB, 55W Output)
Analog Input Impedance (S1 - S8 L/R)	22KΩ
Digital Input sensitivity	0dBFS
Frequency Response	48 KHz sample rate: 10Hz - 22 KHz 96 KHz sample rate: 10Hz - 42 KHz
Tone Control	±12dB, 100Hz (Bass) ±12dB, 10kHz (Treble)
Signal to Noise Ratio	95dB (IHA-A, 0.75V input / unbalanced)
IR Output	(6) 3.5mm Jack: IR1 - IR8 current limited to 25mA
Source Inputs	(6) Digital Coaxial RCA, (4) Analog (L/R) RCA, (2) TOSLINK
Ethernet	(2) 100Base-T, MAIN IN and Switch EXT OUT
USB	(1) USB mini-B female 5 pin
Data	(1) 4 pole 3.5 mm terminal block connector (Data,12V, IR,0V)
Controllers	(4) RJ45 sockets Keypad controller ports
BUS RUN	(1) 4 way terminal block (0V, IR 12V & Data)
Amp On & PG Control	(1) 8 way terminal plug with Amp ON 1 - 8 and (2) page preset contact closure inputs: PG1 & PG2
Zone Triggers & Presets	(1) 8 pole 3.5 mm terminal block connector (Zone trigger 0V out, Zone trigger 1 - 8 12V out, Common, Preset 1 - 2 in)
Power Supply	110–240V AC 50–60Hz
Power Consumption	650W
Standby Power Consumption	6W
Dimensions with feet	4.0" H x 17" W x 15" D (10.2cm x 43.2cm x 38.1cm)
Weight	15.4 lb. (7 kg)
Height including feet	105 mm
Zones	(4) zones Expandable to 96 zones, attaching additional M-401e or M-401e amplifiers

A digital copy of this manual can be found at:

http://www.autonomic-controls.com/documents/Amplifiers/Manual_Instructions_Mirage_401e.pdf