

# MC450/MC650 (MC750)

## OPERATING INSTRUCTIONS

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## TECHNICAL SPECIFICATION

	<b>MC450</b>	<b>MC650</b>	<b>MC750</b>
Output power (Watts RMS) per channel			
8 ohms @ 1 kHz	250	350	425
4 ohms @ 1 kHz	450	650	750
2 ohms @ 1 kHz	675	950	1200
Mono Bridged	8 ohms @ 1 kHz	900	1300
	4 ohms @ 1 kHz	1350	TBD
THD @ rated power 4 ohms	1 kHz	<0.005%	<0.005%
	20Hz-20 kHz	<0.03%	<0.03%
Input CMRR		>90dB	>90dB
Hum & Noise		-105dB	-105dB
Sensitivity (drives full output into 4 ohms)		+5dBm signal	+6dBm signal
Damping Factor 1 kHz, 8 ohms		>400	>400
Frequency response	20Hz-20kHz	+0/-0.5dB	20Hz-20kHz +0/-0.5dB
Input impedance (actively balanced)	10k ohms	10k ohms	10k ohms
Dimensions (mm) - all 2U	88x482x381	88x480x410	88x480x410
Weight	20.4 kgs	22 kgs	22 kgs
Power requirement	230 VAC @ 7.0 amps max or 120 VAC @ 14.0 amps max	230 VAC @ 9.0 amps max 120 VAC @ 18.0 amps max	230 VAC @ 10.0 amps max 120 VAC @ 20.0 amps max

## Product compliance to EC Directives

This product conforms to the relevant Directives, Regulations and Standards for electronic and associated apparatus. The equipment is CE marked both on the apparatus and the packaging. A product "Declaration of Conformity" statement and information regarding auxiliary apparatus and specifications required to meet conformity is available on request from our Customer Service Department on:

**+44 (0) 1404 44633**

**This amplifier will only operate to its very high specification if it is installed and operated as described in this manual.**

## **INTRODUCTION**

Your MC450, MC650 or MC750 digitally controlled power amplifier represents the latest technology in control circuitry coupled to a no compromise high quality class AB power amplifier. There is no dynamic switching of the audio or power rails (a very common method of achieving extra power at the expense of audio quality) thus ensuring optimum sonic performance.

The digital control monitors the operating parameters and adjusts the amplifier to suit the conditions. Fan speed and supply rails are varied as required to keep the amplifier within its temperature limits. The levels are adjusted by specially selected, high performance, digitally controlled attenuators. Signal limiters are included, the attack and release times of which can be adjusted internally by the bit switches on the control PCB (printed circuit board).

The amplifiers include full DC and short circuit protection which automatically re-connects when the fault is cleared.

## **INSTALLATION: ELECTRICAL**

The amplifier has been manufactured to comply with your local power supply requirements, but before connecting the unit to the supply, ensure that the voltage (printed on the rear panel) is correct and that a mains fuse of the correct type and rating has been fitted.

### **SAFETY WARNING**

This unit is fitted with a 3 wire power cord. For safety reasons, THE EARTH LEAD SHOULD NOT BE DISCONNECTED IN ANY CIRCUMSTANCE. If ground loops are encountered consult the section on input connections later in this manual.

TO PREVENT THE LIKELIHOOD OF SHOCK OR FIRE HAZARD, DO NOT EXPOSE THE UNIT TO RAIN OR MOISTURE.

TO AVOID ELECTRICAL SHOCK DO NOT REMOVE COVERS. REFER ALL SERVICING TO QUALIFIED PERSONNEL.

## **INSTALLATION: MECHANICAL**

To ensure that this equipment performs to specification, it should be mounted in a suitable rack or enclosure as described below. Like all high power amplifiers, it should be kept away from other equipment which is sensitive to magnetic fields. Also, this amplifier may suffer a substantial reduction in performance if it is subjected to, or mounted close to equipment which radiates high R.F. fields.

When mounting the amplifier in a rack or enclosure, ensure that :-

1. The rear of the unit is adequately supported. The brackets which are supplied fit standard 19 inch (483mm) rack mounting systems. **THE FRONT PANEL IS NOT CAPABLE OF SUPPORTING THE UNIT ON ITS OWN.**
2. THERE IS ADEQUATE VENTILATION. The cooling fans suck cool air in through the front air filter and blow hot air out at the sides of the unit through the ventilating grills. **IF THIS AIR IS NOT ALLOWED TO ESCAPE, OVERHEATING WILL OCCUR.** Take care when mounting other equipment in the same rack. The air filter must be kept clean and free from dust. It is easily removed by pulling it through the front. Dust can usually be shaken out, or if necessary the filter can be washed.

## CONNECTIONS

### INPUTS

The inputs are made via 2 separate 3 pin XLR connectors wired in parallel. Either socket can be used as the input, the other one can be used to link to other amplifiers ('daisy chain') or to the other input for mono signals.

They are electronically balanced and should be connected via a high grade twin core screened cable, as follows :-

- PIN1 - Screen (see note)
- PIN2 - Hot (signal +)
- PIN3 - Cold (signal -)

The amplifier is designed to operate with fully balanced equipment and ground loops or loss of performance may be experienced if connected to unbalanced sources. If it is unavoidable however, the following wiring should be used. The cable should still be twin core plus screen.

- PIN1 - Screen - connected to the chassis of the unbalanced equipment - or left disconnected at the unbalanced end.
- PIN2 - Signal Hot
- PIN3 - Signal Cold

The input requires a peak level of +6dBm for full output.

**NOTE:** This amplifier is wired to the latest industry recommendations. PIN1 is connected directly to the chassis/mains earth. If ground loops (mains hum) are encountered remove the screen connection from the other end of the cable and leave it open circuit. If problems persist, consult your dealer/supplier, DO NOT TAMPER WITH OR ALTER ANY GROUND (EARTH) CONNECTIONS INSIDE THE AMPLIFIER.

### BRIDGED OPERATION

In Bridged mode input A is fed to both channels. Channel B will be out of phase with channel A.

### OUTPUTS

The speaker outputs are via 4 mm shrouded binding posts. They can be used with 4 mm plugs or plain wires, which can be inserted in the sides of the terminals.

Terminations are as follows :-      Hot                  Red  
    Cold                  Black

- NOTE:**
1. Although the "cold" output terminals are nominally at 0V., they should not be joined together, otherwise cross-talk may be introduced.
  2. The currents involved are very high, especially when using 2 ohm. loads. The speaker cables should be capable of carrying the currents, otherwise the losses will cause the cables to get hot and audio power will be reduced. The minimum rating for an MC750 or MC650 should be 15 amps for 4 ohm and 20 amps for 2 ohm loads. For the MC450 it is 12 amps for 4 ohms and 15 amps for 2 ohms.

## **BRIDGED (MONO) OPERATION**

Connect as follows : HOT - Channel A Hot  
COLD - Channel B Hot

Leave both COLD connections open circuit, they are internally joined.

**NOTE:** The load impedances change when operating in the bridged mode. (See Load/Power section below.)

### **LOAD/POWER SWITCH 2 ohm/4 ohm**

In the 4 ohm position, the amplifier supply voltages are set up for loads of 4 ohms and above. Lower impedance loads can be connected but the internal current limit circuit could cause clipping, and unless the signal is very dynamic, the internal temperature rise will automatically reduce the supply voltages and set the amplifier to the 2 ohm position. In the 2 ohm position, the supply voltages are reduced and the level (overload) indicators and limiters are re-referenced accordingly.

**When operating in bridged mode, the minimum impedances are doubled, i.e. for 4 ohm loads use the 2 ohm position and for 8 ohm loads use the 4 ohm position. The minimum load in bridged mode is 4 ohms.**

## **OPERATION**

### **SWITCHING ON**

When the amplifier is switched on, the outputs will be muted and the controller will check for any faults. It then goes through a power up routine and finally connects the speakers to the output stages and fades up the signal to the level at which the amplifier was previously set.

### **PANEL CONTROLS AND INDICATORS**

#### **Level controls**

These are continuous rotary encoders which provide fine adjustment (3 turns from min. to max.). When adjusted, the level indicators change to level control position indicators and thus the height of the LED column shows the level position. After a second or so the LED column changes back to monitor the signal level. This function can be changed internally via the programming switches on the control PCB. (See the Internal Configuration section.)

#### **Mute Switches**

These are self explanatory, and require one push to mute the signal and one to un-mute - toggle action. The LEDs indicate their status and when "un-muting" the signal is ramped (faded) up.

#### **Link Switch**

This is also a toggle action switch, the LED above indicates its status. When ON, the two level controls are linked together and either control will adjust both channels to the same level. The controls track very accurately and operate as stereo attenuators. The limiters are also linked. When OFF, the level controls and limiters operate separately.

#### **Level Indicators**

These are peak reading meters which show the signal headroom before clipping. The 0dB LED is set at approximately 1/2dB below clipping. They are referenced to the supply voltages and automatically adjust when the supply changes. When the level controls are adjusted, the level indicators change function and show the level control position. They return to their normal function after the level has been set.

## Limiters

The MC750, MC650 and MC450 incorporate digitally controlled signal limiters. They attenuate the signal via the same switch array as the level controls and introduce virtually no distortion. The attack time, release time, threshold level and operating mode can be set internally via the programming switches on the control PCB. (See the Internal Configuration section.)

When the level controls are "linked" then the limiters are also linked, and when the level controls are separate then the limiters are separate.

The amplifiers leave the factory with the limiters set up in the OVER CLIP PROTECTION mode. The threshold is set just below the clipping point, with fast attack and release times. This is the most sonically transparent configuration, transients are allowed to go into clipping for a few milliseconds, but if large amounts of overdrive are applied, the limiter will attenuate the signal back to the clipping point. Low frequency signals will be clipped as normal because of the fast release time, changing the release time to slow will prevent low frequencies from being clipped but will change the mid and high frequency dynamics.

The threshold can be adjusted in 1dB steps up to 3dBs below the clipping point. The limiter then behaves like a conventional limiter, transients will be allowed to go above the threshold level but the average peak level will be kept to the threshold point.

The release time can be set to infinity which changes the limiter to function as an AUTOMATIC GAIN CONTROL. In this mode, if the signal goes above the threshold level, the gain of the amplifier will be reduced. This reduction will remain until the level controls are manually turned back up, or until the amplifier is switched off.

**NOTE:** All levels are referenced to the clipping point of the amplifier and not an actual output voltage or power level. If the mains power drops or increases then the limit threshold will also change, thus maintaining maximum output level.

## Temperature Control

If the heat sinks get excessively hot, the controller will automatically reduce the supply voltages to the power devices. This is totally inaudible, it does not effect the levels, but merely reduces the amplifier headroom by about 1.5dBs. The heat generated by the heat sinks is reduced by 30%. If the amplifier is still getting too hot there will be a further reduction. If the temperature still continues to rise the controller will disconnect the outputs. Just before this "shutdown" point, the temperature LED will start flashing, and it will stay on permanently whilst the amplifier is "shutdown".

The operation of the temperature LED can be changed (see Sw1, internal configuration switches below) in the alternative position. The LED will come on as soon as the first headroom reduction point is reached. In certain applications it is important for the user to know this. All other functions remain the same.

**Normal dynamic signals will not cause the amplifier to overheat unless the air filter is clogged or the ventilation is inadequate. (See installation section.)**

## Fault Indicators

If the outputs are shorted or if DC is present, the control circuit will disengage the outputs and the fault LED will illuminate. The controller will keep monitoring the amplifier and will reconnect the outputs and fade up the signal when the fault is cleared.

The controller also monitors all supply voltages and the mains transformer temperature, any fault with these will cause the amplifier to shut down and both fault LEDs will show.

## 2 ohm & Bridged LEDs

These indicate the position of the switches on the rear panel. The 2 ohm LED will also illuminate if the controller senses a low impedance load (excessive temperature rise).

## INTERNAL CONFIGURATION SWITCHES

As these can only be accessed by removing the top panel **this should only be carried out by qualified personnel.**

The control PCB is located on the side of the unit behind the front panel. The switches are an 8 switch DIL package at the rear of the PCB. For full description of the switches consult the Service manual.

The standard configuration is for all switches to be ON, except Sw2 and Sw6, which are normally OFF.

- Sw 1 Temp LED operation. ON = Standard position, OFF = alternative position. (See temperature control section above.)
- Sw 2 (Normally OFF) This selects the auto reconnect mode. If switched OFF when a fault has been detected, the amplifier will not reconnect the outputs even when the fault is cleared. This is a safety requirement in certain applications.
- Sw 3 (Normally ON) When OFF the LED columns will always show the signal level and will not change to show the level control position when the level controls are adjusted.
- Sw 4 & 5 These select the threshold level as follows:-

<u>Sw4</u>	<u>Sw5</u>	
ON	ON	Just below clipping point.
ON	OFF	1dB below clipping point.
OFF	ON	2dB below clipping point.
OFF	OFF	3dB below clipping point.

Sw 6 & Sw 7 operate together, they determine the operating mode and release time of the limiter as follows:-

<u>Sw6</u>	<u>Sw7</u>	<u>Function</u>
OFF	OFF	Release time = slow
OFF	ON	Release time = fast
ON	OFF	Automatic Gain Control mode. (Once the level has been reduced it will remain at that level until changed manually).
ON	ON	Limiter disabled.

Sw 8 (Normally ON) This sets the attack time of the limiter. ON = Fast      OFF = Slow

## FAULTS/FUSES

There are internal secondary (low voltage) fuses on all the internal supply rails. If one of them blows the amplifier will indicate a fault on both channels and the unit will power down. If the controller (5 volt) supply fails all LEDs will go out and the unit will shut down.

The unit must be disconnected from the mains supply, and the fuses replaced before switching the unit back on. They should be replaced with the same type fuses only.

**THIS SHOULD BE CARRIED OUT BY QUALIFIED PERSONS ONLY.**

## **WARNING**

**When replacing the high current power output fuses, ensure that the supply capacitors are FULLY DISCHARGED before inserting the new ones.**

**If the replaced fuse blows again then there is a serious fault within the unit. Refer to a service engineer or contact your dealer. NEVER INCREASE THE RATING OF THE FUSE.**

## **REMOTE CONTROL OPTION**

The MC450, MC650, MC750 are internally wired for remote control, which is easily achieved by installing the appropriate interface/drive board during the manufacturing process, without any change to the amplifiers' performance.

### **Description**

The system is designed to replicate via Windows all the controls that are available on the front panel of the amplifier (except power-on/off). This means that the volume can be turned up and down, the channels can be linked/un-linked and muted/un-muted remotely.

### **Features**

- Up to 128 amplifiers can be 'daisy-chained' together from an RS485 port via an RS232-485 adaptor.
- Amplifiers can be grouped together and controlled all at the same time within that group.
- The front panel controls on the amplifiers can be 'locked out' so that they can only be controlled from the computer. This allows the system to be set up to the client's requirements and then made secure against manual interference.
- Two levels of security are available on the management control system through the use of passwords, which permit a higher level access for the senior manager through one password and more limited access at a lower level to a number of other 'users'.
- Full Windows software is available on [www.download.at/mc2a](http://www.download.at/mc2a)

### **Wiring information**

The interconnecting cable required is a twisted pair cable for short runs and a screened, low capacitance data cable for long runs. The connectors are 9-way D-type and the wiring of this connector on the rear panel complies with the standard two wire RS485 configuration as follows:

<u>Signal</u>	<u>Pin No.</u>
A (+)	2 & 8
B (-)	3 & 7
Screen	5

- ★ All the 'A's should be joined together and all the 'B's joined together.
- ★ Pins 2 & 8 and 3 & 7 are joined inside the amplifier to ease the 'daisy chain' wiring.
- ★ The cable screen should be terminated at one place only, i.e. PIN 5 of the computer.

## **REMOTE CONTROL SET-UP INSTRUCTIONS**

To set up the remote control:

### Connecting the system to the controlling computer

- The RS485 adaptor is plugged into the back of the computer and the cable (which must be 2-core with a screen) runs from this adaptor to the 9-pin D connector on the back of the first amplifier in the sequence and then on, via 9-pin D connectors, to all other amplifiers in the system, thus creating the daisy chain link from one amplifier to the next.

**NOTE:** All amplifiers in the sequence must be connected at all times to enable the selection of any one amplifier for individual remote control.

- There needs to be a D connector at either end of the cable and connected as follows:

PIN 2 hot (positive)  
PIN 3 cold (-)  
PIN 5 screen

### Configuring the PC

1. Launch Amplifier Explorer program (can be downloaded from [www.mc2@mc2-audio.co.uk](mailto:www.mc2@mc2-audio.co.uk) )
2. Click on the 'Tools' menu and select 'Serial link setup'.

Then:  
SET OPERATING SYSTEM (e.g. WIN98)  
SET COM PORT NUMBER  
SET PORT ADDRESS (This happens automatically.)

Set up is now complete.

Each amplifier has its own individual ID (identity) number, which is shown on a small white label under the socket for the 9-way D connector located on the rear panel of each amplifier.

1. Click on the 'Tools' menu again and select 'New amplifier list'.
2. Check () 'Find all responding amplifiers' in the amplifier list box that appears.
3. Click 'START' - Amplifier Explorer will automatically search for all responding amplifiers.
4. Click on 'ICONS' in left panel to select amplifiers found.