MUSTANG COMMUNICATIONS

MAESTRO 10

INSTALLATION & MAINTENANCE HANDBOOK

Issue No.3

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List of drawings

CE Electromagnetic compatibility (EMC) directive 89/336/EEC and amendment directive 92/31/EEC

This equipment has been designed and manufactured to the highest standards. If connected and operated as set out in this manual, there should be no Electromagnetic Compatibility problems. If any aspect of operation gives rise to concern, then please contact the manufacturer for advice.

INTRODUCTION

Thank you for purchasing this amplifier. You have made a wise choice. It is a purpose designed, British made, public address amplifier which, if installed and operated correctly, will give many years of trouble-free and accurate amplification. Used in conjunction with good quality loudspeakers and microphones etc., the MAESTRO series amplifier is capable of equalling or exceeding the performance of more expensive units from our competitors' ranges.

The MAESTRO 10 amplifier is manufactured entirely by Mustang Communications Ltd., in Scarborough, England, and meets the relevant British Standards for safety and quality assurance.

The MAESTRO range is just one of many amplification ranges amongst the hundreds of items manufactured by Mustang Communications to meet the needs of the public address market. Your dealer will be pleased to advise you on the selection of the most suitable equipment from the comprehensive Mustang catalogue should you have further amplification requirements.

Applications

By design, the Maestro amplifier range is a particularly versatile concept and may be applied to a wide variety of amplification projects in locations such as schools, restaurants, theatres, churches, factories, recreation areas, etc., where high performance standards should be expected.

Maestro amplifiers are designed to meet internationally agreed standards of signal level, impedance, sensitivity etc., and therefore may be used successfully with all good quality public address loudspeakers, microphones, tape units, tuners, etc., of any origin.

Carton contents

On receipt from the manufacturer, this carton will contain:

1	amplifier
1	installation & operation handbook
3	DIN input connectors: 5 pin, 180 degree pin format
1	DIN loudspeaker plug
5	front panel blanking plugs
1	AC mains connection lead
1	guarantee registration sheet

Options

The Maestro range is carefully designed and budget priced. The amplifiers exhibit all the features required by the majority of simple public address amplification installations. Certain internal adjustments may be selected by the commissioning engineer to suit the particular installation. The manufacturers are unable to undertake the consideration of any special options or modifications to the standard Maestro format amplifier, as it is probable that an alternative Mustang amplification range may be more appropriate. Your dealer will advise.

WARRANTY

This amplifier should operate successfully for many years if installed correctly. However, should any fault occur within 24 months of installation, irrespective of usage or application, the manufacturer undertakes to replace parts, or the whole unit, at their discretion, free of all labour or parts charges. However, should investigation of such a fault indicate operation of the unit outside its specification, then the manufacturer reserves the right to levy an appropriate repair charge.

Should a fault be suspected, your dealer should be notified in the first instance. All returns should be made via your dealer, forward carriage paid, and be accompanied by details of:

a	the reported symptoms
b	brief details of the installation.
c	details of the circumstances of failure

Following the routine warranty period, Maestro amplifiers may be returned via your dealer, to the manufacturer for any necessary repairs or refurbishing. Details of the work required/reported fault must accompany the unit, and nominal charges will be levied.

SPECIFICATIONS

INPUTS

Microphone input sensitivity: Inputs 1 - 2. (These inputs may be operated in either balanced or unbalanced mode).	500uV @ 200 ohms
Microphone overload level: Inputs 1 - 2	30dB
Common mode rejection ratio @ 1KHz: Inputs 1 - 2	better than 95dB
Signal to noise ratio: Inputs 1 - 2 loaded	better than 65dB
unloaded	better than 70dB
Optional bass roll-off: Input No.1. Internal PCB switch	-3dB /octave below 200Hz
Priority input channel sequence ladder	1 over 2/3
Input No.1 normal status	unmuted
Inputs 2 - 3 muting during priority	62dB
Input 2 balanced/unbalanced line sensitivity	775mV @ 750k
Input 3 unbalanced line sensitivities	50mV @ 22k 250mV @ 100k
Connectors: Inputs 1 - 3,	5 pin 180 deg. std DIN

OUTPUT

Power output	10W RMS
Output matchings: selectable by internal PCB switch	4 ohms, 100V, & 70V
Frequency response. -3db points @ full rated power	30Hz to 15kHz
100V line regulation load/no load @ 1KHz	1.0dB
Power output connector	2 pin DIN
Treble & bass equalisation (cut & lift)	±12dB @ 100Hz and 10kHz
Signal to noise ratio: zero equalisation, gains set zero	better than 80dB

SUPPLY

Supply voltage limits	200V to 250V AC 40/60Hz
Maximum supply consumption - at full rated power output	27VA

MECHANICAL

Overall width		300mm	
Depth -	fascia to rear panel	240mm	excluding allowance for connectors
Depth -	overall including control knobs	260mm	excluding allowance for connectors
Height-	Fascia	88.5mm	(main body 85mm)
Height	Total including removable feet	95mm	
Weight		5kg	nett

In the interests of our policy of continuous improvement - any of the above specifications may be changed without notice.

FRONT PANEL CONTROLS

Various front controls and facilities are provided to enable the user to obtain maximum clarity from the amplification system. The user may adjust these at will.

Input level controls

Up to three input signals may be accepted by this unit and the corresponding input circuits of the amplifier are occasionally referred to as input “channels”. Input level controls are used to set the relative sensitivities of the three input channels of the amplifier. Whilst these controls are calibrated, the associated numbers are only arbitrary and should not be taken to indicate *absolute* output powers. For instance: an unusually low level input signal will not necessarily cause the amplifier to be operating at maximum power even with the corresponding input control fully rotated. The numbers are primarily to enable accurate re-setting, and the controls should be set to provide the required sound volume from the loudspeakers.

Treble and bass controls

Treble and bass controls are provided to enable correct tonal adjustment to suit the characteristics of the input signals. Each operates on a cut and lift principle, and when set to position “0” has no effect.

Mains power switch & indicator

A front panel rocker switch isolates the unit from the AC power input, and the adjacent LED illuminates to confirm that the internal DC power supply circuit is operational.

INPUT FACILITIES

The three input circuits of the Maestro 10 have been designed to enable the amplifier to be used in a wide variety of applications. Two of the inputs will accommodate two different types of input signal as follows:

Input 1	balanced microphone, with optional priority over input 2-3
Input 2	balanced microphone, or balanced high level line
Input 3	unbalanced medium/high level line, mono or stereo

Alternatively, the balanced inputs may be used with unbalanced signals if required. See the drawing at the rear of this manual for further details

Input connections and selection of cables

It is essential that input connections are made carefully, using appropriate screened cable, soldered to the DIN connector plugs supplied, and using the appropriate terminal numbers indicated in the “Signal Connection” drawing at the end of this manual. Unscreened “telephone” type cables are NOT suitable. Either twin conductor, or single conductor types may be used depending upon the application. For long fixed cable runs, a cable with a conventionally braided outer shield is preferable to a lap-screened type. A conductive plastic shield type is ideal for cables which will be subject to constant flexing such as those connected directly to microphones. For guidance as to the installation and routing of input cables - especially microphone cables - please refer to section 9.1. Failure to meet these requirements will result in inferior performance, and at worst, damage to the amplifier.
It is not possible in this manual to be specific about the exact types of input cable for in any particular amplification system, as many practical factors will need to be taken into account. However, as a guide, we would recommend the following:

Balanced microphone lines should be wired in twin, twisted core, screened cable with a conductor size of at least 0.22sq.mm., and preferably 0.5sq.mm. This is equally valid for dynamic or phantom-powered microphones.
Paging microphone lines will need an extra two conductors to operate the priority circuit of the amplifier. These need not be screened. For short runs, (up to 2 mtrs), paging microphones may be connected using 4-core overall screened cable, and for longer runs, (up to 10 mtrs), 4-core individually screened cable.
If it is necessary to run a cable over say 10 mtrs, then there may be some performance advantage in using a separate twin-twisted screened cable for the audio, and a separate twin unscreened cable for the priority operate cores.
Line level cables, such as those between a tape recorder and the amplifier, which may be up to a few metres in length are less critical and may be run using lap-screened, single or twin cable with conductors of 7/0.1mm or 7./0.2mm.

Input control removal

Each of the three input level controls and the treble and bass controls and associated spindles may be removed, by pulling, to prevent unauthorised tampering. Blanking plugs are provided. At any time in the future, the situation may be reversed, but care should be exercised in correctly locating the spindle splines.

Priority control: input No.1

A facility is provided whereby input No.1 takes priority over the other inputs. This is particularly important for a paging system where background music may be playing via input 3, for example. Operation of the microphone button will automatically mute the music whilst the paging announcement is made. The priority circuit is operated by making a contact between pins 4 and 5 of the DIN input plug. This would normally be done by the microphone “press-to-talk” button via the microphone lead.
The audio pre-amplification circuit for input No.1 is active (live) at all times, and therefore the “press-to-talk” button of the paging microphone that is used should normally mute the microphone audio output. The Mustang DM/1 microphone has been designed with this facility in mind.

Input No.1 bass cut option

For paging microphone applications, it is usually advantageous to introduce a small amount of attenuation of the bass frequencies - bass cut - for increased clarity. Maestro 10 amplifiers leave the factory with both microphone inputs amplifying the full frequency range. Input No.1 of the amplifier features an internally selectable bass-cut switch on the main PCB adjacent to the No. 1 input socket and circuitry. Remove the coloured jumper from its position on the two pins towards the rear panel,and reposition it on the two pins nearest the centre of the PCB.

LOUDSPEAKER OUTPUT

The output circuitry of the Maestro 10 amplifier is designed to be used with most internationally recognised loudspeakers, operating at low impedance or 100 Volt, or 70 Volt line level. The commissioning engineer is able to set the internal selector to suit the loudspeaker system in use.

On leaving the factory, the amplifier is set to match a 4 ohm loudspeaker load.

The use of 100/70 Volt line enables a greater number of loudspeakers to be connected accurately and at differing powers if required, than would be possible with low impedance units. There is no limit to the number of 100/70 Volt line loudspeakers that may be connected but the total collective consumption should not exceed the amplifier power output rating.
It is recommended that loudspeakers be wired in parallel wherever possible.

See the drawings at the end of this manual for illustrations of typical loudspeaker circuit connection and matching arrangements.

Typical loudspeaker arrangements

The following are acceptable examples of loudspeaker loading arrangements for a Maestro 10:

A 10 x 1 Watt 100 Volt line loudspeakers = 10 Watts total load to the amplifier. Amplifier set to 100 Volt output

B 20 x 0.5 Watt 100 Volt line loudspeakers = 10 Watts total load to the amplifier. Amplifier set to 100 Volt output

C 2 x 3 Watt 100 Volt line loudspeakers and 2 x 1 Watt loudspeakers = 8 Watts total load, (and 2 Watts spare for future application). Amplifier set to 100 Volt output

D 3 x 2 Watt 100 Volt line loudspeakers and 1 x 3 Watt loudspeaker = 9 Watts total load to the amplifier (and 1Watt spare). Amplifier set to 100 Volt output

E 2 x 8 ohm speakers (rated at at least 7 Watts each) connected in parallel. Amplifier set to 4 ohm output

F 1 x 4 ohm speaker (rated at at least 13 Watts) Amplifier set to 4 ohm output

Most 100 Volt line loudspeakers use a transformer which can be 'tapped' at various Wattages so that each loudspeaker may be adjusted individually to provide the sound level required.
See the drawing "Typical loudspeaker circuits and matching" at the rear of this manual for further examples of connection arrangements.
The amplifier may be operated indefinitely without any loudspeaker load connected. However if the loudspeaker load exceeds the ratings of the amplifier, then it is likely that permanent serious damage and overheating will result, with inferior reproduction quality meanwhile.

Selection of 100, or 70 Volt, or 4 ohm outputs

Maestro 10 amplifiers leave the factory with the internal selector set to match a 4 ohm loudspeaker load. It will be necessary to gain access to the main internal PCB to reset the selector switch if 100, or 70 Volt line loudspeakers are to be used:-
Remove power from the unit by disconnecting at the power point. Remove the top cover to obtain access to the PCB. The switch is located immediately behind the output socket, and takes the form of a jumper link which may be positioned on any of three sets of PCB pins. The rearmost pins are for 4 ohms. To change to 100 Volt line operation, remove the small coloured jumper link and reposition it on the two pins towards the centre of the PCB. Replace the cover etc. For 70V operation, use the central pair of pins.
See the drawing "Typical loudspeaker circuits & matching" at the rear of this manual for examples of connection arrangements.

Loudspeaker cables

Use of an appropriate cable for the connection of loudspeakers to the amplifier will ensure that a minimum amount of audio power is lost during transmission to the loudspeaker network. The loss will depend upon several factors - loudspeaker loadings, size of cable conductor, length of cable, etc.
As a general rule, for any particular loudspeaker system, the longer and the thinner the cable, the greater will be the loss. We therefore recommend, that the system is planned such that the amplifier is as near as possible to the loudspeakers, especially with low impedance loudspeakers, and that the cable used is as large as practicable.
Whilst it is not possible to be specific about the precise cable to be used in any particular system, we would suggest as follows:

a) for 100V or 70V line systems, with loudspeakers located up to 50 mtrs, twin conductors of 0.5sq.mm cross-sectional area.
b) for 50V line systems with loudspeakers located up to 50 mtrs, twin conductors of 0.75 sq.mm cross-sectional area.
c) for 4 ohm systems, twin conductors of 1.0 sq.mm cross sectional area and the loudspeakers should be no more than 25 mtrs from the amplifier.

Either solid or flexible conductor cables may be used, or a combination of both. It would be appropriate for a heavy duty cable to be used between the amplifier location and the general loudspeaker location, and for the subsequent loudspeakers of the network to be interconnected with thinner cable.

INSTALLATION

No two installations are identical. We recommend that all aspects of installation should be carried out by a competent engineer or dealer who will have the experience to enable him to recognise potential trouble spots, and the symptoms of existing ones. He will be able to advise on the selection of loudspeakers and their locations for best results. The use of a dealer will also provide the user of the system with a contact should a problem occur in the future.

Location

The installation environment for a Maestro amplifier is not critical but in general we would recommend a location that will:

avoid dampness or heavy vibration
prevent unauthorised adjustment
prevent heat build-up around the amplifier casing or heatsink
separate microphone cables from loudspeaker cables
separate microphone cables from mains cables
prevent microphone cables passing strong magnetic fields
avoid long microphone leads - over 50 Mtrs
avoid long, low impedance loudspeaker leads - over 50 Mtrs

Installation checklist

During the commissioning of the amplifier, various options are available to the engineer to enable him to meet various technical requirements and the operating requirements of the user:

Bass cut on paging microphone
Use of signal priority for input channel 1
Selection of appropriate loudspeaker output matching
Removal of front control knobs

AC MAINS POWER INPUT

The standard U.K. power requirement for the Maestro range is 230V 50Hz though correct operation is possible between 200-250V and 40-60Hz.
No special consideration of the power supply is necessary though it is good safety practice to fit a small AC fuse in the supply to the unit.
The amplifier may be switched on/off remotely, by interruption of the supply, without any adverse effects.
Mains power transformers for supply voltages other than the U.K. standard are available.

FUSES

Fuses are fitted to electronic equipment to isolate damaged circuitry thus preventing further consequent damage, and to avoid excess consumption from the AC supply. The failure of a fuse is far more likely to indicate a problem with the amplifier circuitry or the loudspeaker network rather than a 'weak' fuse.
In the unlikely event of an AC fuse failure (rear panel), it is acceptable to replace the fuse using the correct type, and try to run the amplifier again. If the fuse fails again, refer to your dealer.
In the unlikely event of an internal fuse failing, it is pointless and possibly dangerous to attempt replacement. Consult your dealer.
UNDER NO CIRCUMSTANCES use fuses of a higher value than those specified.

EARTHING & HUM LOOPS

If the amplifier is interconnected with other earthed equipment using unbalanced screened connections, it may be possible to form an earth hum loop. The symptoms would be that of a soft low-level hum from the loudspeakers, which would be uneffected by the front control settings.
Such problems may be resolved easily by the use of the balanced line input signal connections. If the interconnection is via the 'Tape' socket - which does not feature a balanced input connection - then it should be possible to resolve the hum loop by lifting the internal signal earth of either the Maestro amplifier or the other unit. The signal circuitry within the case is earthed to the chassis via an internal green wire signal earth link which is located between the PCB and an adjacent chassis earth lug, near to input socket No.1.

As supplied, the amplifier chassis and casing is electrically earthed via the AC supply lead and connector.

INTERNAL WIRING USING YELLOW/GREEN STRIPED CABLE IS FOR SAFETY EARTHING AND SHOULD NEVER BE DISTURBED.

Where the unit is to be powered from a two-wire AC supply, the rear screw earth terminal must be permanently connected to a suitable earth point.
This terminal is indicated by the symbol -

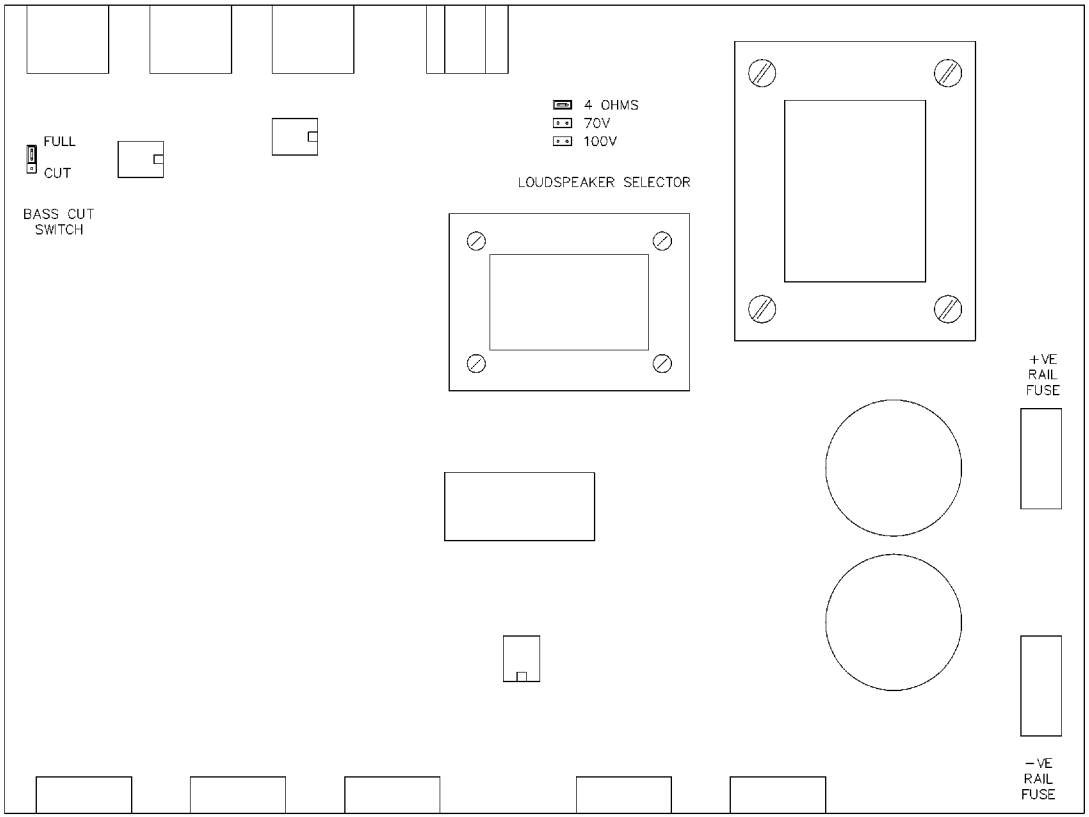
CASE REMOVAL

To gain access to the inside of the amplifier for any adjustments which may be required, firstly remove the AC mains supply to the unit, then remove the 7 securing screws holding the top cover. The cover is earthed by a push-on tab connector which must always be in place when the AC supply is connected.

FAULT CHECKLIST

We would always recommend calling your dealer if any problem is experienced though an initial check through the following list may enable you to provide him with valuable time saving information.

	FAULT SYMPTOM	**CHECK POINTS**
1	Sound off, power lamp off	Mains supply Mains fuse Mains switch
2	Sound off, power lamp on	Input level controls rotated Input connections secure Loudspeaker circuitry connected Priority input channel in use Internal DC fuse fail: Consult dealer
3	Sound faint	Input level controls rotated Inappropriate input signal Incorrect input connection Loudspeaker line fault
4	Sound faint & distorted	Inappropriate input signal Input level control rotated Incorrect loudspeaker connection Incorrect output matching selection Loudspeaker line fault Distorted input signal
5	Sound loud & distorted even with input control set low	Inappropriately high input signal for the input in use Distorted input signal
6	Sound distorted on bass peaks only	Poor quality loudspeakers Bass control set too high
7	Distortion and insufficient volume	System requires more powerful amplifier unit 100 Volt loudspeakers are set too low Incorrect internal loudspeaker matching selection Excess loudspeaker load: Consult dealer
8	Extreme case temperature	Excess loudspeaker load: Consult dealer System working very hard
9	Extreme case heat, soft hum, even without input signal	System oscillation due to proximity of input leads to loudspeaker leads: Consult dealer Input lead security Internal circuit fault: Consult dealer
10	Persistent hum, input controls set to normal	Incorrect input cables used Incorrect input connections Nearby electrical appliance Earthing hum loop: Consult dealer
11	Persistent hum, input controls set to off	Earthing hum loop: Consult dealer Nearby electrical appliance
12	Persistent faint buzz	Nearby electrical appliance Interference from lighting dimmer Interference to sensitive input cables
13	Intermittent loud crack	Faulty AC supply connection Input connector security Faulty input signal
14	Howling/ringing	Acoustic feedback due to proximity or angling of microphones relative to loudspeakers



REV	DESCRIPTION	APPD	DATE

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Phone 01723-582555 Fax 01723-581673
data@mustang.co.uk www.mustang.co.uk

CUSTOMER REF

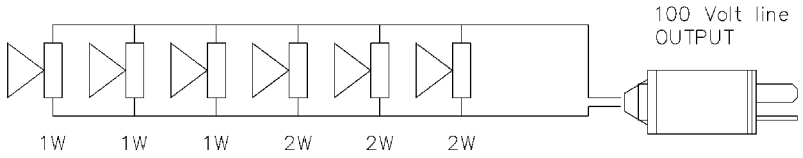
DRAWING TITLE

MAESTRO 10
LAYOUT OF 6500 PCB

DRAWN	TRACED	CHECKED	APPRVD	DATE
MRT				04-03-88

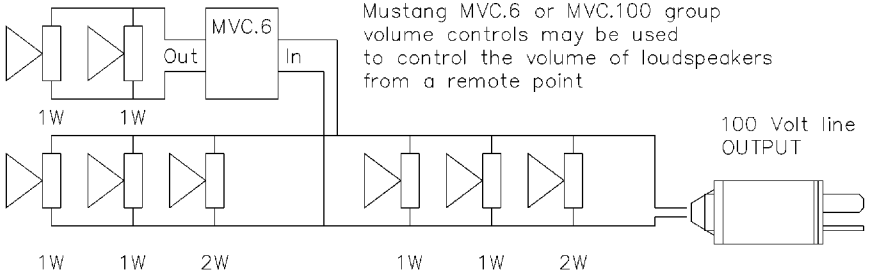
DRAWING No. MAE-7

TYPICAL SINGLE CIRCUIT 100V LINE SYSTEM SUITABLE FOR A MAESTRO 10



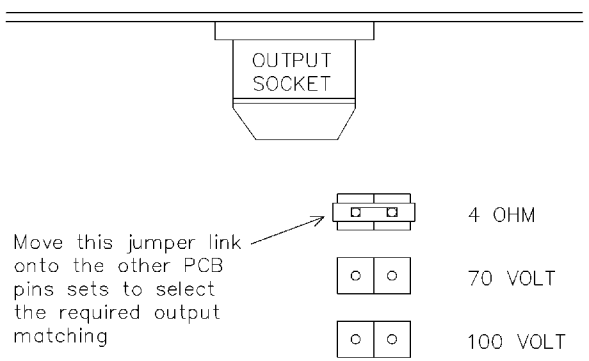
Any quantity of 100V line loudspeakers may be used but total load must not exceed amplifier rating

TYPICAL 100V LINE SYSTEM FEATURING ONE MAIN CIRCUIT AND ONE SUB-CIRCUIT SUITABLE FOR A MAESTRO 10



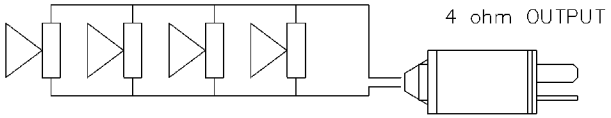
Any quantity of 100V line loudspeakers may be used but total load must not exceed amplifier rating

INTERNAL LOCATION OF LOUDSPEAKER MATCHING SELECTOR SWITCH: PLAN OF REAR OF PCB



LOW IMPEDANCE LOUDSPEAKER CIRCUITS

Up to four 16 ohm loudspeakers or up to two 8 ohm loudspeakers wired in parallel, or one 4 ohm loudspeaker



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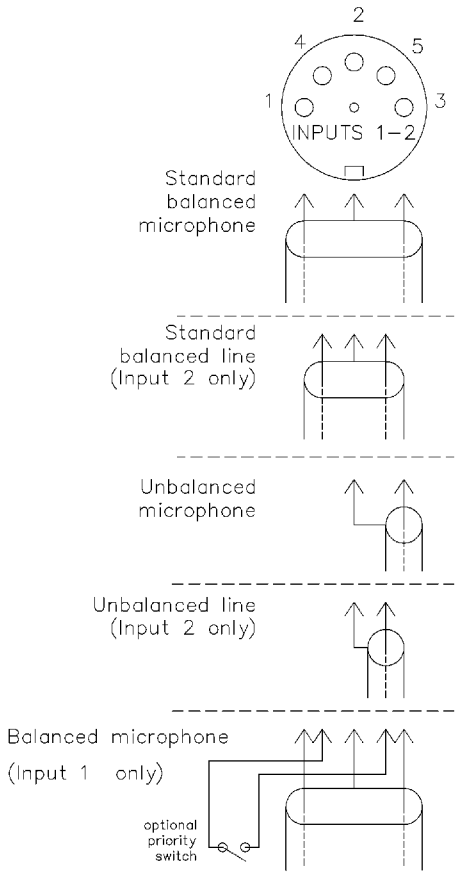
CUSTOMER REF

DRAWING TITLE
MAESTRO 10: TYPICAL LOUDSPEAKER CIRCUITS AND MATCHING

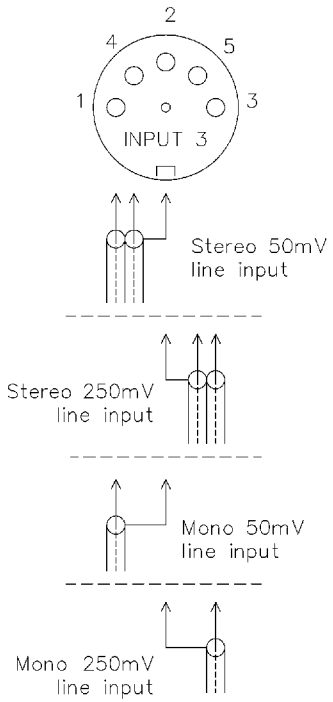
DRAWN	TRACED	CHECKED	APPRVD	DATE
MRT				09-08-90

DRAWING No. MAE-M170

MICROPHONE & LINE



LINE



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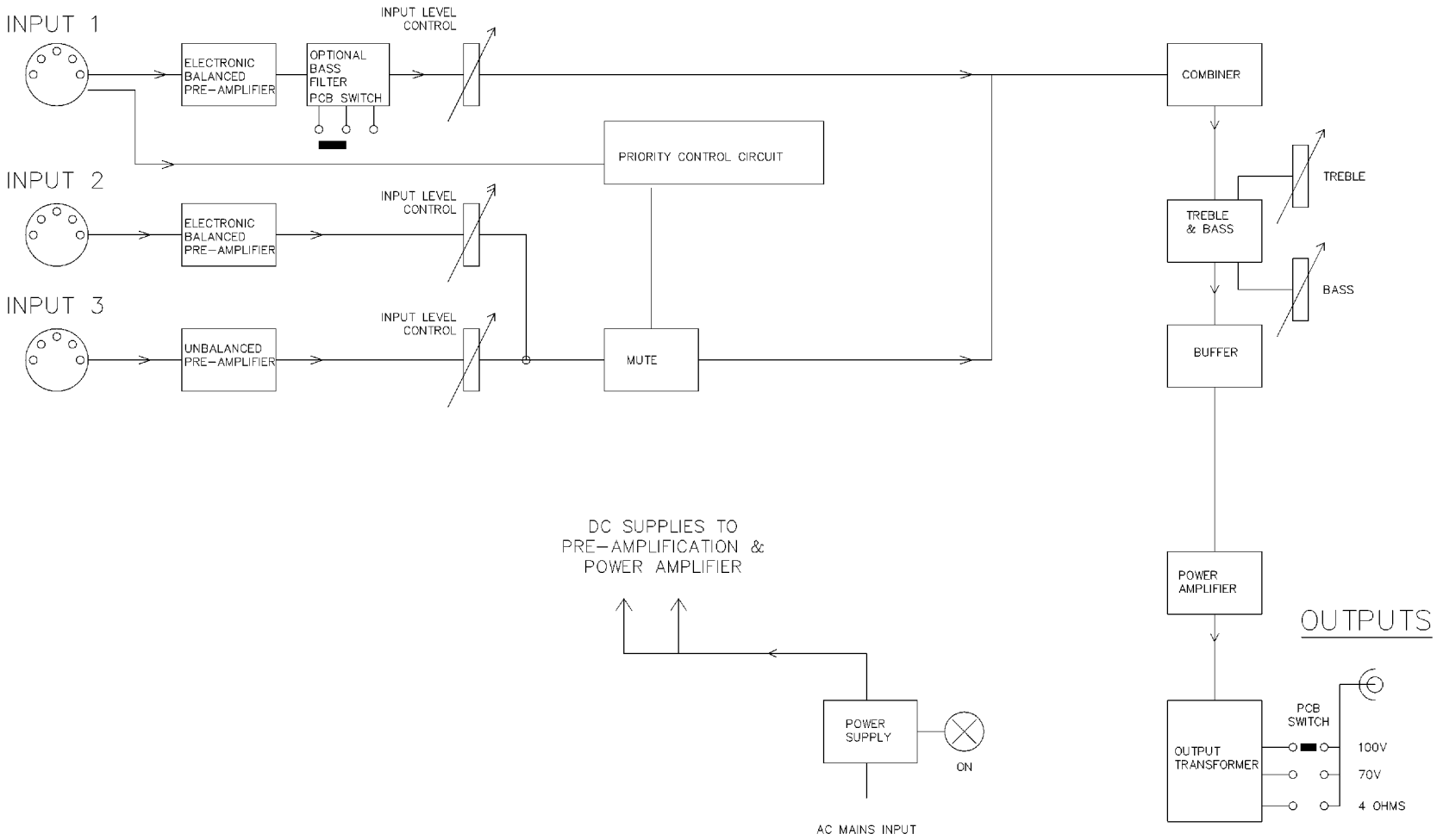
CUSTOMER REF

DRAWING TITLE
MAESTRO 10
SIGNAL CONNECTIONS

DRAWN	TRACED	CHECKED	APPRVD	DATE
MRT				09-08-90

DRAWING No. MAE-M180



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CUSTOMER REF

DRAWING TITLE

MAESTRO 10
BLOCK SCHEMATIC

DRAWN	TRACED	CHECKED	APPRVD	DATE
MRT				01-08-90

DRAWING No. MAE-M190