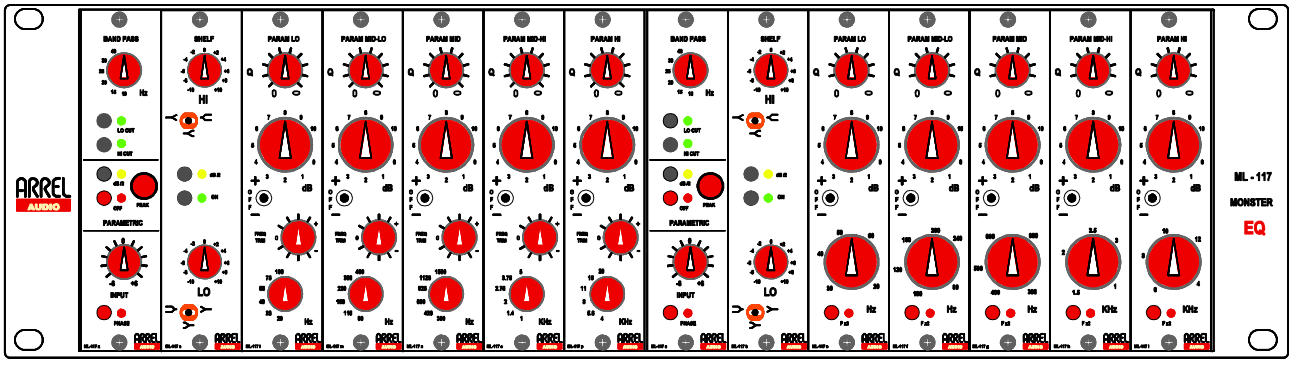
ML–117
Mastering Monster Line
Five Band Modular
Parametric Equalizer
+ Shelving



User Manual

Issue 0.1

SAFETY INSTRUCTIONS

⚠ *WARNING*

Always follow the precautions listed below to avoid any possibility of serious injury or even death from electrical shock, short-circuiting, damages, fire or other hazards. These precautions include, but are not limited to, the following:

- Do not expose the instrument to liquids and rain. Do not use it near water or in damp or wet conditions, or place containers on it containing liquids. If any liquid seeps turn off the power and unplug the power cord from the AC outlet.
- Do not put burning items, such as candles, on the unit. A burning item may fall over and cause a fire.
- This instrument contains no user-serviceable parts. Do not open the instrument or attempt to disassemble or modify the internal circuit.
- Never insert or remove an electric plug with wet hands.
- Check the electric plug periodically and remove any dirt or dust which may have accumulated on it.
- Do not place the power cord near heat sources such as heaters or radiators, and do not excessively bend or otherwise damage the cord, place heavy objects on it, or place it in a position where anyone could walk on, trip over, or roll anything over it.

⚠ *CAUTION*

Always follow the precautions listed below to avoid any possibility of serious injury or even death from electrical shock, short-circuiting, damages, fire or other hazards. These precautions include, but are not limited to, the following:

- Do not connect the instrument to an electrical outlet using a multiple-connector. Doing so can result in lower sound quality, or possibly cause overheating in the outlet itself.
- When removing the electric plug from the instrument or an outlet, hold the plug itself and not the cord. Pulling by the cord can damage it.
- Remove the electric plug from the outlet when the instrument is not to be used for extended periods of time, or during electrical storms.
- Do not place the instrument in an unstable position where it might accidentally fall over.
- Before moving the instrument, remove all connected cables.
- When setting up the product, make sure that the AC outlet you are using is easily accessible. If some trouble or malfunction occurs, immediately turn off the power switch and disconnect the plug from the outlet. Even when the power switch is turned off, electricity is still flowing to the product at the minimum level.
- When you are not using the product for a long time, make sure to unplug the power cord from the wall AC outlet.
- Use only the stand/rack specified for the instrument. When attaching the stand or rack, use the provided screws only. Failure to do so could cause damage to the internal components or result in the instrument falling over.

Information for Users on Collection and Disposal of Old Equipment

This special symbol on the products, packaging, and/or accompanying documents means that used electrical and electronic products should not be mixed with general household waste.
For proper treatment, recovery and recycling of old products, please take them to applicable collection points, in accordance with your national legislation and the Directives 2002/96/EC.
By disposing of these products correctly, you will help to save valuable resources and prevent any potential negative effects on human health and the environment which could otherwise arise from inappropriate waste handling.
For more information about collection and recycling of old products, please contact your local municipality, your waste disposal service or the point of sale where you purchased the items.
[For business users in the European Union]
If you wish to discard electrical and electronic equipment, please contact your dealer or supplier for further information.
[Information on Disposal in other Countries outside the European Union]
This symbol is only valid in the European Union. If you wish to discard these items, please contact your local authorities or dealer and ask for the correct method of disposal.

ARREL Audio Contacts

ARREL Audio
Via A. Mondadori, 7
00128 Rome – Italy
Tel +39 06 506 2017
Fax: +39 06 5062017
Info: info@arrel-audio.com
Web: www.arrel-audio.com
Support: http://www.arrel-audio.com/support

TABLE OF CONTENTS

INTRODUCTION

The **ARREL Audio Mastering Monster Modular EQ ML-117** is an advanced 2-channel modular equalizer built to meet the versatility demands of professional recording and mastering engineers. Special analog design techniques has been used to obtain a precise control of the sound structure down to the minimum details.
Each channel of the **ML-117** is equipped with 7 modules. Three families of modules are available: stepped control, continuous control modules and custom modules.
The first module on the left of each channel must be an input module, the other modules can be chosen between continuous, stepped or custom modules (see the compatibility list in Tab. 4).
The **ML-117** features HI and LO cut filters and a 5 band parametric equalizer section + high and low shelving filters. This advanced set of tools for the manipulation of the frequency spectrum allow for unique filtering designs and for tuning of the structure of the sound down to the smallest detail. The **ML-117** is based on Livio Argentini's patented single-stage parallel parametric filters. This innovative phase coherent EQ design offers the lowest distortion/noise specifications, not available on similar units on the market.
The equalizer architecture provides a ±6 dB rotary knob with center detect controlling the input level, a 50 KHz HI-cut filter and a subsonic filter with 6 selectable cut-off frequencies.
The continuous parametric control module is a traditional parametric equalizers with Q, frequency and emphasis/de-emphasis rotary knobs.
This unit has been designed for mastering applications where very precise settings are required. To this purpose, both the parametric and the shelving sections are equipped by a special function button (±5 dB button) that halves the emphasis/de-emphasis range for super fine-tunings. When this button is pressed, the pot's entire 270° rotation is spread on a ±5 dB range (rather than the default ±10 dB range) permitting and easy manual recall without the use of stepped controls.
The filtering section offers low and high shelving filters with 3 different shelving slopes selected by a switch. The emphasis/de-emphasis for the shelving section is controlled in the ±10 dB range by rotary knobs. A special button labeled "±5 dB" halves the emphasis/de-emphasis range for super fine-tunings.
The Monster EQ can be equipped with 5 or 6 (in the case the shelving function is not used) single-stage fully parametric bands.
The F x 2 switches are used to multiply by 2 the frequency bands.
The stepped control modules (ML-117 -S) are characterized by rotary switches.
The ML-117-BS has 11 positions for emphasis/de-emphasis control and a three positions toggle switch for the shelving slope. The ML-117 BS has 11 positions for the emphasis/de-emphasis control and 6 positions for the selection of the frequency band. Moreover a fine trim continuous knob is used for super fine tuning of the frequency.
In the ML-117 short lever toggle switches have been used to limit accidental operations.

To obtain an outstanding audio quality, no servo amplifiers are used in the **ML-117** so

IT IS NOT POSSIBLE TO UNBALANCE THE LINE OUT OF THE ML-117.

If you need an unbalanced connection for the line out there follow the instructions in APPENDIX A.
Even though the ML-166 has been designed for professional mastering applications, it can be used in any high profile recording, broadcast or live applications.

HOUSING AND RACK MOUNTING

The ML-117 has been designed to be compliant with a 3U rack. No specific air Conditioning is required for the racks, provided that there is a free flow of air through the rack from front to back and the temperature is maintained in the operating range. Consequently the racks may be stacked.

ML-117 Modules Table

At present the modules available are listed in Tab. 1

MODULE NAME	MODULE FUNCTION
ML-117A	Input module
ML-117 BC	Shelving module continuous controls
ML-117 DC	Parametric module continuous controls
ML-117 E	Band pass continuous controls
ML-117 BS	Shelving module stepped controls
ML-117 DS	Parametric module stepped controls

Tab. 1 ML-117 Series modules

Two different types are available, the continuous control version and the stepped control version. The input module and the band pass module are available only in the continuous version. On customer request custom modules can be produced with different filter frequency characteristics.

ML-117 Configurations

The typical standard configuration of the ML-117 is the same of the ML-116: two channels (A and B) each equipped with an input module and full parametric equalizers in continuous (Fig. 1 and Tab. 2) or stepped (Fig. 2 and Tab. 3) version.

SLOT NUMBER	MODULE NAME	FUNCTION
1	ML-117 A	Input module
2	ML-117 BC	Shelving module continuous controls
3	ML-117 DC	Parametric module continuous controls
4	ML-117 DC	Parametric module continuous controls
5	ML-117 DC	Parametric module continuous controls
6	ML-117 DC	Parametric module continuous controls
7	ML-117 DC	Parametric module continuous controls

Tab. 2 ML-117 Equalizer continuous mode controls configuration

SLOT NUMBER	MODULE NAME	FUNCTION
1	ML-117 A	Input module
2	ML-117 BS	Shelving module stepped controls
3	ML-117 DS	Parametric module stepped controls
4	ML-117 DS	Parametric module stepped controls
5	ML-117 DS	Parametric module stepped controls
6	ML-117 DS	Parametric module stepped controls
7	ML-117 DS	Parametric module stepped controls

Tab. 3 ML-117 Equalizer stepped mode controls configuration

Custom configurations can be implemented. In any case the first slot must be always equipped with an input module ML-117 A.

In custom configuration some rules must be observed as illustrated in Tab. 4.

SLOT NUMBER	FUNCTION
1	Only Input module
2	Shelving or parametric modules
3	
4	
5	Only parametric modules
6	
7	

Tab. 4 Slot Position-modules compatibility

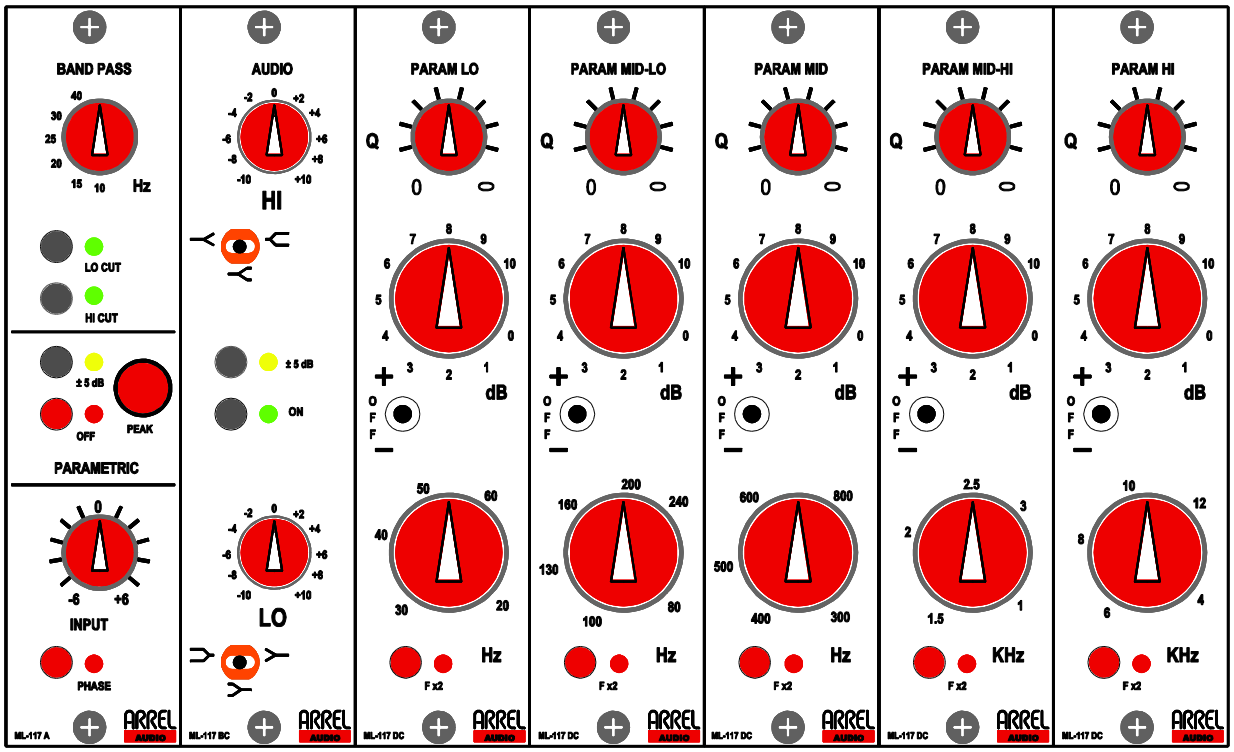


Fig. 1 Single channel front panel continuous control configuration

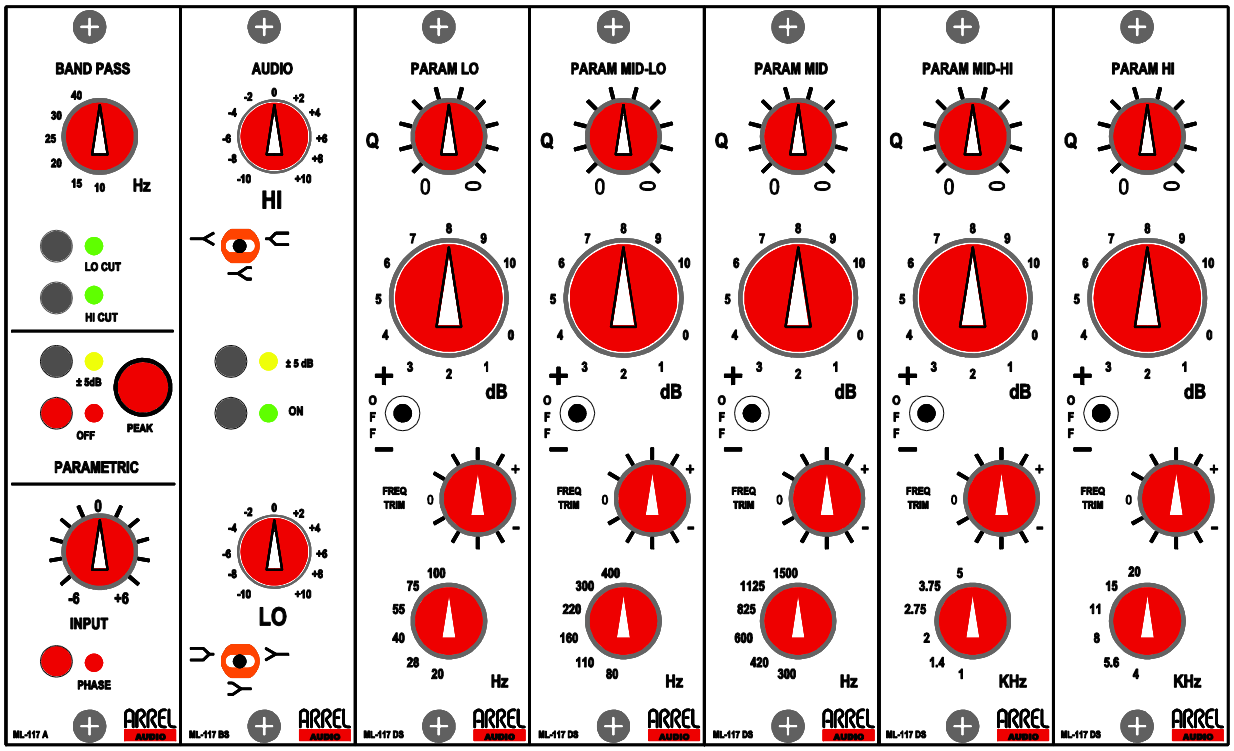


Fig. 2 Single channel front panel stepped control configuration

ML-117 A: Input Module

This module must be provided as the first module of each section of the ML-117 chassis.

GAIN CONTROL

The input section gain control knob is located in the bottom of the module. A continuous level control (center detect) in the ± 6 dB range is obtained by rotating the corresponding knob (Fig. 1).

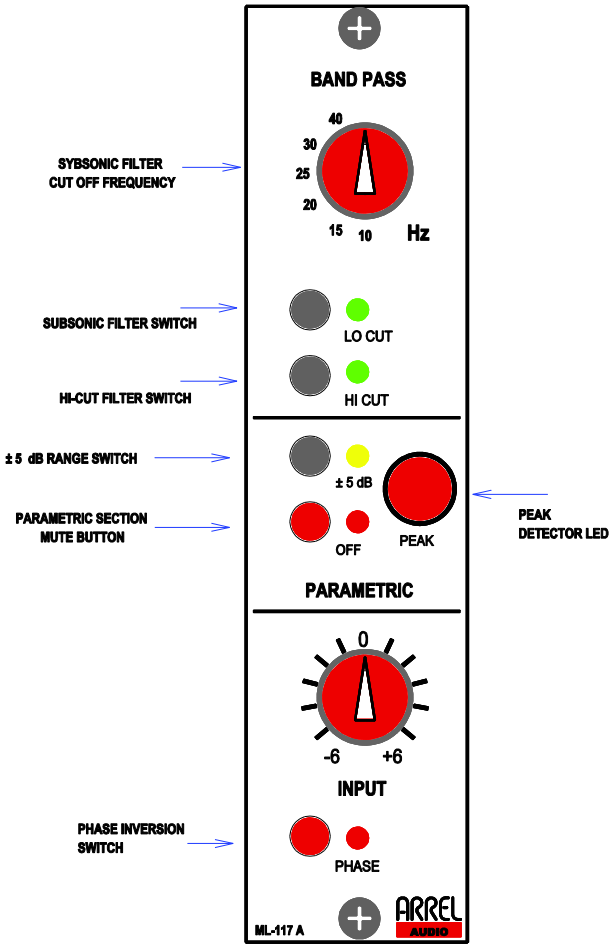


Fig. 1 ML-117 A Front panel

PHASE SWITCH

The input signal phase can be inverted by pressing the PHASE button (red LED indicator). Push the button to invert the phase (red LED on). Push again to switch off the phase inversion (red LED off) (Fig. 1).

PEAK INDICATOR

A peak level detector (red LED on) circuit indicates when the output level is -6 dB with respect to the saturation level (Fig. 1). The red LED on do not means saturation but must be interpreted as a warning indicating you are reaching the saturation level.

OFF SWITCH

The parametric section can be excluded by pressing the OFF button (red LED indicator). Push the button to exclude the parametric section (red LED on). Push again to switch on the parametric section of the equalizer (red LED off) (Fig. 1).

± 5 dB SWITCH

This button changes the range of the emphasis/de-emphasis continuous or stepped controls in the corresponding parametric modules (ML-117 DC, ML-117 DS). The range can be changed to ± 5 dB by pressing the ± 5 dB button (yellow LED indicator). Push the button to change to the ± 5 dB range (yellow LED on). Push again to switch off the ± 5 dB function obtaining ± 10 dB range (yellow LED off) (Fig. 1).

LO-CUT SUBSONIC FILTER SWITCH

The input signal can be filtered by a variable cut off frequency subsonic filter by pressing the LO CUT button (green LED indicator). Push the button to activate the subsonic filter (green LED on). Push again to deselect the subsonic filter (green LED off) (Fig. 1).

CUT OFF FREQUENCY ROTARY SWITCH

The cut off frequency of the subsonic filter can be changed by the rotary switch. Six possible frequencies are available (10, 15, 20, 25, 30, 40 Hz) (Fig. 1).

HI-CUT SWITCH

The input signal can be filtered by a low pass filter by pressing the HI CUT button (green LED indicator). Push the button to activate the HI pass filter (green LED on). Push again to deselect the HI CUT filter (green LED off) (Fig. 1).

ML-117 BC: Shelving Module Continuous Controls

The shelving equalizers are available in two different versions: continuous control version (ML-117 BC) and stepped version (ML-117 BS). In the two sections HI and LOW of the ML-117 BC shelving filters are provided. Each control described in this section is applicable to the two shelving filters (HI and LOW) (Fig. 2).

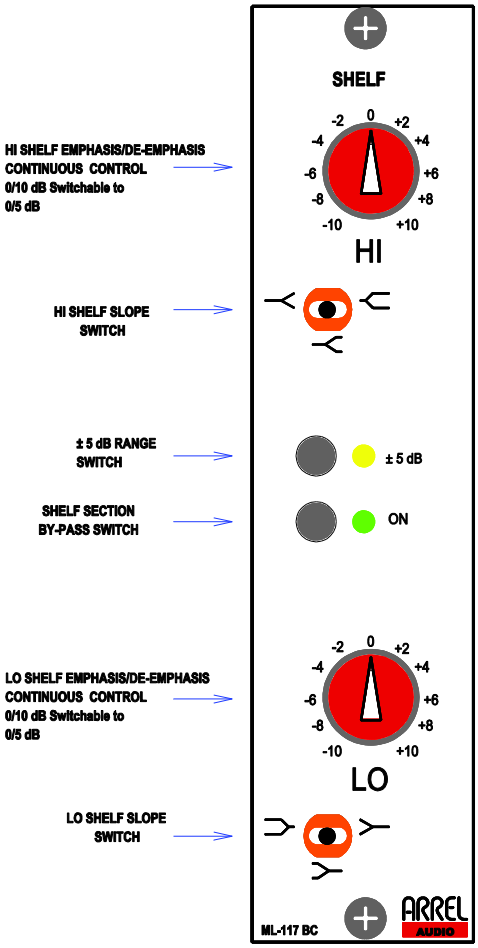


Fig. 2 ML-117 BC module

EMPHASIS/DE-EMPHASIS CONTROL KNOB (HI AND LOW)

The emphasis/de-emphasis control in the ± 10 dB range is obtained by rotating the corresponding knob (Fig. 2) for the ML-117 BC. The range becomes ± 5 dB if the ± 5 dB function is on.

SHELF SLOPE SWITCH (HI AND LOW)

The slopes of the HI and LO shelving filters can be changed by using the toggle switch (Fig. 2). Three slopes are available.

ON SWITCH

The shelving section can be activated by pressing the ON button (green LED indicator). Push the button to activate the shelving section (green LED on). Push again to by-pass the shelving section of the equalizer (green LED off) (Fig. 2).

± 5 dB SWITCH

The range of the shelving section emphasis/de-emphasis knobs can be changed to the ± 5 dB range by pressing the ± 5 dB button (yellow LED indicator). Push the button to change to the ± 5 dB range (yellow LED on). Push again to switch off the ± 5 dB function (yellow LED off) (Fig. 2).

ML-117 BS: Shelving Module Stepped Controls

In the two sections HI and LOW of the ML-117 BS shelving filters are provided. Each control described in this section is applicable to the two shelving filters (HI and LOW) (Fig. 3).

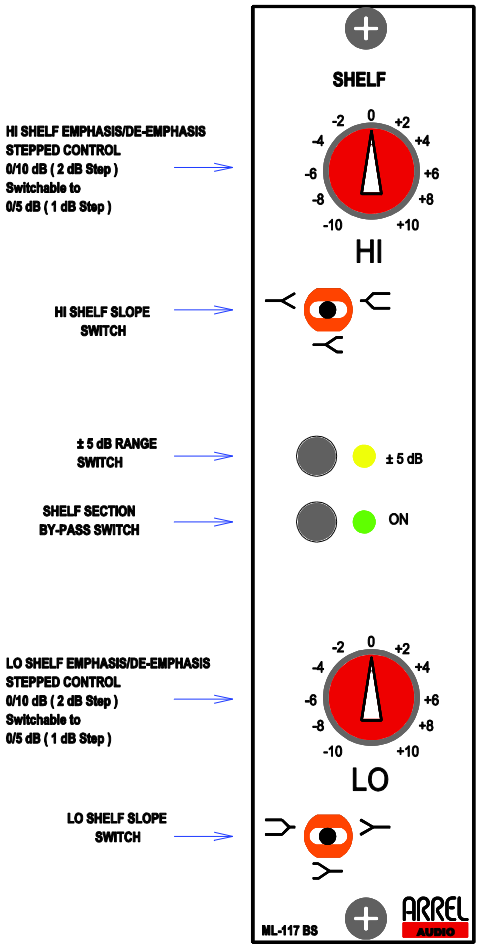


Fig. 3 ML-117 BS module

EMPHASIS/DE-EMPHASIS CONTROL KNOB (HI AND LOW)

The emphasis/de-emphasis control in the ± 10 dB range is obtained by by selecting the corresponding step for the ML-117 BS (each step correspond to 2 dB). The range becomes ± 5 dB if the ± 5 dB function is on. In this case each step of the rotary switch corresponds to 1 dB (Fig. 3).

SHELF SLOPE SWITCH (HI AND LOW)

The slopes of the HI and LO shelving filters can be changed by using the toggle switch (Fig. 3). Three slopes are available.

EQ SHELVING SECTION: ON SWITCH

The shelving section can be activated by pressing the ON button (green LED indicator). Push the button to activate the shelving section (green LED on). Push again to by-pass the shelving section of the equalizer (green LED off) (Fig. 3).

± 5 dB SWITCH

The range of the shelving section emphasis/de-emphasis knobs can be changed to the ± 5 dB range by pressing the ± 5 dB button (yellow LED indicator). Push the button to change to the ± 5 dB range (yellow LED on). Push again to switch off the ± 5 dB function (yellow LED off) (Fig. 2).

ML-117 DC: Parametric Module Continuous Controls

Each control described in this section is applicable to the five standard frequency bands (LO, MID LO, MID, MID HI, HI) and to custom modules.

Q CONTROL KNOB

The Q value is changed by rotating the corresponding knob (Fig. 4).

EMPHASIS/DE-EMPHASIS CONTROL KNOB

The emphasis/de-emphasis control in the ±10 dB range is obtained by rotating the corresponding knob (Fig. 4). The range becomes ± 5 dB if the ± 5 dB function is on (ML-117 DC). This knob works as frequency boost if the corresponding (-)CUT-OFF-BOOST(+) switch is in the BOOST position (switch lever green illuminated). This knob works as frequency cut if the corresponding (-)CUT-OFF-BOOST(+) switch is in the CUT position (switch lever red illuminated).

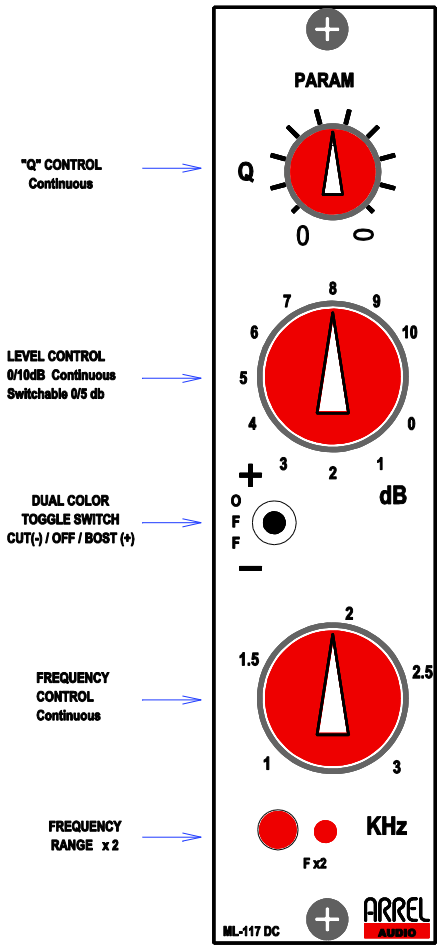


Fig. 4 ML-117 DC

EMPHASIS/DE-EMPHASIS CONTROL SWITCH

This is a lever illuminated toggle switch. Frequency boost is selected if the corresponding (-)CUT-OFF-BOOST(+) switch is in the (-) position (switch lever green illuminated). Frequency cut is obtained if the corresponding (-)CUT-OFF-BOOST(+) switch is in the + position (switch lever red illuminated). If the switch is not illuminated, the off function is selected so the emphasis/de-emphasis knob is not active. This function is important in order to avoid accidental operations Fig.

FREQUENCY CONTROL KNOB

Turn the frequency knob in order to select the required frequency value (Fig. 4 and Tab. 5).

F X 2 SWITCH

This button selects the F x 2 function. Push the button to activate the F x 2 function (red LED on). Push again to deselect the F x 2 function (red LED off) (Fig. 4).
This function permits to obtain ten different frequency bands.

FREQUENCY BAND	ML-117 Dc FREQUENCY BANDS F X 2 OFF	ML-117 Dc FREQUENCY BANDS F X 2 ON
LO	20-60 Hz	40-120 Hz
MID LO	80-240 Hz	160-480 Hz
MID	300-800 Hz	600-1600 Hz
MID HI	1000-3000 Hz	2000-6000 Hz
HI	4000-12000 Hz	8000-24000 Hz
CUSTOM	XX-XX Hz	XX-XX Hz

Tab. 5 Frequency bands for the ML-117 DC

ML-117-DS: Parametric Module Stepped Controls

Each control described in this section is applicable to the five standard frequency bands (LO, MID LO, MID, MID HI, HI) and to custom modules.

Q CONTROL KNOB

The Q value is changed by selecting the step (12 steps available) in the stepped version (Fig. 5).

EMPHASIS/DE-EMPHASIS CONTROL KNOB

The emphasis/de-emphasis control in the ± 10 dB range is obtained by rotating the corresponding knob (Fig. 5). The range becomes ± 5 dB if the ± 5 dB function is on. For the ML-117 DS we have 1 dB step (± 5 dB function off) or 0.5 dB step (± 5 dB function on) (Fig. 5).
This knob works as frequency boost if the corresponding (-)CUT- OFF-BOOST(+) switch is in the BOOST position (switch lever green illuminated). This knob works as frequency cut if the corresponding (-)CUT-OFF-BOOST(+) switch is in the CUT position (switch lever red illuminated).

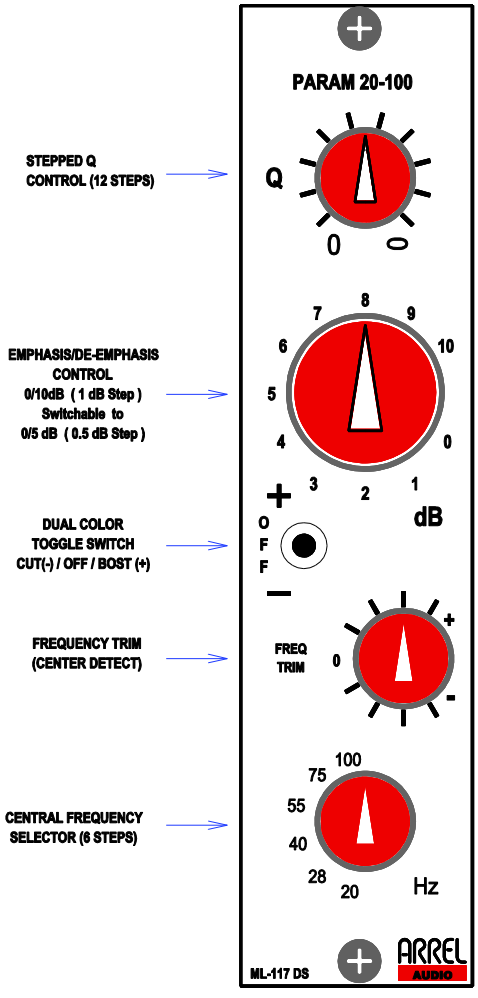


Fig. 5 ML-117 DS

EMPHASIS/DE-EMPHASIS CONTROL SWITCH

This is a lever illuminated toggle switch. Frequency boost is selected if the corresponding (-)CUT-OFF-BOOST(+) switch is in the (-) position (switch lever green illuminated). Frequency cut is obtained if the corresponding (-)CUT-OFF-BOOST(+) switch is in the + position (switch lever red illuminated). If the switch is not illuminated, the off function is selected so the emphasis/de-emphasis knob is not active. This function is important in order to avoid accidental operations Fig. 5.

FREQUENCY CONTROL KNOB

Select the desired step to change the frequency band (6 steps are available: 20, 28, 40, 55, 75, 100 Hz) (Fig. 5 and Tab. 6).

FREQUENCY TRIM CONTROL KNOB

Rotate the frequency trim knob to change the frequency band. A variation of ± 10 % is available on 270 degrees of knob rotation.

FREQUENCY BAND	ML-117 DS FREQUENCY BANDS F X 2 OFF
LO	20-28-40-55-75-100 Hz
MID LO	80-110-160-220-300-400 Hz
MID	300-420-600-825-1125-1500 Hz
MID HI	1000-1400-2000-2750-3750-5000 Hz
HI	4000-5600-8000-11000-15000-20000 Hz
CUSTOM	XX-XX-XX-XX-XX-XX Hz

Tab. 6 Frequency bands for the ML-117 DS

ML-117 D: Band Pass Module

The ML-117 D is a flexible filtering module that cha be used as HI pass (LO CUT on, HI CUT off), LO pass (LO CUT off, HI CUT on) or BAND PASS (LO CUT on, HI CUT on) filter.

CUT-OFF FREQUENCY CONTROL KNOB

Turn the frequency knob in order to select the required cut off frequency (Fig. 6 and Tab. 7) for the LO CUT and HI CUT sections. Two ranges are available depending on the frequency range switch.

FREQUENCY RANGE SWITCH

This switch selects two different frequency ranges for the LO CUT and HI CUT sections (Fig. 6 Tab. 7).

LO-CUT SWITCH

The input signal can be filtered by a HI pass filter by pressing the LO CUT button (green LED indicator). Push the button to activate the HI pass filter (green LED on). Push again to deselect the HI pass filter (green LED off) (Fig. 6).

HI-CUT SWITCH

The input signal can be filtered by a LO pass filter by pressing the HI CUT button (green LED indicator). Push the button to activate the HI pass filter (green LED on). Push again to deselect the HI pass filter (green LED off) (Fig. 6).

LO CUT FILTER FREQUENCY RANGE	
FREQUENCY SELECTOR SWITCH=1/10	1-10 KHz
FREQUENCY SELECTOR SWITCH=8/10	8-20 KHz
HI CUT FILTER FREQUENCY RANGE	
FREQUENCY SELECTOR SWITCH=1/10	20-60 Hz
FREQUENCY SELECTOR SWITCH=8/10	50-150 Hz

Tab. 7 Frequency bands ML-117 E band pass filter module

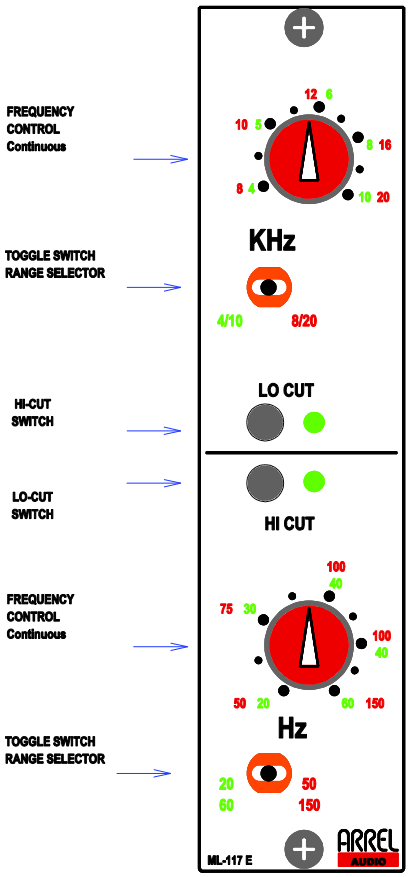

FREQUENCY
CONTROL
Continuous
TOGGLE SWITCH
RANGE SELECTOR
HI-CUT
SWITCH
LO-CUT
SWITCH
FREQUENCY
CONTROL
Continuous
TOGGLE SWITCH
RANGE SELECTOR
12 6
10 5
8 16
8 4
10 20
KHz
4/10
8/20
LO CUT
HI CUT
100
40
75 30
100
40
50 20
60 150
Hz
20
50
60
150
ML-117 E
ARREL
AUDIO

Fig. 6 ML-117 E

ML-117 Back Panel Controls and Operations

POWER SUPPLY SWITCH

The ML-117 power-on switch is located in the left part of the back panel. The power on state is indicated by the illumination of the switch (Fig. 4).

BAL/UMBAL SWITCH

On the back panel of the ML116 each output is equipped with a Bal/Unbal switch (Fig. 4).

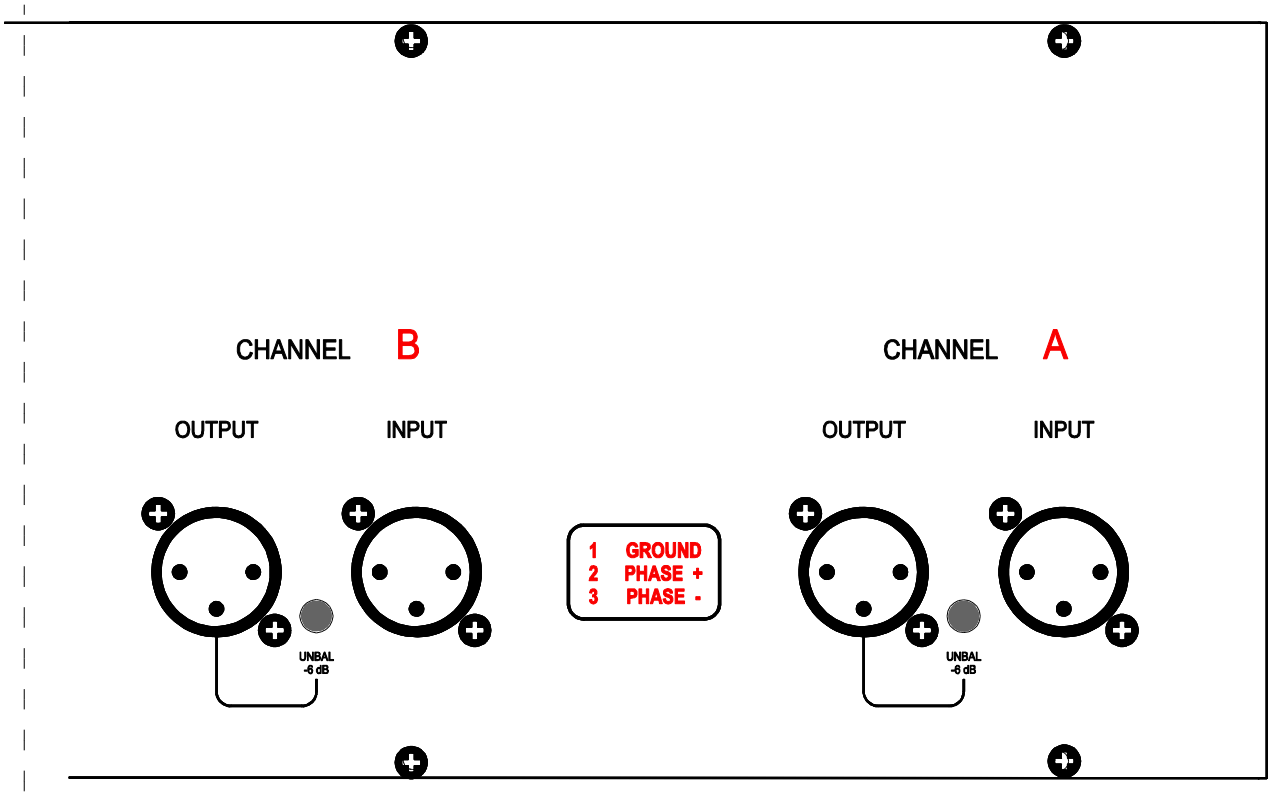


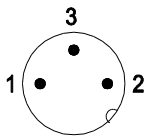
Fig. 4 Back panel

APPENDIX A: External connections

ARREL AUDIO

WIRING ML - 117

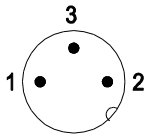
LINE INPUT XLR On the back



1 = Ground
2 = PHASE +
3 = PHASE -

Balanced line - It is possible connect unbalanced lines

MAIN OUTPUT XLR On the back



1 = Ground
2 = PHASE +
3 = PHASE -

Balanced line only - Switch for unbalanced lines

FIG. 5 ML-117 external connections

APPENDIX B: Half Front Panel

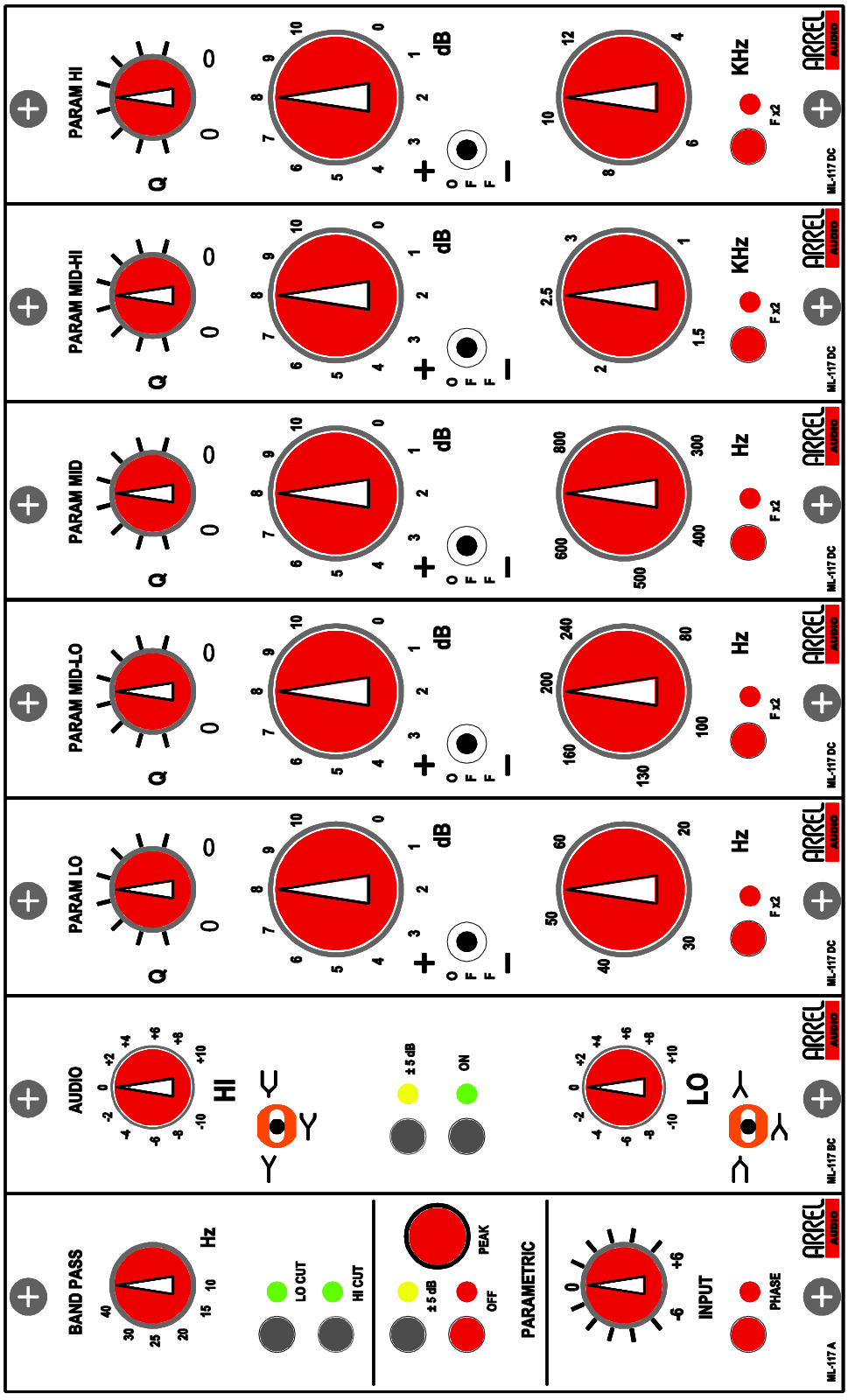


FIG. 6 ML-117 half front panel continuous control module

APPENDIX C: Half Front Panel Stepped Control Module

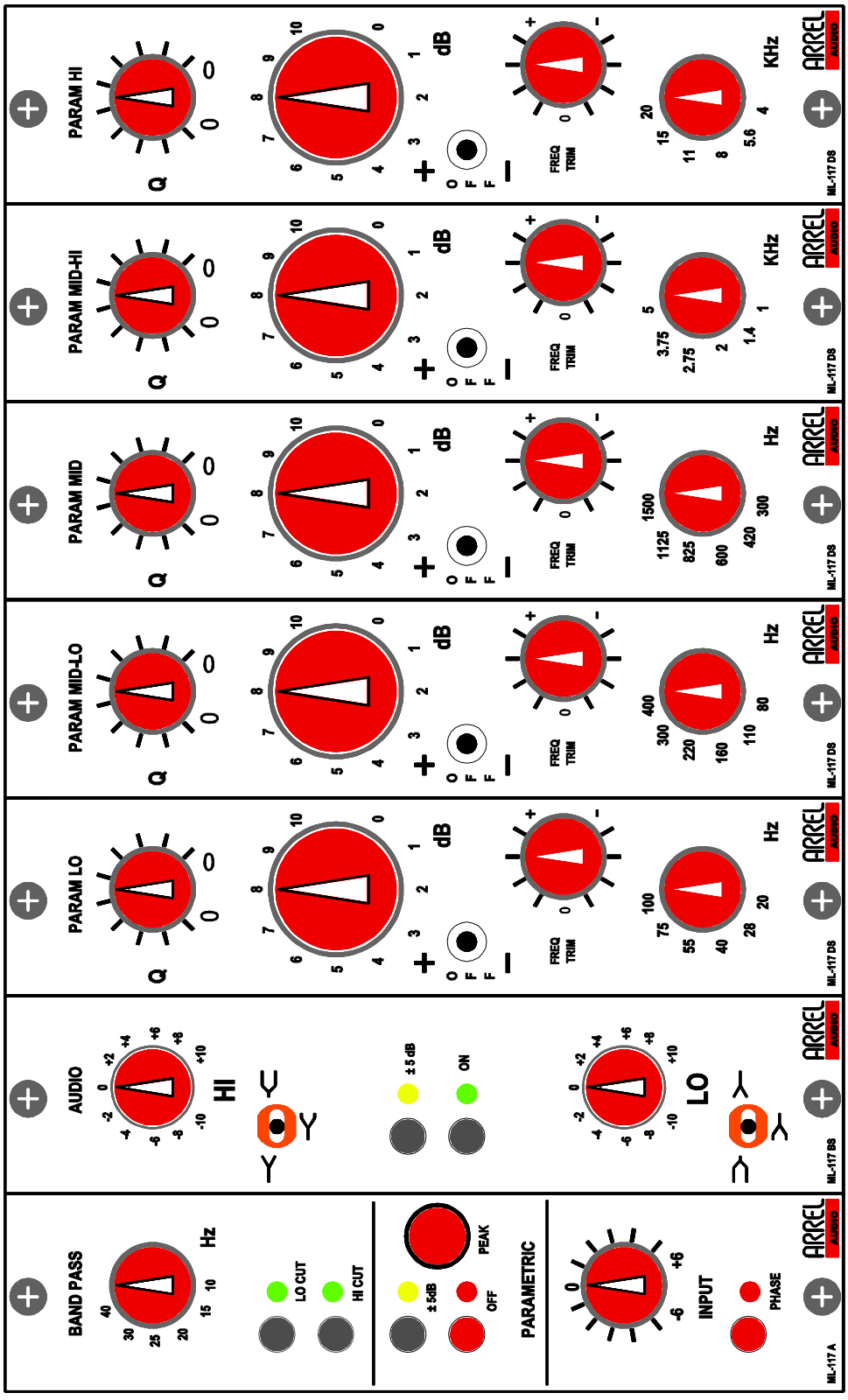


FIG.7 ML-117 half panel stepped control module

APPENDIX D: Front Panel

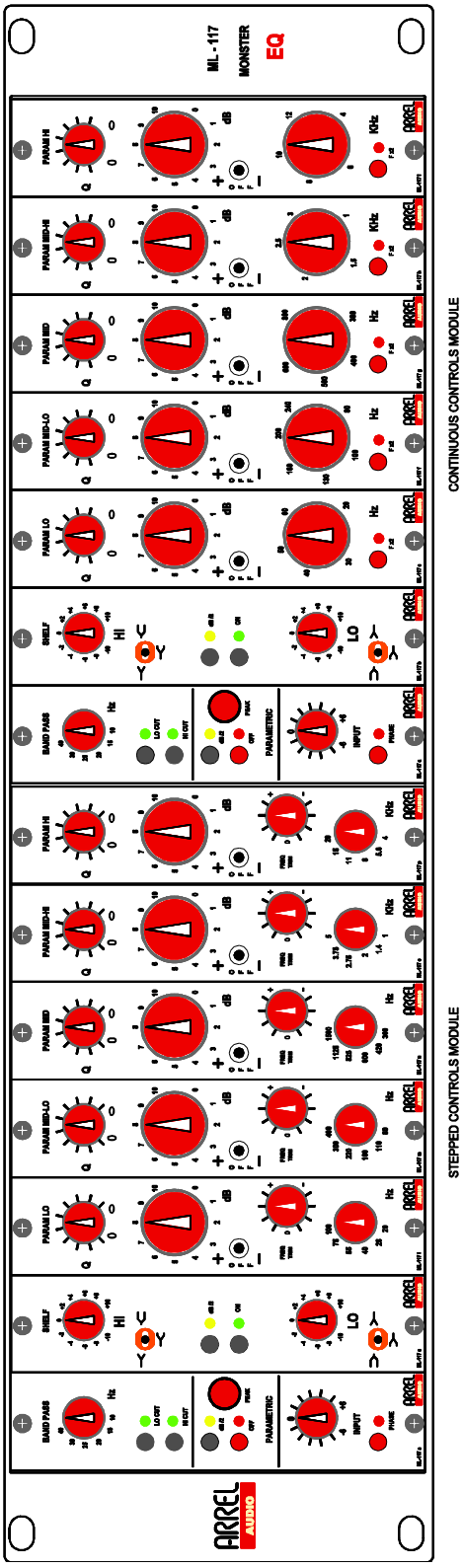


FIG.7 ML-117 front Panel

APPENDIX E: Back Panel

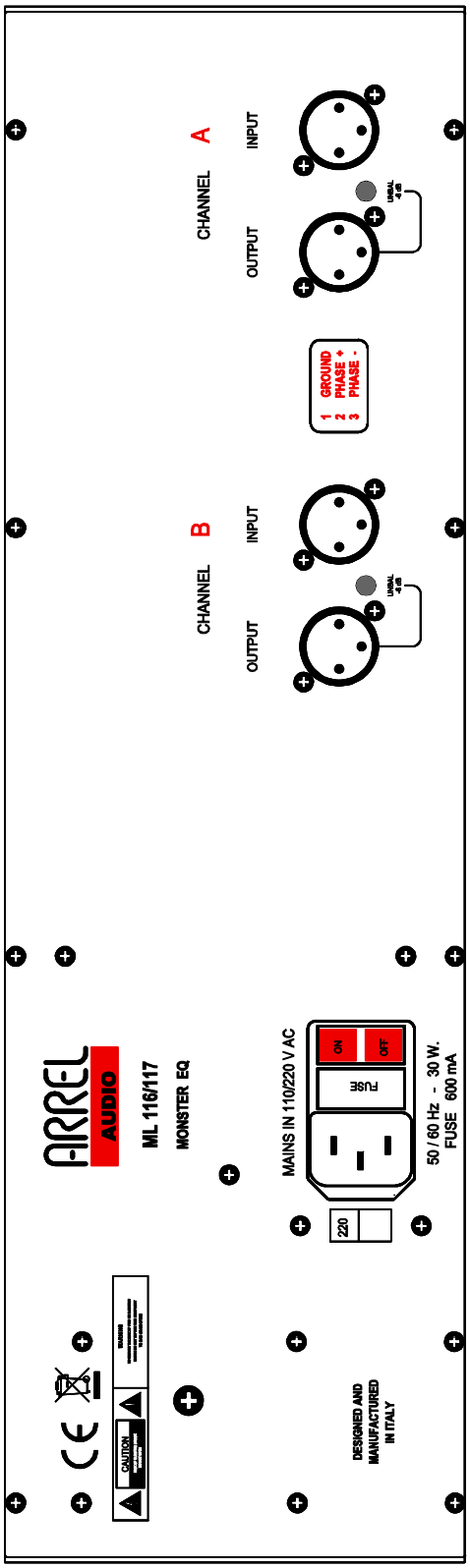


FIG.8 ML-117 Back Panel

TECHNICAL SPECIFICATIONS

MS-117 A: INPUT MODULE	
Input	Electronically balanced, Impedance > 10 KΩ
Input Gain	Range: ±6 dB rotary knob with center detect
Phase Inversion	Phase Reverse button (red LED)
PARAMETRIC SECTION	
Equalizer Mute	Mute button to deselect the parametric section (red LED)
±5 dB Button	dB range switch (yellow LED) to change the range of the emphasis/de-emphasis potentiometer
Input Peak Meter	
BAND PASS FILTER	
LO-CUT filter	6 selectable cut-off frequencies sub sonic filter (10-15-20-25-30-40 Hz) 12 dB/Oct
HI-CUT filter	50 KHz cut-off frequency 12 dB/Oct

MS-117 BC SHELVING EQUALIZER MODULE CONTINUOUS CONTROLS	
HI SHELF	± 10 dB gain (± 5 dB gain with ± 5 dB button on)
LO SHELF	± 10 dB gain (± 5 dB gain with ± 5 dB button on)
SHELF SHAPE SWITCH	3 positions switch to selects the slope of the shelving filters
By-Pass	True bypass switch (green LED)
±5 dB Button	dB range switch (yellow LED) to change the range of the shelving emphasis/de-emphasis potentiometer

ML-117 BS SHELVING EQUALIZER MODULE STEPPED CONTROLS	
HI SHELF	11 steps rotary knob ± 10 dB gain 1 dB step (± 5 dB gain with ± 5 dB button on, 0.5 dB gain)
LO SHELF	11 steps rotary knob ± 10 dB gain 1 dB step (± 5 dB gain with ± 5 dB button on, 0.5 dB gain)
SHELF SHAPE SWITCH	3 positions switch to selects the slope of the shelving filters
ON switch	True bypass switch (green LED)
±5 dB Button	dB range switch (yellow LED) to change the range of the shelving emphasis/de-emphasis potentiometer

ML-117 DC PARAMETRIC EQUALIZER MODULE CONTINUOUS CONTROLS		
FREQUENCY BAND F X 2 OFF All the filters are bell shaped	LO MID LO MID MID HI HI CUSTOM	20-60 Hz 80-240 Hz 300-800 Hz 1000-3000 Hz 4000-12000 Hz XX-XX XX-XX Hz
FREQUENCY BANDS F X 2 ON All the filters are bell shaped	LO MID LO MID MID HI HI CUSTOM	40-120 Hz 160-480 Hz 600-1600 Hz 2000-6000 Hz 8000-24000 Hz XX-XX Hz
F X 2 Button	switch to multiply by 2 the frequency range of the parametric filters(green LED)	
BOOST-OFF-CUT SWITCH	3 positions switch to select the function of the gain potentiometer (emphasis-OFF-de-emphasis)	
Emphasis/de-emphasis knob	Rotary control knob to set the emphasis/de-emphasis value	
Q Control	Rotary control knob to set the Q value	

ML-117 DS PARAMETRIC EQUALIZER MODULE STEPPED CONTROLS		
FREQUENCY BANDS All the filters are bell shaped Six steps rotary switch	LO MID LO MID MID HI HI CUSTOM	20-28-40-55-75-100 Hz 80-110-160-220-300-400 Hz 300-420-600-825-1125-1500 Hz 1000-1400-2000-2750-3750-5000 Hz 4000-5600-8000-11000-15000-20000 Hz XX-XX-XX-XX-XX-XX Hz
Frequency trim	switch to multiply by 2 the frequency range of the parametric filters(green LED)	
BOOST-OFF-CUT SWITCH	3 positions switch to select the function of the gain potentiometer (emphasis-OFF-de-emphasis)	
Emphasis/de-emphasis knob	11 steps rotary control knob to set the emphasis/de-emphasis value	
Q Control	11 steps rotary knob to set the Q value	

MS-117 D: BAND PASS FILTER MODULE	
LO CUT SWITCH	On-off switch for the high pass filter (green LED)
HI CUT SWITCH	On-off switch for the low pass filter (green LED)
LO CUT TOGGLE SWITCH	Frequency range switch (4-10 KHz, 8-20 KHz)
HI CUT TOGGLE SWITCH	Frequency range switch (20-60 Hz, 50-150 Hz)
LO CUT FREQUENCY CONTROL	Frequency band LO CUT rotary knob 12 dB/Oct
HI CUT FREQUENCY CONTROL	Frequency band HI CUT rotary knob 12 dB/Oct

ML-117 OUTPUT SECTION	
Output	Electronically balanced Output Impedance 100 Ω, (minimum external load 600Ω)
Output Level	Level +4dBu, Max +28 dBu
Bandwidth	5 - 200.000 Hz -1dB, perfect square wave up to 20 KHz
Distortion + Noise	<0.005% (typical 0.001 %)
BACK PANEL CONTROLS	
Power-On Switch	Power Supply switch
Bal/Unbal	Switch to select balanced or unbalanced connection

ML-117 MECHANICAL SPECIFICATION	
Construction	19" 3U rack mount metal box
Number of Modules	14
Dimensions	W 483 mm / 19”, H 133,35 mm/1.75” (1 RU), D 225 mm / 8.86”
Weight	6 Kg
ML-117 POWER SUPPLY	
Power Supply	Linear Regulator (Toroidal Transformer)
Operating Voltage	220V 50 Hz / 110V 60 Hz on request 110 V
Power Consumption	25 W
Rear Panel AC mains	IEC C13 16 A connector, AC mains cord with IEC Schuko 16A
Voltage Output	± 18, +24 VDC 300 mA, 48 VDC 25 mA
Power switch	Back panel backlighted switch