WYETECH LABS

Owner's Manual

Ruby P1 Stereo Phono Stage Preamplifier

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Stereo Phono Stage SMD (Surface Mount Device) Board

Phono preamplifier module with very accurate RIAA equalization (0.05dB).

Adapts to practically all MC and MM cartridges on the market through a wide range of gain, input resistance and input capacitance settings.

No step-up transformer required for MC cartridges.

Dual-mono design using two +/- separate power supplies per channel

Outboard power supply with shunt regulation + choke filtering

Introduction

Thank you for purchasing a Wyetech Labs Ruby P-1 phono stage preamplifier. The Ruby P-1 is not only able to accommodate all presently known cartridges, but is also one of the most user friendly in operation and in setting up the various parameters for your particular cartridge.

We have chosen to use two chassis to first eliminate any noise induced transients into this very high gain amplifier module capable of up to 80 db of gain and second to allow the module to be as close as possible to the pickup cartridge.

The phono module uses state of the art surface mounted components of the highest quality and maximum density to keep all signal paths to a minimum. Totally automated assembly of the module for precise positioning of components before soldering is applied for quality assured reliability.

The external power supply is in the Wyetech Labs tradition of using only passive devices and L-C type filtering. It consist of four separate supplies with three stages of filtering that ensures that only clean DC power is fed to the amplifier module. It contains 6 large chokes and 8 large electrolytic capacitors which form a reservoir totaling 56 Henries of inductance and 41,600 µF of capacitance. A metalized polyester 22 µF capacitor in conjunction with a 5 watt zener diode are employed as shunt regulation and final filter on all four DC power lines.

Description

The Ruby P-1 is a two-channel phono preamplifier module with very accurate RIAA equalization and many features. It is realized with the best semiconductors available and non-inductive, low noise, SMD metal film resistors. The circuit is designed to accept both moving coil (MC) and

moving magnet (MM) transducers/cartridges directly in order to eliminate the need for an external MC step-up transformer or amplifier. MC/MM input loading, gain and input capacitance values are easy to select with high resolution DIP switches.

The Module is ideal for the most demanding applications requiring accurate RIAA equalization, very low noise, extremely low distortion and superior sonic performance.

The Ruby P-1 module has been custom-built for Wyetech Labs by completely automated state of the art assembly methods using extremely precision components with tolerances to 0.1% accuracy.

Wyetech Labs has employed dual completely independent plus and minus power supplies for each channel rendering the most accurate level attainable by any means and far outperforms battery supply capabilities.

Shunt regulation in DC power supply

The Niagara river produces enormous power while still allowing some water to flow over the falls to maintain the beauty of it and allow it to be a world attraction. It only consumes a portion of the water flow to meet these dual requirements

It is the equivalent to Shunt Regulation in audio power supplies and specifically in the Ruby phono power supply.

The power supply is designed to produce more power than what is actually needed while the surplus power is dissipated as heat in order to maintain a precise voltage to the amplifier itself. The amplifier drains the current [power] from the power supply as needed which can vary depending on the signal output, while fixating the VOLTAGE to a precise level to eliminate any modulation of the actual audio voltage signal.

The dual RED / GREEN LED’s show the operation of these four circuits. The LED’s monitor this excess current which flows through each of them such that they become the status of the proper operation. They should always be lit but the intensity of the light output could vary depending on the AC power fed to it. If any should go out they represent a power fault that could be caused by several factors which we can determine by the effect it has on the audio reproduction itself. However in proper operation they should always be lit up.

In other words the amplifying circuit is always supplied with the power it needs which can vary with the signal while the excess power is dissipated through the ground as heat. This type of regulation is called shunt regulation and is considered to be far superior to a series type regulator which is why we chose to implement it in this product.

Features

- Compact design. Dual-mono. Very low noise. Single or Balanced output
- Non-inductive low noise SMD metal film resistors [0.1%]
- Input accepts moving coil/moving magnet (MC/MM) cartridges directly without step-up transformer
- Input loading > from 10 ohms to 47k ohms selectable in 21 steps
- Gain Select > 40db to 80db selectable in 34 steps

- High output drive. Balanced - 28V. Unbalanced - 14V
- High accuracy RIAA equalization with 0.05dB tolerance
- Selectable time constants of 3.18uS and/or 7950uS
- Total harmonic distortion 0.0003%
- Low output impedance [0.1 Ohm] - drives long signal cables
- Two-stage dual-supply voltage regulator on PCB board for each channel in combination with external DC power supply
- Three-stage outboard power supply with 6 chokes and over 40,000 µF of filtering capacitance

Installation / Setup

Unpacking

Remove all items from both boxes. Contents should contain an AC power cord, a DC power cord (umbilical between the power supply and the phono stage module), a Philips screwdriver and a wooden tool to set the DIP switches.

Power Standard Selection

The power supply has a switch to select for the power voltage and frequency – in factory this is set to the North American standard of 115 V / 60Hz, but by moving the selector you can use 230 V / 50 Hz used in Europe and other regions. We include a power cable conforming to North American standards – if you are in a 230V / 50Hz region be sure to use an appropriate cable.

Power Cabling

- First plug in the input RCA interconnect coming from the tonearm / cartridge and the output connectors going to your preamp. Hook the ground wire to the 5-way binding post.
- Ensure the power switch is turned off – press down.
- Connect the DC power cable between the amp and power supply. This uses a connector that has a guide ridge. Once the guide is lined up, push on the connector until it snaps into place. You will hear a click. To remove this you have to press down on the spring loaded top of the connector to pull out.
- Connect the ac cord to the power supply IEC filter input connector and connect the AC plug to the wall outlet.

Power-Up

To power up place power switch in on position and wait for the automatic ramp up sequence to complete. In about 15 seconds the 4 LED’s light up to signal that all 4 power lines are now active and ready.

Factory settings

The factory default settings for the phono module are:

- 1000 Ohm loading resistance
- 100 pf capacitance
- 1mv (60 dB gain) sensitivity with rumble filter on (20Hz warp & infrasonic)

These default settings should be appropriate for most moving magnet cartridges.

Calibrating to match your cartridge

To exactly match the phono stage module's settings to the specifications of your cartridge (for example, for a moving coil cartridge), you will need to calibrate the module. This is easily accomplished through setting the DIP switches.

WARNING!
Always turn the power OFF and unplug the when setting the DIP switches.

To calibrate your phono module (the smaller of the two boxes):

- First, power off the phono power supply and then disconnect from power mains.
- Using the screwdriver provided, remove the 2 screws holding the front panel on the amplifier.
- Slide the cover forward only far enough to uncover the DIP switches.
- Orient the phono module so that the writing on the circuit board is right side up. This will endure you are in the correct orientation for setting the DIP switches.
- Use the wooden tool provided to position the DIP switches into the required positions. Use the pointed end on a 45 degree angle placed on the concave portion of the lever to switch on / off.
- Refer to the calibration tables in this manual, and the specifications sheet for your cartridge, to find the correct settings for the DIP switches.

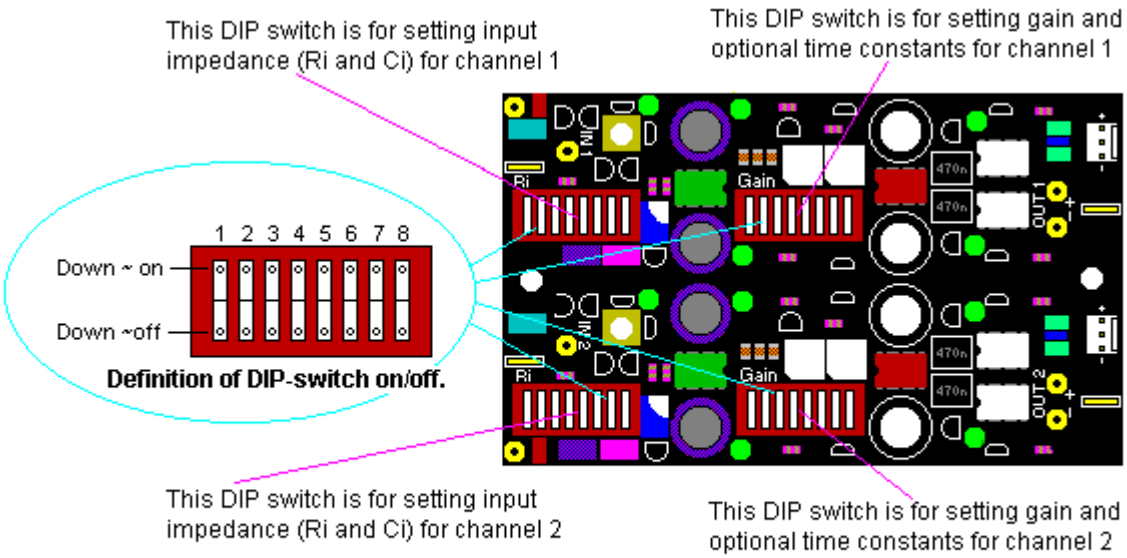
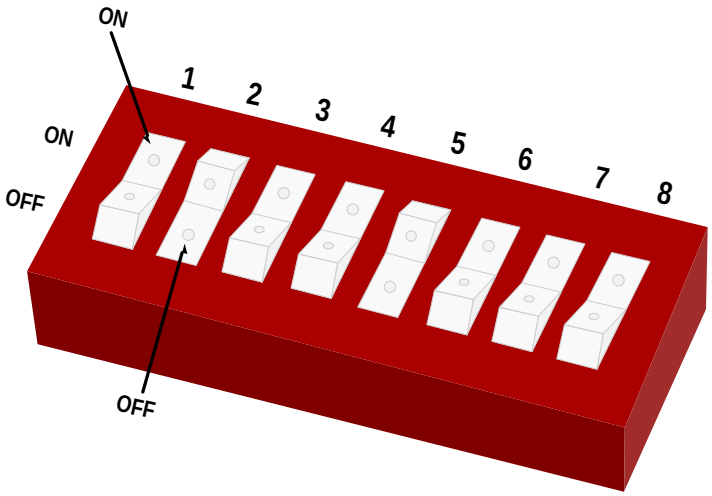


Fig. 12. DIP switch location and on/off definition.



Positioning of DIP switches (on/off)

Input Impedance Settings

Resistive input loading, Ri

The resistive input loading for MC/MM cartridges can be set in accordance with the cartridge manufacturer's recommendation or experimentally. Both channels must be set identically.

Resistance, Ri	**Input impedance - DIP switch settings on/off**							
Ohms	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
10	on	on	on	on	on	on	-	-
15	on	off	on	on	off	on	-	-
18	on	off	off	on	off	off	-	-
20	on	off	off	off	off	off	-	-
25	off	on	on	on	on	on	-	-
30	off	on	on	off	on	on	-	-
40	off	on	off	on	off	on	-	-
50	off	on	off	off	off	off	-	-
60	off	off	on	on	on	on	-	-
70	off	off	on	on	off	off	-	-
80	off	off	on	off	on	on	-	-
90	off	off	on	off	off	on	-	-
100	off	off	on	off	off	off	-	-
150	off	off	off	on	on	on	-	-
180	off	off	off	on	on	off	-	-
200	off	off	off	on	off	on	-	-
250	off	off	off	on	off	off	-	-
400	off	off	off	off	on	on	-	-
600	off	off	off	off	on	off	-	-
1k	off	off	off	off	off	on	Factory default setting	
47k	off	off	off	off	off	off	-	-

Capacitive input loading, Ci

The capacitive input loading for MC/MM cartridges can be set in accordance with the cartridge manufacturer's recommendation or experimentally. Both channels must be set identically.

Capacitance, Ci	**"Input impedance"-DIP switch settings on/off.**							
pF	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
100	Factory default setting						off	off
200	-	-	-	-	-	-	on	off
300	-	-	-	-	-	-	off	on
400	-	-	-	-	-	-	on	on

Example: If your cartridge requires a load resistance of 40 Ohms and a load capacitance of 200 pF, the Ri/Ci DIP switch settings (1-8) should be off, on, off, on, off, on, on, off.

Time and gain constants

Gain

The gain required for MC/MM cartridges can be set in accordance with the manufacturer's specification for MC/MM nominal output level or experimentally. (For MC/MM nominal output levels below 0.10 mV (=100 µV), gain is set at 0.10 mV. For MC/MM nominal output levels above 10mV, gain is set at 10 mV). Both channels must be set identically unless balance adjustment is necessary.

Settings specified in the table below apply for a nominal output level of 1 Volt (Vo=1V) unbalanced and 2 Volts balanced.

MC/MM nominal output level		**Gain DIP switch settings on/off**							
mV	**dB**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
0.1	80	off	off	off	off	on	on	-	-
0.12	78	off	off	off	off	off	on	-	-
0.15	76.5	on	off	off	off	on	on	-	-
0.18	75	on	off	off	off	off	on	-	-
0.2	74	off	on	off	off	on	on	-	-
0.25	72	off	on	off	off	off	on	-	-
0.3	70	on	on	off	off	off	on	-	-
0.4	68	off	off	on	off	on	on	-	-
0.45	67	on	off	on	off	on	on	-	-
0.5	66	off	off	on	off	off	on	-	-
0.55	65	on	on	on	off	on	on	-	-
0.6	64	off	on	on	off	off	on	-	-
0.7	63	on	on	on	off	off	on	-	-
0.8	62	off	off	off	on	on	on	-	-
0.9	61	off	on	off	on	on	on	-	-
1	**60**	**off**	**off**	**off**	**on**	**off**	**on**	**factory default setting**	
1.1	59.2	off	off	on	on	on	on	-	-
1.2	58.4	off	on	on	on	on	on	-	-
1.3	57.8	off	off	on	on	off	on	-	-
1.4	57	on	off	on	on	off	on	-	-
1.5	56.5	off	on	on	on	off	on	-	-
1.6	56	off	on	on	off	on	off	-	-

MC/MM nominal output level		Gain DIP switch settings on/off							
mV	**dB**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1.8	55]	on	on	on	off	on	off	-	-
2	54	off	on	off	off	off	off	-	-
2.5	52	off	off	off	on	on	off	-	-
3	50.5	on	on	off	on	on	off	-	-
3.5	49	off	off	on	on	on	off	-	-
4	48	on	on	on	on	on	off	-	-
4.5	47	off	on	on	off	off	off	-	-
5	46	on	on	on	off	off	off	-	-
7	43	off	off	off	on	off	off	-	-
8	42	on	on	off	on	off	off	-	-
9	41	off	off	on	on	off	off	-	-
10	40	on	on	on	on	off	off	-	-

Time constants (3.18 µs and 7950 µs)

It can be most advantageous to activate the time constant 7950 µs (20Hz) as a high pass filter (RIAA/IEC) to minimize warp and infrasonic signal interference. The time constant 3.18 µs (50kHz) is only activated if the phonograph disc is cut with this time constant. Otherwise the high frequencies will be affected. In most cases the 3.18 µs time constant DIP switch (7) should be left in its default "on" position (meaning filter "off"). Both channels must be set identically.

Time constant (µs)		Gain DIP switch settings on/off							
3.18	**7950**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
off	**off**	-	-	-	-	-	-	on	on
off	**on**	**Factory Default Setting (Rumble Filter On)**						**on**	**off**
on	**off**	-	-	-	-	-	-	off	on
on	**on**	-	-	-	-	-	-	off	off

Example: If your cartridge has a nominal output level of 1.8 mV and you wish to use the standard RIAA correction curve, the Gain/Time constant DIP switch settings (1-6) should be on, on, on, off, on, off.

Balance adjusting

The high resolution gain setting (table 2) allows for channel balance control if necessary. Even expensive MC/MM cartridges very often have considerable unequal output levels "Right" to "Left". (Channel difference). This module can equalize channel difference by setting different gain for the two channels. Most easily by alternate listening and adjusting. Remember to turn the power OFF when the DIP-switches are operated.

Ruby P-1 Phono Specifications

DC Electrical Characteristics

(Typical values at TA = +25 deg.C and RL = 1k unless otherwise specified)

Symbol, parameter	(conditions / comments)	Value	Unit
RIN, input resistance	(DIP-switch selectable)	10, 15, 18, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100, 150, 180, 200, 250, 400, 600, 1k, 47k	Ohm
CIN, input capacitance	(DIP-switch selectable)	Approx. 100, 200, 300, 400	pF
IB, input bias current	(Input bias current cancellation pre-adjusted)	Max. 0.5	uA
PSRR, power supply rejection ratio	(AV = 40dB, 10Hz to 20kHz)	120	dB
RO, output resistance	(VO = 1V, DC to 100kHz)	0.1	Ohm
VO, output voltage swing	(Unbalanced operation)	Min. 14.2	V
IO, output current	(RL = 100 Ohm)	25	mA
IS, supply current	(Each channel)	22	mA

AC Electrical Characteristics

(Typical values at TA = +25 deg.C and RL = 1k unless otherwise specified)

Symbol, parameter	**(conditions / comments)**	**Value**	**Unit**
VIN, input nominal levels	(VO = 1V) (DIP-switch selectable) (0.10mV ~ AV = 80dB)(1.0mV ~ AV = 60dB)(10mV ~ AV = 40dB)	0.10, 0.12, 0.15, 0.18, 0.20, 0.25, 0.30, 0.40, 0.45, 0.50, 0.55, 0.60, 0.70, 0.80, 0.90, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.8, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 7.0, 8.0, 9.0, 10.0	Mv
VINO, input overload level	(f = 1kHz, AV = 40dB)	100	mV
AV, voltage gain	(DIP-switch selectable)	40 to 80	dB
dAV, RIAA equalization deviation	(Ref.= 1kHz, 10Hz to 20kHz)	0.05	dB
BW, bandwidth	(-3dB, VO = 1V, AV = 40dB)	2	MHz
en, input noise voltage density	(f0 = 1kHz, AV = 80dB)	0.5	nV/Hz
S/N, signal to noise ratio	(AV = 40/60/80dB)	98/90/71	dB
CS, channel separation	(AV = 40dB, 10Hz to 20kHz)	120	dB
THD, total harmonic distortion	(AV = 40dB, f0 = 1kHz)	0.0003	%