

## Instruction Manual

### CT100 Stereo Phono Stage Module



**Make sure to read the COMPLETE Instruction Manual before connecting CT100.**

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## CONNECTIONS

### Definitions

Please see the text on the PC board.

Marking	Definition
IN 1	Signal input, channel 1
IN 2	Signal input, channel 2
OUT 1 +/-	Signal output, channel 1 (Bal./Unbal.)
OUT 2 +/-	Signal output, channel 2 (Bal./Unbal.)
GND	Ground, channel 1
GND	Ground, channel 2

The power supply must be connected to both 3-way PCB square pin headers:

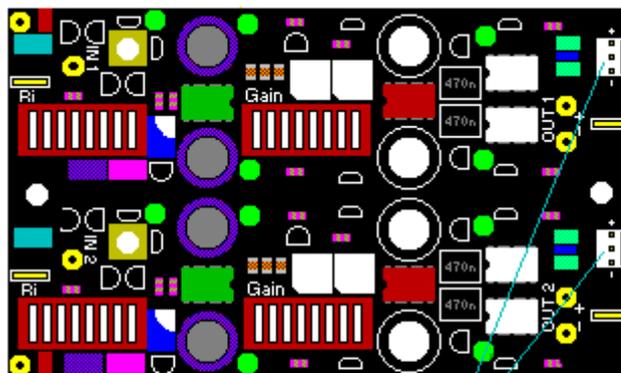


Figure 1.  
Power supply connections.

	Positive supply voltage	Red
	Common (0 Volt)	Black
	Negative supply voltage	Blue

### Electrical connections

The power supply must be connected in accordance with fig. 1. (See also [POWER SUPPLY](#)).

The signal output must be connected with screened cables. The (braid/foil) screens must be soldered to the flat connector tabs (~"spade" terminals) and the center conductors (cores) must be soldered to the PCB round pin terminals. The marking on the PC board shows this. The signal output can provide balanced or unbalanced signals. See fig. 2 and fig. 3

Figure 2.  
Unbalanced output connections.

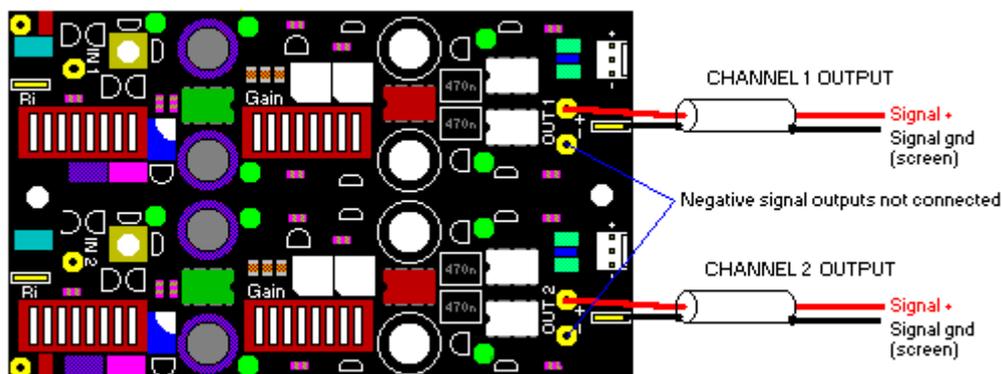
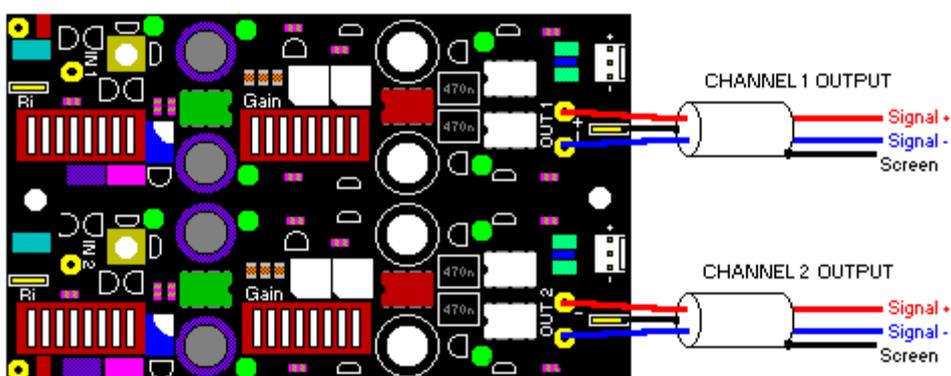


Figure 3.  
Balanced output connections.



**WARNING!**

Avoid shortcircuiting any of the outputs (+ or - outputs) to ground. Also avoid connecting + and - outputs directly to each other.

Doing so will damage the output devices.

The signal input must be connected to the phono transducer/cartridge. If the cartridge is wired with screened cables, the screens must be soldered to the flat connector tabs and the center conductors must be soldered to the PCB round pin terminals IN 1/2. If the cartridge is wired with unscreened wires, then take care that the wires are not interchanged, which will cause inverting of the phase of one or both channels. Likewise, take care that "Right" and "Left" channels are not interchanged. See fig. 4 and fig. 5.

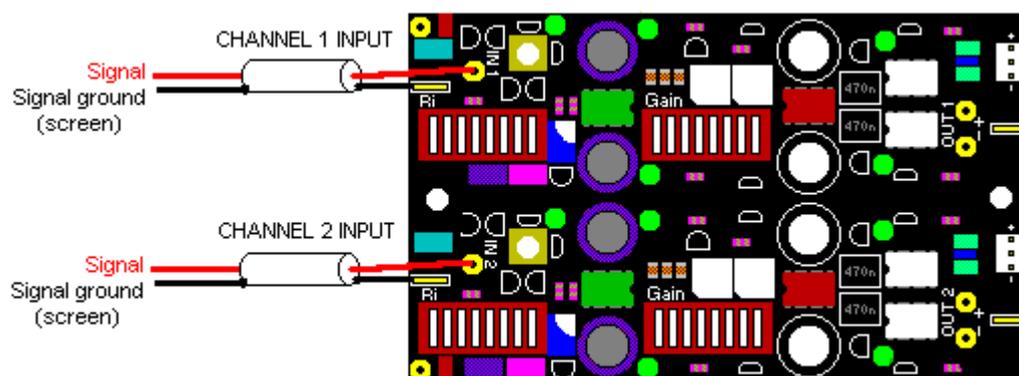


Fig. 4. Connecting the cartridge using screened cables.

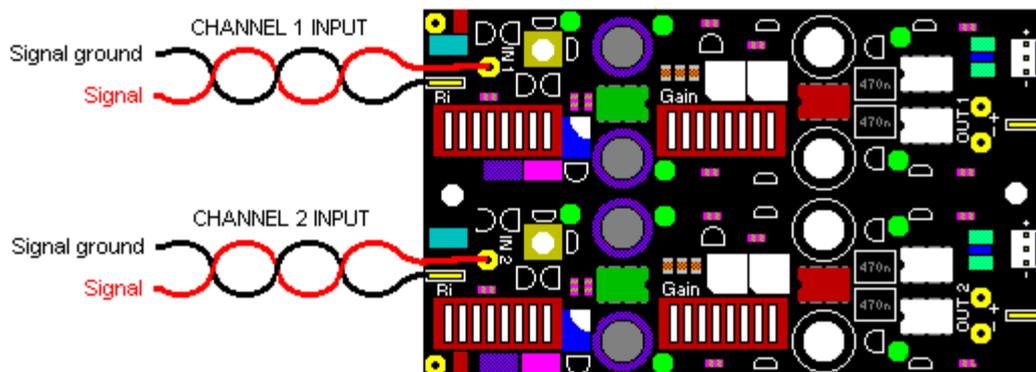
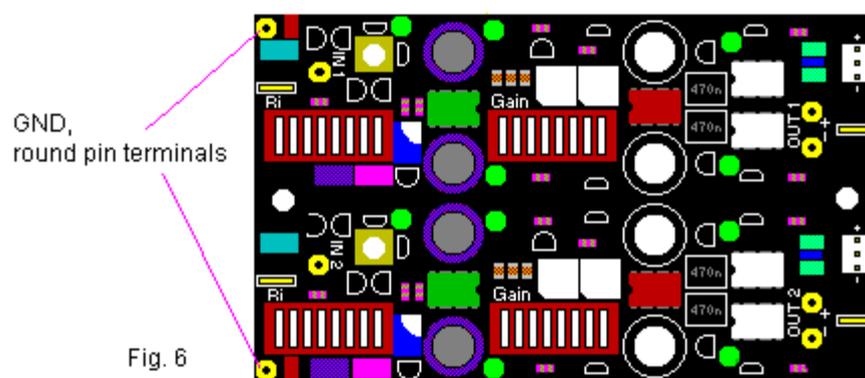


Fig. 5. Connecting the cartridge using unscreened wires.



**GND.** The two round GND pin terminals must be connected with short wires to the solder tags on the attached Screen Plate P117-02. This is normally done by the manufacturer before shipping. Please observe that no conductor tracks on the PC board unintendedly connect to the Screen Plate or other external circuits. See fig. 6. (See also [MOUNTING](#)).

### **Mechanical mounting**

The CT100 PC board must be mounted on the Screen Plate P117-02. Normally this is done by the manufacturer. (See also [MOUNTING](#)).

### **Dual-mono**

CT100 is only operating in true dual-mono when the two channels are connected to two individual power supplies. This is recommended. (It is possible to power supply both channels with only one power supply, but this is not true dual-mono. See also [POWER SUPPLY](#)).

### **Headphones**

If headphones are connected directly to CT100, there is a risk of overloading the output devices and thereby affecting the reliability of CT100. Headphones are normally not connected directly to CT100. (OUT 1 and OUT 2 are intended to be connected to a preamplifier). If headphones are experimentally connected to CT100, the volume can be adjusted with "Gain". (See also [SETTINGS](#)). We recommend to use dynamic headphones with an impedance of 600 Ohms or higher. Use terminals marked OUT 1 and OUT 2. Take care that the phase is correct and that "Right" and "Left" channels are not interchanged. Both channels are connected in the same way: The "0" (normally a screen) is connected to the flat connector tab and the

other conductor (normally a single core) is connected to the round pin terminal "+". (To invert the phase, use the round pin terminals "-").

**WARNING!**

Avoid playing with the headphones at so loud volume that extended listening may affect your hearing.

In order to reduce the risk of excessive power dissipation in the output devices of CT100, the power supply voltage must not exceed  $\pm 24$  Volts with headphones connected directly to CT100.

## POWER SUPPLY

### Definitions

See [CONNECTIONS](#) fig. 1.

### Power requirements

CT100 must be supplied with a  $\pm$ DC voltage, which is a positive voltage with reference to 0 Volts (Common) as well as a negative voltage with reference to the same 0 Volts. The positive and negative voltages are usually of equal magnitude. Although equal magnitude is not required it is recommended. Each channel of CT100 provides local positive and negative voltage regulation of  $\pm 16$  Volts when CT100 is power supplied with  $\pm 17$  Volts to  $\pm 35$  Volts. CT100 can operate with minimum  $\pm 9$  Volts. When CT100 is connected to a preamplifier or a loading impedance higher than 5 kOhms, the power supply requirement is:

$\pm 9$  to  $\pm 35$  Volts. Optimum  $\pm 17$  to  $\pm 35$  Volts

When CT100 is connected to a loading impedance lower than 5 kOhms, the power supply requirement is:

$\pm 7$  to  $\pm 24$  Volts

The supply current is approx.  $\pm 22$ mA per channel, but possibly higher when the loading impedance is less than 5 kOhms, depending on the audio signal level.

**WARNING!**

If the CT100 is power supplied incorrectly with only a positive voltage or only a negative voltage, a DC voltage of several Volts will occur on the output terminals OUT 1 and OUT 2.

In other words this means if only one (+ or -) voltage is connected to the CT100, a DC voltage and/or an AC voltage of unacceptable magnitude will occur on the output of CT100. Probably harmless to CT100, but connected hi-fi equipment etc. could be damaged. Especially if this equipment can amplify DC voltage and thereby destroy loudspeaker voice coils and set them on fire. The user is solely responsible that the power requirements are observed and followed correctly. (We believe that power amplifiers should not be able to amplify DC voltage).

### CT100-pow1 mains adapters (CT100 accessory).

You may purchase the DACT CT100-pow1 mains adapters/power supplies for powering your CT100. Although not the ideal power supply, CT100-pow1 is a good, convenient and safe power source for CT100. We recommend using two CT100-pow1's - one for each channel. In this way CT100 can be operated in true dual-mono. When connecting the CT100-pow1's to the mains make sure that their input voltage and input frequency range are correct for your local mains power supply before they are connected to the mains socket. Europe: (230VAC/50Hz). The mains adapters are regarded as safe. (Approvals: CE/N/SD/Fi and more. Safety standards: HD 195 56. EN 60950). Each mains adapter provides stabilised DC voltage of  $\pm 23$  Volts. The marking indicates  $\pm 17$  Volts. This valids for a loading of (70mA). When connected to CT100, each adapter will



provide approx.  $\pm 20$  Volts. The leads on both mains adapters are terminated with a 3-way 0.1 inch locking connector which fit onto CT100. These connectors are designed to ensure locking and correct polarizing when connected to the CT100 power supply input sockets. For the sake of optimized sonic performance (based on subjective evaluation) and in order to minimize mains leakage into ground circuit, the correct "Phase" is indicated on the mains adapters. See fig. 7. The mains power supply live wire "Phase" can be identified in the mains socket with a mains tester (neon indicator). DANGER! Electric shock risk! The mains high voltage is dangerous! Although Phase" is recommended to be connected according to fig. 7 this is not required for CT100 to function, but the recommended connection of "Phase" will optimize the sonic performance.

Note: The CT100-pow1 mains adapters are not suitable as battery chargers.

#### **WARNING!**

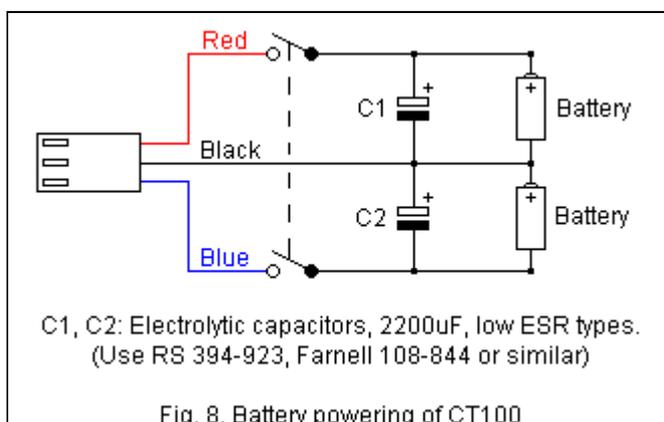
The mains adapters are for indoor use only! Do not expose the units to water, rain or dust. They must not be covered over. Do not remove the casings.

#### **Other power supplies**

If CT100 is installed in units having their own  $\pm DC$  voltage power supply, CT100 can be connected to the units DC voltage if all above-mentioned power requirements are met including the ability to supply at least  $\pm 22$ mA per channel.

#### **Battery powering**

Powering with batteries or rechargeable batteries nearly always change the subjective evaluation of the sonic performance compared to powering by the supplied mains adapters. The user must decide for himself, which is preferred as "correct". For reference use, battery power supply is recommended to ensure uniform power conditions from test to test and to eliminate mains leakage into ground circuit. All above-mentioned power requirements are valid for battery powering as well. Rechargeable batteries may be used as well, but a mains powered charging circuit will induce mains leakage into the ground circuit of the hi-fi system. Such charging circuits should be disconnected from the mains when the charging is ended in order to assure all advantages of battery powering. Each CT100 is supplied with two cables terminated with locking connectors intended for connecting CT100 to batteries or other power sources. The three cores are colour coded in accordance with fig. 1. (See [CONNECTIONS](#)). See also fig. 8.



#### **CT100 voltage regulators**

CT100 has 4 voltage regulators on board. Each of the two channels has one positive and one negative voltage regulator. All voltage regulators consist of two independent sections in series. Four ferrite bead filters provide effective RFI suppression. (Mobile phones etc.). Decoupling capacitors are selected to ensure optimum wideband working conditions for audio signals.

## **MOUNTING**

#### **Noise sources**

Phono amplifiers are very sensitive and mostly screening is required. When CT100 is installed, it is advisable to make experiments with wiring and screening if noise interference occurs. The following directions are guidelines. They apply for dual-mono and balanced output unless otherwise specified.

#### **Common noise sources**

- Transformers

- Electrical motors
- Mobile phones
- Relays
- Electrical appliances

### **Screen Plate P117-02**

The Screen Plate must always be used even if CT100 is built into a metal box. It provides RF shielding, protects the SMD components on the rear side of the PCB and avoids that PCB tracks are short-circuited accidentally. CT100 is normally shipped mounted on its Screen Plate.

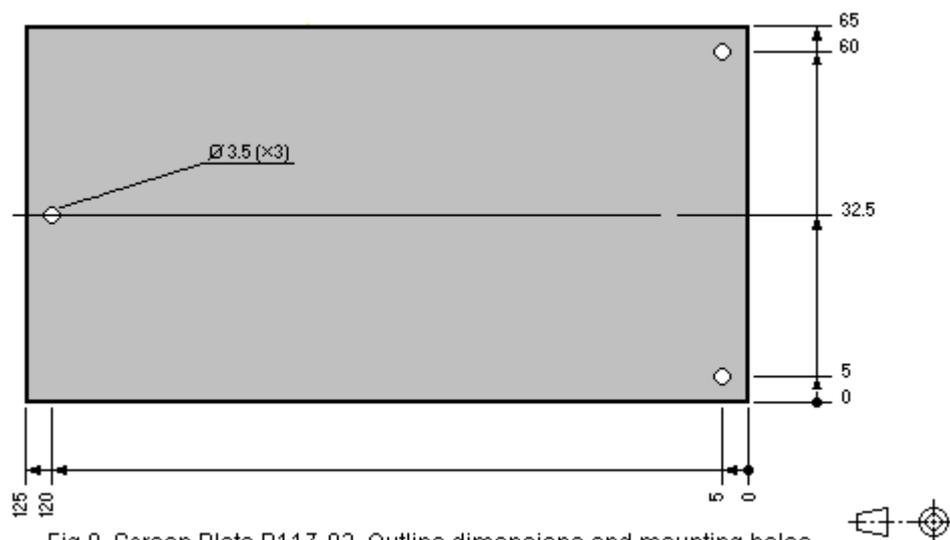


Fig.9. Screen Plate P117-02. Outline dimensions and mounting holes.

### **Mounting into turntables**

CT100 can be built into a turntable so that the sensitive audio signal from the cartridge can be wired to CT100 with short wires or screened cables in order to protect the original audio signal from noise interference. This configuration enables the turntable to deliver a balanced (2 Volts) or unbalanced (1 Volt) audio signal directly to preamplifiers etc. Fig. 10 shows installation into a non-metal enclosure/turntable. Follow 1-9:

1. Draw the complete circuit diagram of the turntable. Keep it.
2. Fix CT100 near the signal from the cartridge and far away from motor, mains transformer etc.
3. Connect (solder) GND on both channels to the Screen Plate P117-02 with two short wires. Tinned copper wire is fine. (These connections are normally made by the manufacturer before shipping).
4. Connect (solder) the wires from the cartridge to CT100 IN 1 / IN 2 (See "[Electrical connections](#)").
5. Connect (solder) the turntables "Earth" wire to one GND. ("Earth" is connected to the tonearm and/or the turntables metal chassis).
6. Connect (solder) OUT 1/2 to XLR or RCA plugs. Fig. [2](#), [3](#), 10 and 11.
7. Connect (solder) P1 from the solder tag to "Left" screen. In the same way, P2 is connected to "Right" screen, but only if "Right" channel is noisy. Then both channels share the same common (0 Volt) which is not true dual-mono.
8. Connect the power supply. See [CONNECTIONS](#) fig. 1 and [POWER SUPPLY](#).
9. Earth connection is not required, but if desired connect earth to one GND. (Two capacitors "C" on the CT100 PC board are already connecting GND to common at the inputs IN 1 / IN 2 in order to secure high frequency stability).

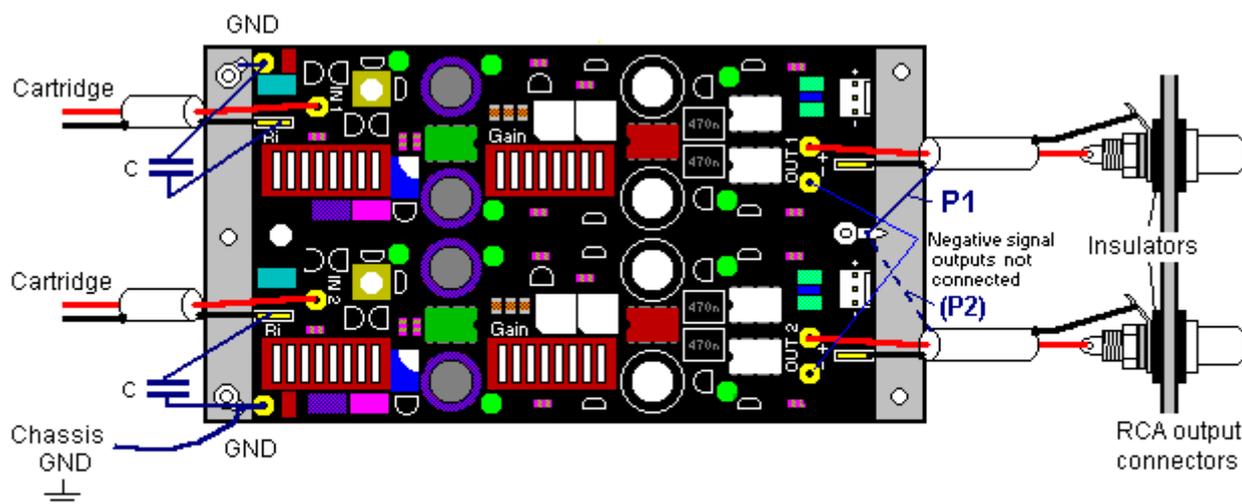


Fig.10. Mounting CT100 into a non-metal enclosure/turntable.  
This example uses non-balanced output connections (RCA connectors)

### Mounting into a screening metal box

If noise interference is a problem, a metal box can provide screening.

Fig. 11 shows an example. The above 1-9 are still valid except for:

**4a.** Connect (solder) IN 1 and IN 2 to two insulated phono chassis sockets.

**5a .** Connect (solder) a wire from GND to a non-insulated binding post, which is electrically connected, to the metal box.

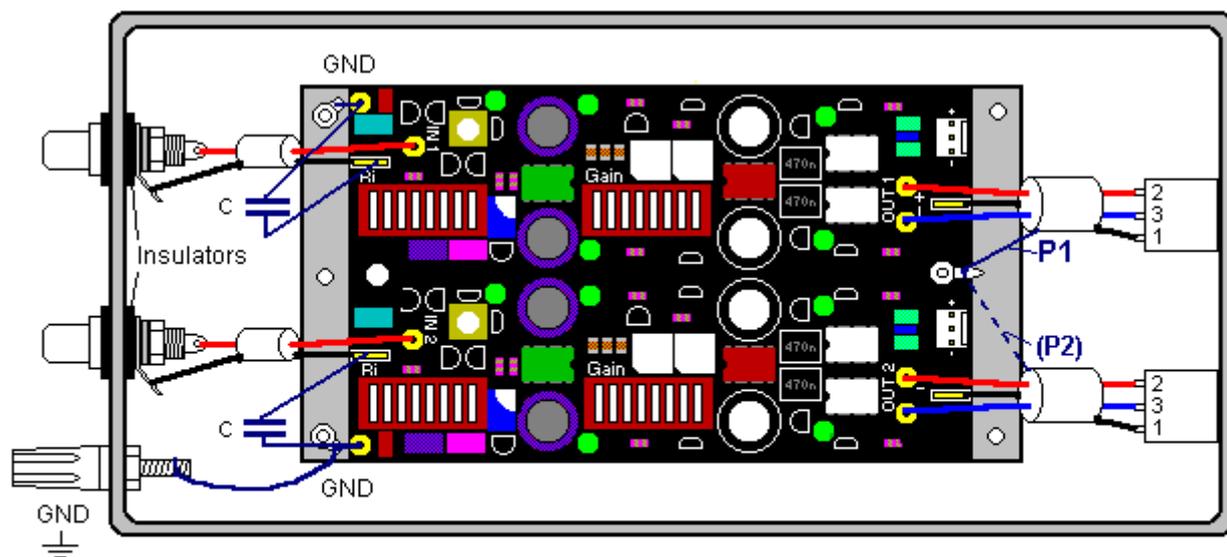


Fig.11. Mounting CT100 into a screened metal enclosure.  
This example uses balanced output connections (XLR connectors).

## SETTINGS

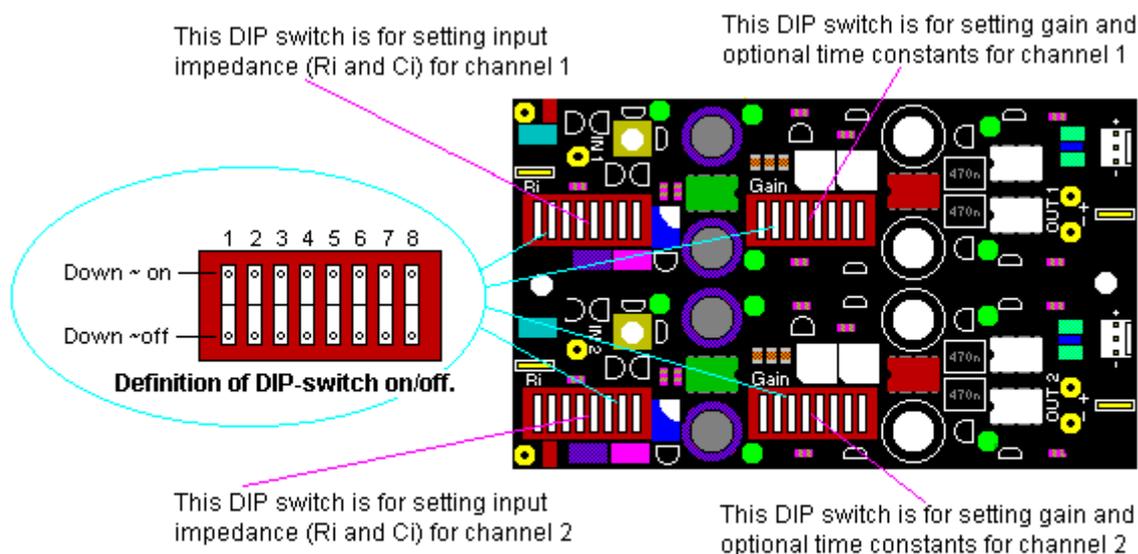


Fig. 12. DIP switch location and on/off definition.

**WARNING!**

Turn the volume control completely down when the DIP-switches are operated. Otherwise your hi-fi equipment may be damaged by noise transients.

**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. Select only Ri settings specified in table 1. (For resistive values not specified, see [OTHER INFORMATION](#)).

**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. See table 1. (For capacitive values not specified, see [OTHER INFORMATION](#)).

TABLE 1, INPUT IMPEDANCE SETTING								
Resistance, Ri	"Input impedance"-DIP switch settings on/off (fig. 12).							
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	<b>on</b>	off	<b>on</b>	-	-
250	off	off	off	<b>on</b>	off	off	-	-
400	off	off	off	off	<b>on</b>	<b>on</b>	-	-
600	off	off	off	off	<b>on</b>	off	-	-
1k	off	off	off	off	off	<b>on</b>	-	-
47k	off	off	off	off	off	off	-	-
Capacitance, Ci	"Input impedance"-DIP switch settings on/off (fig. 12).							
pF	1	2	3	4	5	6	7	8
100	-	-	-	-	-	-	off	off
200	-	-	-	-	-	-	<b>on</b>	off
300	-	-	-	-	-	-	off	<b>on</b>
400	-	-	-	-	-	-	<b>on</b>	<b>on</b>

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.

TABLE 2, GAIN AND TIME CONSTANT SETTING								
MC/MM nom. output level	"Gain"-DIP switch settings on/off (fig. 12).							
mV	1	2	3	4	5	6	7	8
0.10	off	off	off	off	<b>on</b>	<b>on</b>	-	-
0.12	off	off	off	off	off	<b>on</b>	-	-
0.15	<b>on</b>	off	off	off	<b>on</b>	<b>on</b>	-	-
0.18	<b>on</b>	off	off	off	off	<b>on</b>	-	-
0.20	off	<b>on</b>	off	off	<b>on</b>	<b>on</b>	-	-
0.25	off	<b>on</b>	off	off	off	<b>on</b>	-	-
0.30	<b>on</b>	<b>on</b>	off	off	off	<b>on</b>	-	-
0.40	off	off	<b>on</b>	off	<b>on</b>	<b>on</b>	-	-
0.45	<b>on</b>	off	<b>on</b>	off	<b>on</b>	<b>on</b>	-	-
0.50	off	off	<b>on</b>	off	off	<b>on</b>	-	-
0.55	<b>on</b>	<b>on</b>	<b>on</b>	off	<b>on</b>	<b>on</b>	-	-
0.60	off	<b>on</b>	<b>on</b>	off	off	<b>on</b>	-	-
0.70	<b>on</b>	<b>on</b>	<b>on</b>	off	off	<b>on</b>	-	-
0.80	off	off	off	<b>on</b>	<b>on</b>	<b>on</b>	-	-
0.90	off	<b>on</b>	off	<b>on</b>	<b>on</b>	<b>on</b>	-	-
1.0	off	off	off	<b>on</b>	off	<b>on</b>	-	-
1.1	off	off	<b>on</b>	<b>on</b>	<b>on</b>	<b>on</b>	-	-
1.2	off	<b>on</b>	<b>on</b>	<b>on</b>	<b>on</b>	<b>on</b>	-	-
1.3	off	off	<b>on</b>	<b>on</b>	off	<b>on</b>	-	-
1.4	<b>on</b>	off	<b>on</b>	<b>on</b>	off	<b>on</b>	-	-
1.5	off	<b>on</b>	<b>on</b>	<b>on</b>	off	<b>on</b>	-	-
1.6	off	<b>on</b>	<b>on</b>	off	<b>on</b>	off	-	-
1.8	<b>on</b>	<b>on</b>	<b>on</b>	off	<b>on</b>	off	-	-
2.0	off	<b>on</b>	off	off	off	off	-	-
2.5	off	off	off	<b>on</b>	<b>on</b>	off	-	-
3.0	<b>on</b>	<b>on</b>	off	<b>on</b>	<b>on</b>	off	-	-
3.5	off	off	<b>on</b>	<b>on</b>	<b>on</b>	off	-	-
4.0	<b>on</b>	<b>on</b>	<b>on</b>	<b>on</b>	<b>on</b>	off	-	-
4.5	off	<b>on</b>	<b>on</b>	off	off	off	-	-
5.0	<b>on</b>	<b>on</b>	<b>on</b>	off	off	off	-	-
7.0	off	off	off	<b>on</b>	off	off	-	-
8.0	<b>on</b>	<b>on</b>	off	<b>on</b>	off	off	-	-

9.0	off	off	on	on	off	off	-	-
10.0	on	on	on	on	off	off	-	-
Time constant								
"Gain"-DIP switch settings on/off (fig. 12).								
uS	1	2	3	4	5	6	7	8
3.18off / 7950off	-	-	-	-	-	-	on	on
3.18off / 7950on	-	-	-	-	-	-	on	off
3.18on / 7950off	-	-	-	-	-	-	off	on
3.18on / 7950on	-	-	-	-	-	-	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 (1-8) should be on, on, on, off, on, off, on, on. Note: If the normal standard RIAA equalization is preferred then DIP-switch "Gain" 7 and 8 must always be set at "on".

### 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 0.10mV (=100uV), gain is set at 0.10mV. For MC/MM nominal output levels above 10mV, gain is set at 10mV). Both channels must be set identically unless balance adjustment is necessary. Select only gain settings specified in table 2.

### Gain settings

Settings specified in table 2 apply for a CT100 nominal output level of 1 Volt ( $V_o=1V$ ) unbalanced and 2 Volts balanced. (For other CT100 output levels, see [OTHER INFORMATION](#)).

### 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). CT100 can equalize channel difference by setting different gain for the two channels. Most easily by alternate listening and adjusting. Remember to turn the volume fully down when the DIP-switches are operated. Otherwise your audio equipment may be damaged by noise transients.

### Time constants 3.18uS and 7950uS

It can be most advantageous to activate the time constant 7950uS (20Hz) as a high pass filter (RIAA/IEC) to minimize warp and infrasonic signal interference. The time constant 3.18uS (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 3.18uS time constant DIP switch (7) should be left in its default "on" position (meaning filter "off"). Both channels must be set identically.

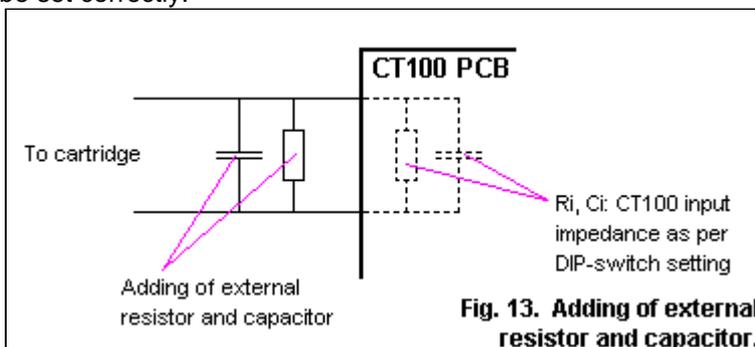
## OTHER INFORMATION

### Recommended cartridges

Practically all MC/MM cartridges will work well with CT100. Ask for the cartridge manufacturer's specifications for nominal resistive and capacitive input loading and nominal output level for your MC/MM cartridge so the CT100 DIP-switches can be set correctly.

### Other values of $R_i$ and $C_i$

Other values of  $R_i$  and  $C_i$  than specified in table 1 and 2 can be obtained. Other resistors and/or capacitors can be mounted (soldered) directly onto the CT100 input terminals, in parallel with the signal. Keep the leads short. (Remember to include the resistance and capacitance set by the CT100 DIP-switches). See figure 13.



### **Other gain settings**

The gain setting need not provide a CT100 nominal output level of 1 Volt ( $V_o=1V$ ). Gain can be adjusted so the CT100 output level matches the required input signal level of preamplifiers etc. Select only gain settings specified in table 3. Gain should not be set so the CT100 output level at OUT1 and OUT 2 is unnecessarily high, as this will reduce the signal to noise ratio. (For example, if gain is set at 0.10mV and the cartridge nominal output level is 1.0mV, the signal to noise ratio is reduced by 20dB = 10 times).

### **DC output offset**

Normally a low DC output offset will occur on the output terminals OUT 1 and OUT 2. Typically 1 mV to 3mV. The magnitude of the output offset depends on whether the CT100 servo amplifier has settled. Therefore, the output offset cannot be measured until 10-20 seconds after CT100 has been switched on). If CT100 is connected to a preamplifier and a power amplifier which both can amplify DC voltage, it must be estimated whether the resulting DC output offset voltage applied to the loudspeakers is too high. If necessary, a capacitor can be inserted in the signal path to block the DC offset voltage. (The capacitor value is calculated in each individual case to allow for source/load impedance values and the desired low frequency roll-off. Make sure only to use high quality audio-grade capacitors). If a totally steady DC output offset voltage is most important, it is recommended that the high pass filter 7950uS (20Hz), table 2, is activated.

### **Oscillation**

There is always a risk that hi-fi equipment and its interconnect cables can cause oscillation when connected. The reason is that inevitable capacitance and inductance (capacitors and inductors) may force high frequency signals into phase shift so the amplifier acts as an oscillator. CT100 is designed with special Integrated Circuits, which are stable with any load connected to OUT 1, and OUT 2. Screened cables from the CT100 output are required.

#### **WARNING!**

Screened cables are required for CT100 signal input IN 1/IN 2 and signal output OUT 1/OUT 2 in order to prevent oscillation.

However, if unscreened wires are used anyway, signal wires and their corresponding screen wires must be twisted with at least one turn per centimeter.

### **Hints**

- 1 . Power "on"/ "off" must be switched by a double-pole switch to ensure that both the positive and the negative voltage are switched simultaneously as required. [See fig. 8.](#)
- 2 . DIP-switches must be operated full "Down" (fig. 12). If contact changeover is incomplete with insufficient make or break action, random noise transients will occur.
- 3 . Do not touch the two gold-plated screening houses close to IN 1/IN 2 when CT100 is switched "on". (Temperature influence may disturb the CT100 servo amplifier stability, which causes an unsteady DC output offset).
- 4 . Power amplifiers, which can amplify DC voltage, should be avoided. They represent a potential risk.
- 5 . Never clean or lubricate the DIP-switches. It may affect the sonic performance seriously and even produce noise transients.
- 6 . Do not flex the CT100 PC board. This will damage the SMD components by cracking and/or breaking their solder joints.
- 7 . Do not remove CT100 from the metal screening plate.
- 8 . Never remove the sealing on the two trimmers.
- 9 . When powering with batteries or rechargeable batteries, the leads connecting to CT100 should be short. Otherwise the effect of the capacitors C1/C2 is reduced. [See fig. 8.](#)
- 10 . The CT100-pow1 mains adapters have long leads which may pick up hum. Therefore coil up excessive lead sections close to the adapter housings. Squeeze the coil (with a rubber band) to minimize the air gap.
- 11 . When turning CT100 on for the very first time make sure to connect its outputs to an amplifier that has a volume control. Turn the volume fully down and turn it up slowly in order to prevent wrong wiring etc. from damaging your other audio equipment.

### **Modifications**

Do not modify the CT100 circuit. CT100 is already optimized. This is confirmed by listening tests and by

measurements.

**Maintenance**

None. (The two multiturn trimmers for "input bias current cancellation are adjusted by DACT. Readjustment is unnecessary).

**Service**

If servicing is required, contact your CT100 dealer and arrange for further action.