

Steel Mixer™

User Manual

Revision 1.5



*Designed by
Mark Dunn*

Website : <http://www.steelmixer.com>

The Steel Mixer is a UK manufactured product.

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Thank you for purchasing the Steel Mixer. It is my sincere hope that this unit will assist you towards achieving the very best steel guitar sound possible and operate trouble free for many years. For over 20 years I've worked as a musician and electronics engineer. This product is something I feel proud to have brought to the market, I look forward to watching other musician's use it and hearing the sounds it will help to produce. I would like to thank my wife and family for their support throughout this project and a number of friends who have freely given their time to help with development and promotion.

Before using the Steel Mixer I would highly recommend you read the manual to gain some understanding of how the product functions. By understanding the basic way the product works you should be able to maximise its capabilities.

Mark Dunn

*** WARNING ***

Infringers beware: This device is Patent Pending.

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Important Safety Instructions

CAUTION : To reduce the risk of electric shock. Do not remove the covers of the Power Supply, Steel Mixer Floor Box or Remote Box. No user serviceable parts inside. Refer servicing to qualified service personnel.

WARNING : To reduce the risk of fire or electric shock. Do not expose the appliance to rain or moisture.

- 1) Read these instructions.
- 2) Keep these instructions.
- 3) Heed all warnings.
- 4) Do not use this apparatus near water.
- 5) Clean only with dry cloth.
- 6) Do not operate near heat sources, such as radiators.
- 7) Protect power cord from being walked on or pinched.
- 8) Unplug this apparatus during lightning storms.
- 9) Unplug this apparatus when unused for long periods of time
- 10) No naked flame sources should be placed on the apparatus.
- 11) Do not use apparatus with a damaged or frayed power cord.
- 12) Replace mains plug fuse ONLY with the identical rupture value.

Legal Disclaimer

The Steel Mixer has been designed to work in conjunction with other units and careful consideration has been given to this purpose. However, BY USING THIS EQUIPMENT THE USER ACCEPTS THAT THERE IS A RISK OF DAMAGE TO OTHER EQUIPMENT AND NO LIABILITY WILL BE ACCEPTED FOR THIS DAMAGE. Typically, damaged may be caused if: The Steel Mixer or a unit connected to it develops a fault; The Steel Mixer is incorrectly wired to an attached unit; The Steel Mixer or an attached unit is incorrectly powered; The Steel Mixer or an attached unit is misused or not maintained in a good state of repair.

Note: The Steel Mixer warranty only covers faults caused by faulty manufacturing or rogue component failure.

Basics

The Steel Mixer is an audio device for use with a guitar or steel guitar (specifically). It is used in conjunction with a delay effects unit, reverb effects unit and a guitar amplifier. It provides the means for interconnecting the units and easy access to the delay and reverb level controls. Using switches, common connection configurations are selectable without the need to change the physical wiring or effect settings. The Steel Mixer does not pass the unaffected signal (also referred to as the dry signal) through the effect devices: Preserving the quality of the dry signal is paramount in the design.

Box Contents

- 1 Steel Mixer (Floor unit and Remote unit)
- 1 Power supply
- 1 Power lead
- 1 Manual (Supplied on CD)
- 1 Neoprene strips for Floor Box

Accessories

- 1) Floor Plate :- For mounting the Steel Mixer, Volume Pedal, Delay Pedal and Reverb Pedal. Allows the Steel Mixer to be pre-wired; ideal for live work.
- 2) Carrying Case :- Holds the Steel Mixer, common volume and effects pedals, mounted on the Floor Plate; ideal for live work.
- 3) Connection Lead Set :- George L's jack leads and DC power leads made up to suit the Steel Mixer and Floor Plate arrangement.
- 4) Volume Pedal Power Lead :- A custom lead made with connectors to power up a Telonics* FP-100 or Hilton* new type (24VDC) volume pedal.

*Note: Telonics and Hilton are fine companies that produce good products. No connection or recommendation is implied by the use of their names.

Contact Info

Website : <http://www.steelmixer.com>

Email : mail@steelmixer.com

The Inspiration

Have you ever noticed that your guitar sounds great when it's plugged straight into a combo with just your volume pedal in-line? Yes..... Then you add a delay or reverb pedal.... At first you're impressed with the fat, full sound that's produced with the added effect. Then you go to a gig..... Things don't work out how you expected! That great sound you had in the practice room isn't there!

After several years of playing guitar and steel guitar through many different amplifiers, effect units and combinations of equipment, in the repair workshop and in a gigging situation one simple fact became clear: The best guitar sounds are often produced using a classic design of amplifier (in good original working order) with no effects. Adding almost any effect in-line deteriorates the basic sound. I started to consider, why? And could there be a solution that would preserve the basic sound while allowing room simulating effects to be added?

Without doubt a good quality reverb and delay effect can greatly enhance the sound of the guitar or steel guitar; if adjusted correctly. Modern digital delay and reverb effects units are capable of producing very controllable and high quality effect emulations. Ironically, the more modern nicer sounding effects often introduce latency (a small delay) into the signal chain. Latency is insignificant in terms of its affect on the delay or reverb, but appears to degrade, as perceived by a musician, the dry element of the sound. For this reason some musicians use older low quality effects units that don't introduce latency and accept the compromise of a lower quality effect. Adding effects in series often compounds the latency in the signal and remains present even when the effect is bypassed.

The Steel Mixer was designed to make any deterioration in the raw guitar signal negligible, to introduce absolutely no latency, while enabling delay and reverb effects to be integrated into the sound. By using the Steel Mixer you really can have the best of both worlds, a great dry sound, combined with high quality modern digital reverb and delay.

How Does It Work?

The Steel Mixer circuitry uses around 250 carefully selected components. The fundamental principal and signal flow is relatively simple. But, to make the unit work in a way that is useful to the musician, and integrates with the steel guitar and effect pedals required some careful consideration during the design process.

Normal Mode

The block diagram Figure 1 (see back pages of this section) shows the circuit arrangement and the signal flow when the unit is in Normal (N) Mode. This mode is designed to mimic the traditional arrangement where a volume pedal, delay pedal and reverb pedal are connected as a series chain. i.e. Simply daisy-chained together, with the volume pedal first in the line and the reverb at the end of the line.

****Important *** It is essential that the delay and reverb effects units are configured / adjusted so that they ONLY output the effect. The unaffected or dry sound must be completely removed from the effect output. The Steel Mixer website provides more information on how to set up the more common effects units up to achieve this.*

With the delay and reverb level controls set to zero, a guitar signal will pass straight through the Steel Mixer without being amplified, with no latency and with negligible frequency / phase modification. By rotating the delay or reverb controls clockwise, the selected effect will be added to your guitar sound.

In this mode the signal sent to the delay pedal is purely the dry guitar sound; this is delayed according to the settings on the delay pedal. However, the signal sent to the reverb is a combination of the dry guitar signal and delay pedal output. Hence the reverb pedal output is a reverb applied version of this. This combination of signals would be created when effects are simple daisy-chained together. The main difference is with the daisy-chained connection the summation of the effects pedal latency is added to the dry signal; whereas, by using the Steel Mixer absolutely no latency is added to the dry signal.

Although Figure 1 shows the reverb return as a mono return, the reverb return on the Steel Mixer is stereo. A reverb effect is normally enhanced by using a stereo amplifier configuration. The Steel Mixer therefore has two main outputs allowing two amplifiers to be driven with the stereo signal. When using a mono reverb, only one reverb return is used and the associated main output fed to the guitar amplifier (marked "MONO").

Note:- With reference to Figure 1:

A "Buffer" is a device that allows a signal to be fed to multiple circuit paths.

A "Cond." is short for Conditioner; this modifies a signal to make it more suitable for the circuitry it's feeding.

A "Summing Point" is a point in the circuitry where signals are added together.

Pre-delay Mode

When high levels of reverb are added to a guitar signal the attack of individual musical notes can become "cluttered" with the reverb sound. In this situation if the reverb is significantly delayed, the attack of the sound can be preserved. When a delay is placed before a reverb effect this is referred to as Pre-delay. Using a normal pedal arrangement the pre-delay effect is not practical as it requires some rewiring and significant re-adjustment of the pedal controls. This effect is normally only used by players with rack based effects units. Using a clever switching system the Steel Mixer automatically re-configures the pedal wiring and levels so that this mode is available at the flick of a switch.

The block diagram Figure 2 (see back pages of this section) shows the circuit arrangement and the signal flow when the unit is in Pre-delay (P) Mode.

In this mode the delay level control is not used and will have no effect on the sound. The reverb level control will function as normal.

Double Mode

Using a delay pedal it is possible to create an effect that makes a player appear to be picking at double the speed he or she is in reality. To create this effect does require practice and its practical use is limited. But as a special effect used once or twice during a performance it can really add the “Wow factor”. Under normal circumstances significant re-wiring of the pedals is required and issues of overloading the delay pedal input are often associated with this configuration.

Using the Steel Mixer and pressing just one button completely reconfigures the volume pedal and effects pedals so this effect can be achieved. User adjustable preset controls allow the repeat level and Double Mode volume to be set. The player only has to adjust the delay time to suit the song. A footswitch on the Steel Mixer floor box allows fast access to this mode, and when engaged overrides all other modes. The reverb operates as normal when this mode is engaged.

The block diagram Figure 3 (see back pages of this section) shows the circuit arrangement and the signal flow when the unit is in Double Mode.

The Steel Mixer website shows typical delay settings used to achieve this effect and a demonstration.

Added Value!

Having built a device that allowed the player to configure effects in a practical way it was logical to add the finishing touches that make the difference in a live situation. Easy access to the reverb and delay levels was an essential requirement identified during the design process. For this reason the Steel Mixer has two parts: A Floor Box that sits near the volume pedal and a Remote Box that clips to the leg of the steel. The two boxes are connected by a fixed cable. Splitting the Steel Mixer into two boxes increases the production cost but makes the unit more practical for the musician.

A 9VDC power supply with three outlets is included so the pedals interfaced into the Steel Mixer can be powered up without requiring additional power supplies or batteries. This reduces onstage wiring and ensures the pedals have a steady supply.

A +/- 12VDC or 24VDC supply outlet is provided for use with compatible devices. This may be used to power up volume pedals and other equipment that can be used in conjunction with the Steel Mixer.

A tuner output is provided that is tapped off before the delay and reverb effects are added. A normal guitar tuner may be plugged into this socket. Since this is a buffered output any loading that the tuner has will not affect the guitar signal through the Steel Mixer. In Normal and Pre-delay modes the volume pedal is in circuit before the tuner is tapped off. In Double mode the tuner is tapped off at the guitar input. The tuner output is a high quality output similar to the main outputs and therefore may also be used as a dry signal only output for recording purposes.

The Steel Mixer is supplied with a power supply that can be connected to a wide range of mains voltages. The normal DC plug fitted to this supply has been replaced with a more rugged connector that twist locks together.



Steel Mixer Floor Box



Steel Mixer Remote Box

Figure 1

Steel Mixer "Normal" Mode Block Diagram and Signal Flow

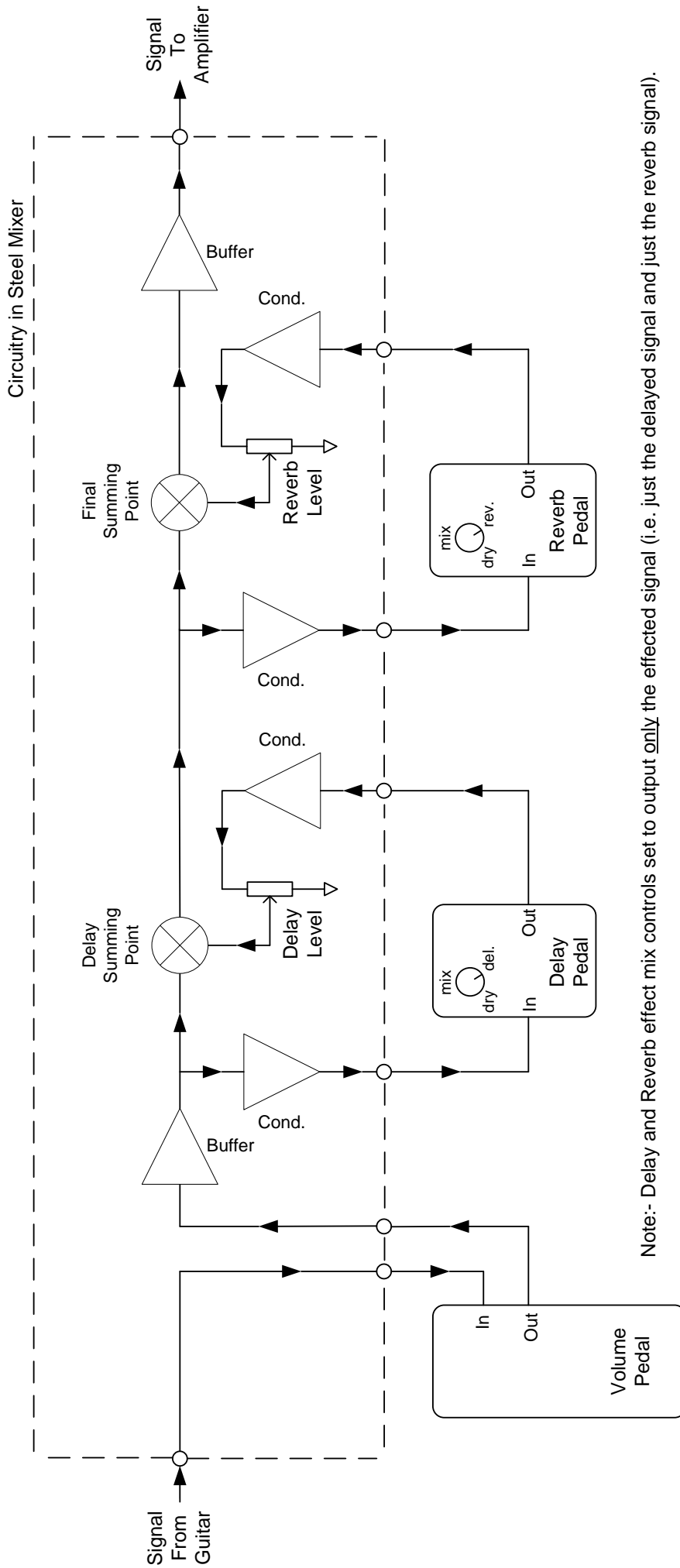
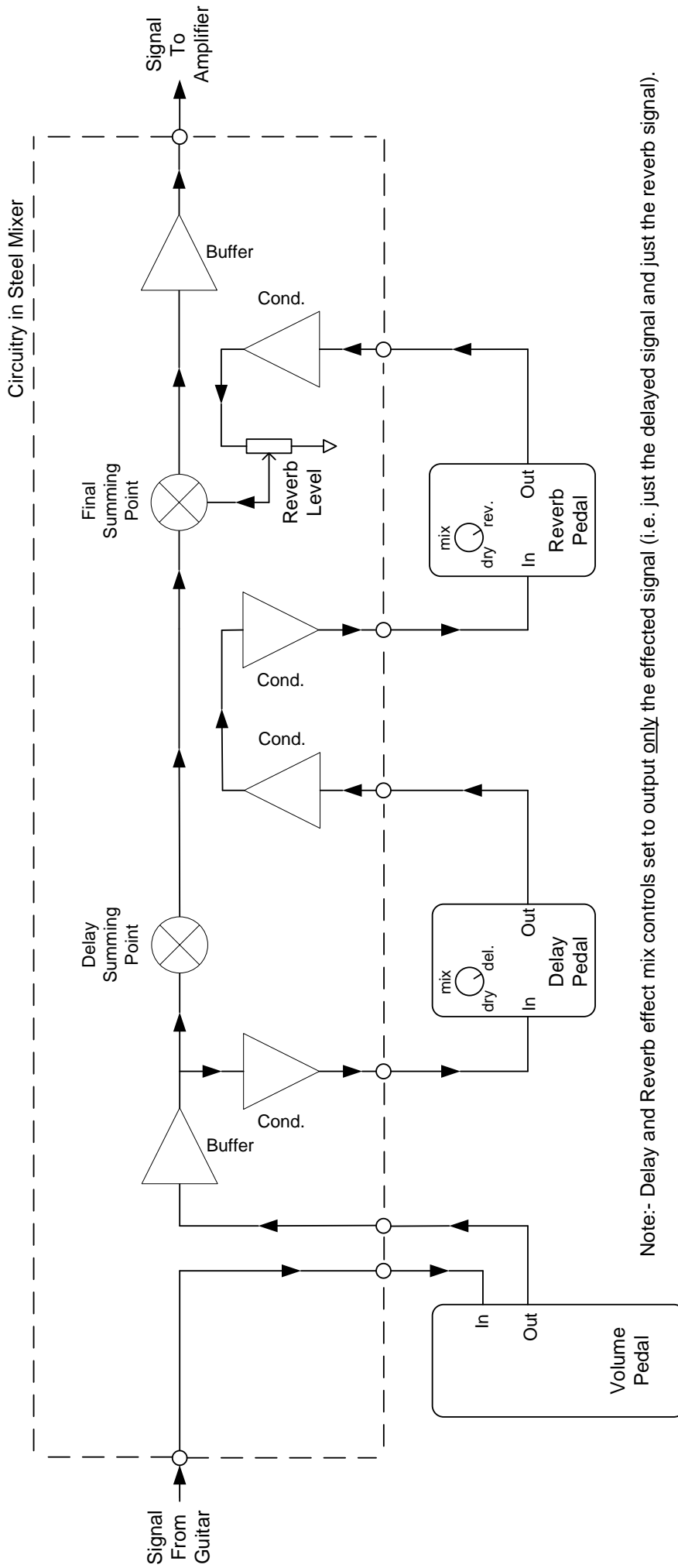
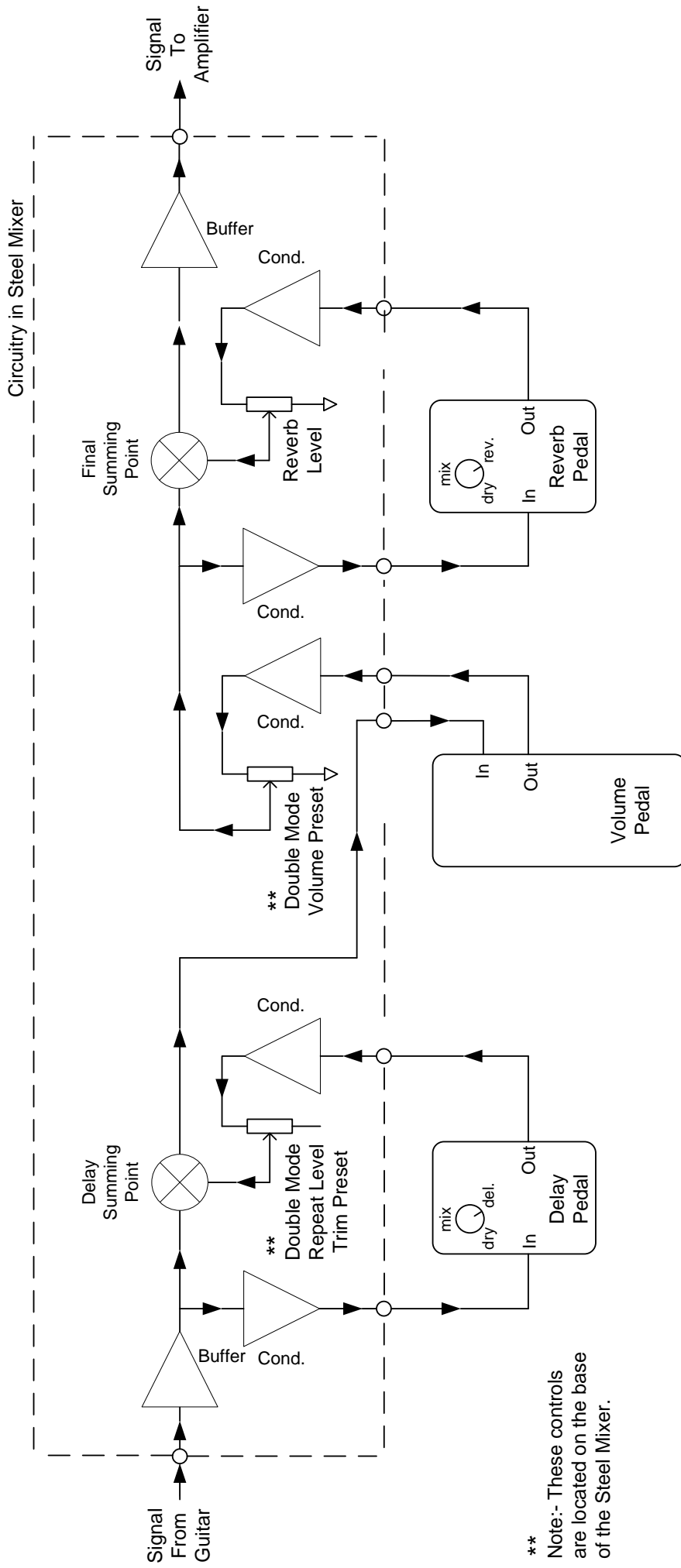


Figure 2 Steel Mixer “Pre-Delay” Mode Block Diagram and Signal Flow



Note:- Delay and Reverb effect mix controls set to output only the effected signal (i.e. just the delayed signal and just the reverb signal).

Figure 3 Steel Mixer “Double” Mode Block Diagram and Signal Flow



** Note:- These controls are located on the base of the Steel Mixer.

Note:- Delay and Reverb effect mix controls set to output only the effected signal (i.e. just the delayed signal and just the reverb signal).

Section 2 – USING THE STEEL MIXER

The picture below shows the Steel Mixer set up with the steel guitar.



First Time Use

The Floor Box contains the Steel Mixer circuitry; the pedals are connected to the box using 1/4" jack to jack leads. The block diagram Figure 4 (see back pages of this section) shows the connection to the pedals. Although the diagram shows pedal type effects, a 19" rack mounting delay, reverb or effects processor could be used.

I would suggest that you power-up and get familiar with the operation of the delay and reverb units as standalone devices before using them with the Steel Mixer.

**** Here's the important bit again!*** It is essential that the delay and reverb effects units are configured / adjusted so that they ONLY output the effect. The unaffected or dry sound must be completely removed from the effect output.*

When you have successfully set up the delay and reverb units as standalone effects and achieved the effect only sound, make sure you save the settings or make a note of the controls.

If you are assembling the Steel Mixer and effects units onto a pedal-board I would suggest you check each lead works before using it. This simple procedure is often helpful because a lead failure may not be immediately obvious.

Power-up Procedure

When all connections to the Steel Mixer have been made and the unit is used for the first time, follow this procedure:-

- 1) On the Steel Mixer Remote Box set the Mode switch to “N” (Normal mode) and check the Reverb and Delay controls are set to “0” (Fully anti-clockwise).
- 2) Apply power to the Steel Mixer and attached effects units. Within 2 seconds the Steel Mixer will be ready.
- 3) On the Steel Mixer Floor Box use the footswitch to ensure the “Double Mode ON” LED is off. *The steel Mixer should now be in Normal mode.*
- 4) Check that all attached effects units have finished their power-up sequences. Set the effects controls to achieve effect only as previously discussed.
- 5) Check that the Guitar Amplifier(s) gain / volume controls are set to a low setting. Apply power to the amplifier(s). When the Volume pedal is increased the dry sound of the guitar should be heard.
- 6) When the Reverb and Delay controls on the Remote Box are increased to the 12 o’clock position, a typical amount of effect should be heard. When using 19” rack effects, the effect may be excessive or very low in this position. Adjust parameters on the effects unit so that the 12 o’clock position provides an average delay and reverb level. If you are using pedal type effects no level adjustment should be necessary.

In normal use this procedure need not be followed to the letter, but the general principal of powering up effects first and checking the guitar amp gain etc. makes sense.

Using the Modes

Normal Mode

The procedure above describes how to set the Steel Mixer to operate in Normal mode. In this mode the controls on your delay and reverb pedal will affect your sound as if the effects they were simply chained together. Only the effect mix or level control will be different; this control is now more conveniently located on the Remote Box. With the delay and reverb controls set to “0” you should hear a nice dry steel sound as if you were plugged straight into the amp with no in-line effects. As you increase the delay and reverb controls on the Remote Box the effect should be heard without changing the tone of the dry signal. If as you increase either the delay or reverb level you hear a

change in tone, it is more than likely either the delay or reverb pedal is outputting a dry signal with the effect. This situation must be resolved before using the Steel Mixer or you will not achieve a good sound.

Pre-delay Mode

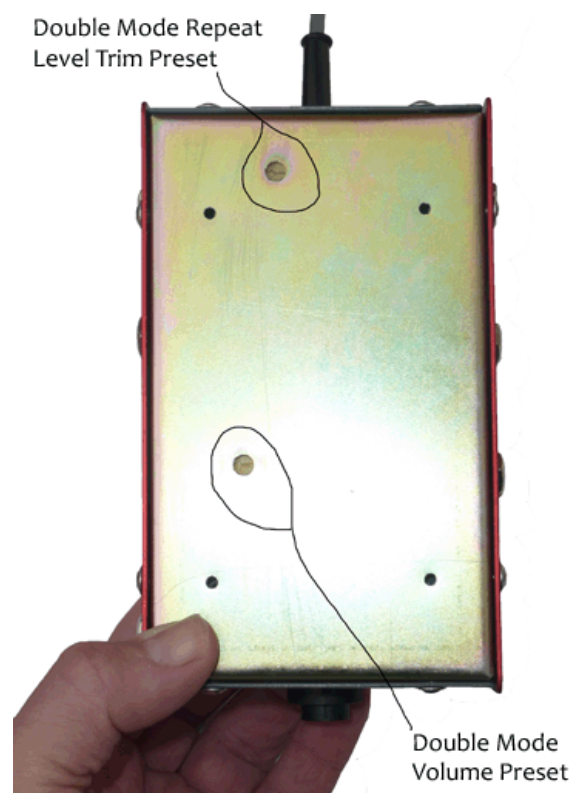
To operate the Steel Mixer in Pre-delay mode simply turn the “Mode” switch on the Remote Box to “P”. The Steel Mixer circuitry will instantly be re-arranged into this configuration.

To get a feel for this mode, pick and quickly damp a single string. You should hear the reverb effect come in after a short delay. Changing the delay time on the delay pedal will directly affect the time it takes for the reverb to be heard. You may need to experiment with this mode before using it. The delay time and reverb level can be critical to make it work effectively. When adjusted correctly you shouldn't hear the delayed reverb effect; it should sound like the guitar is quite dry, but strangely sits nicely in the mix.

Double Mode

When using Double mode the delay feedback control must be set so that only one repeat is heard (usually the minimum setting). The delay time will be related to the picking speed (crotchets [$\div 1$], quavers [$\div 2$], etc) and tempo of the song. E.g. If the song tempo is 150bpm and you are picking crotchets the time interval between notes would be $(60 \div 150) \div 1 = 400\text{mS}$. The key point here is; you don't set the delay to half this time to generate the 'extra', note you set it 1.5 times the interval, i.e. 600mS. This means, the note that fills in between notes is not a replica of the previous note; it's a replica of the note that you played two steps back. Confused! After you've read this section look at the demo on the Steel Mixer website; this should help.

On the base of the Steel Mixer are two additional preset controls. The picture below shows these controls.



These presets can be adjusted using a small screwdriver. Note, use a screwdriver or trimming tool that fits the presets and do not apply excessive force when reaching the end stops. Once adjusted for a particular delay unit these should not need to be further adjusted or altered during a performance.

Adjust the “Double Mode Repeat Level Trim Preset” first. This sets the level of the repeated note being generated by the delay unit. This preset is only a trim control and does not span down to zero output. It quite simply allows the output of quieter pedals to be slightly increased and the output of louder pedals to be slightly decreased. Before adjusting this control; check that the delay level on the Remote Box in Normal mode is operating around the 12 o’clock position for a typical delay level. Then switch to Double mode and use this preset to trim the repeat level.

Having achieved a good balance between the real and delayed sound the Double Mode Volume Preset should be now be adjusted. This is used to balance the Double mode volume against the Normal mode volume. With the “Mode” switch on the Remote Box set to ‘N’; use the footswitch on the Floor Box to switch between the modes. Adjust the preset so that the volume while playing is the same. *Hint* – Play a song that uses both modes.

Effect Modes 1 & 2

As currently supplied the Steel Mixer can only be operated in Normal, Pre-Delay and Double Mode. These modes do not add effects they simply rearranged the attached effects units to achieve the required sound. A sub-board is planned for development that will be integrated with the existing Steel Mixer electronics. The sub-board will generate steel guitar specific effects that will be accessed using the Mode Switch positions 1 and 2. If the sub-board is not fitted (as currently supplied), position 1 will also select Normal Mode and position 2 will also select Pre-delay Mode.

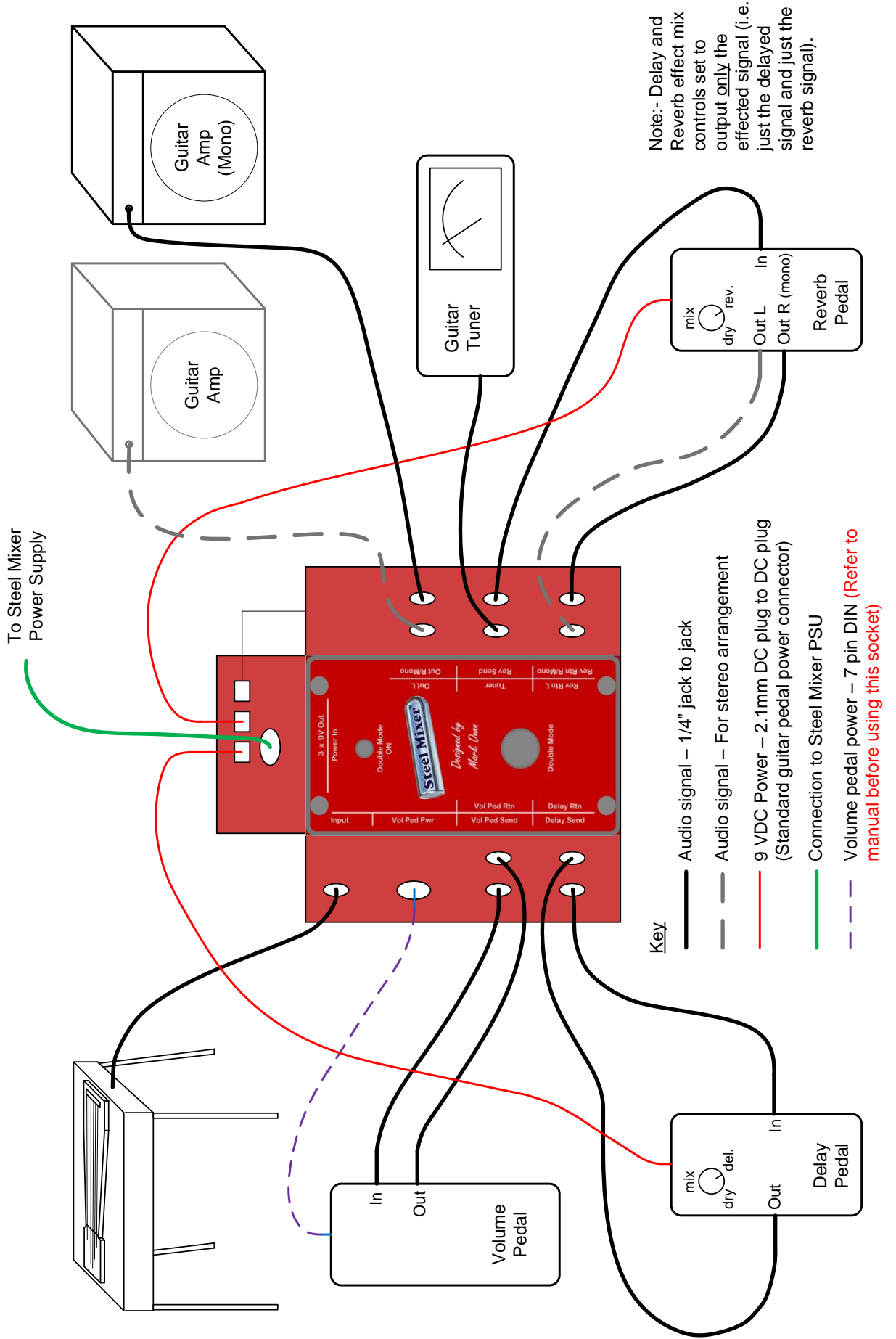
Volume Pedals

The Steel Mixer can be used with potentiometer (pot) based or electronic volume pedals. Using the Steel Mixer with a pot type pedal will allow long leads to the amplifier to be used without degrading the sound. Sadly it will not make a scratchy pot sound better!

In Normal and Pre-delay modes the volume pedal is placed by the Steel Mixer switching system at the front of the chain. See Figures 1 and 2. Note that the Steel Mixer does not buffer the signal before sending it to the volume pedal in these two modes. This is an important part of the design as some pickups sound nicer when loaded by the volume pedal.

In Double mode the output from the guitar isn’t immediately sent to the volume pedal. See Figure 3. Due to the lack of the volume pedal load the EQ may be slightly altered in this mode. A small amount of tone shaping has been added to compensate. The tone shaping is only applied in Double mode.

Figure 4 Steel Mixer – Floor Box – Connections to the Pedals



Power Supplies

The Steel Mixer power supply can be connected to mains supplies in the range 100 – 240VAC 50-60Hz. The power supply provided is a switching type design and provides a regulated 12VDC supply to the Steel Mixer Floor box. Switching supplies are generally very reliable when connected to a stable mains supply e.g. a domestic outlet. Similar supplies are commonly used in TV's and PC's.

From the attached power supply the Steel Mixer generates a +/- 12VDC supply for the internal electronics, and for external equipment a regulated 9VDC supply and an isolated +/- 12VDC or 24VDC supply.

The regulated 9VDC supply has been designed to power-up pedal based effects that use this supply voltage. The Steel Mixer outputs this supply using the same type of DC power connector. Like most of the small 9VDC powered pedals the outer sleeve of the DC power plug is +ve. A DC plug to DC plug lead is required to connect power to a pedal. The Steel Mixer provides three 9VDC power outputs; this allows for a delay, reverb and other pedal. The combined current draw for all pedals should not exceed 300mA. Two DC plug to DC plug leads are supplied with the Steel Mixer.

A 7 pin DIN socket is provided that allows an internally generated +/- 12VDC or 24VDC supply to be accessed. This is an isolated supply; i.e. none of the supply lines are solid connected to earth. This may be used to power-up a volume pedal or other peripheral device that is compatible with this socket. **Before using this socket:-** Check the device is compatible; the Steel Mixer website shows the details of all devices that can be used with this socket.



Steel Mixer power supply with US power lead.

Mechanical Information - Fixing Holes

The Steel Mixer Floor Box has 4 pre-drilled holes on the bottom of the case. The centres of the holes are 96mm x 56mm and drilled to fit a No.6 self tapping screw. **Important Information** – Self tapping screws longer than 8.0mm (5/16”) could touch the internal circuit board and may cause both mechanical and electrical damage. If you use these fixing holes ensure your screws do not protrude more than 8.0mm into the Floor Box case. Note: Sticky backed neoprene strips are supplied with the Steel Mixer, these should be stuck on the bottom of the Floor Box case should you wish to use it as a free standing unit.

Optional Extra's

Floor Plate

An aluminium Floor Plate can be supplied to mount the Steel Mixer, two effects pedals and the volume pedal. By pre-wiring the interconnections and mounting the parts onto the plate a more practical solution is created for live work. The plate also helps protect connections to pedals. The picture below shows the Steel Mixer Floor Box and effects pedals mounted on the plate.



George L's connectors and cable (as shown in the picture above) can be supplied to make connections between the Steel Mixer and pedals. These connectors are well suited for this application and make a neat job.

Trouble-Shooting

- 1) With power applied to the Steel Mixer and all connections leads connected as shown in Figure 4: Can you hear any sound from your amplifier? YES – Go to step 3. NO – Continue to the next step.
- 2) Operate the Double Mode Switch on the Steel Mixer Floor Box. Does the Double Mode ON led light when the switch is operated? YES – Go to step 3. NO – This normally indicates the unit is not receiving power. Check the green led on the PSU is lit, if not; check the mains supply to the unit and check all mains power supply connectors are made correctly. Finally, if applicable; check the fuse in the plug of the mains power lead. If the previous checks have been made try another Steel Mixer power supply. If a known healthy supply does not make the Double Mode ON led light the Steel Mixer should be returned to the dealer for testing and repair.
- 3) Does the Double Mode ON led flash when turned on? NO – it stays lit, go to step 4. YES – If the Double Mode ON led flashes you more than likely have a short circuit on the 9VDC output. In this situation you should also see the green led on the PSU flashing and hear an audible click from your amplifier. Remove all the DC plugs from the 9VDC power outputs on the Steel Mixer. If the flashing stops, this is good news and means the fault is external to the Steel Mixer. In this case check the 9VDC leads for short circuits and secondly, reconnect the 9VDC powered effects one by one to find the effects pedal(s) causing the fault. If the flashing does not stop when the 9VDC plugs are removed the Steel Mixer should be returned to the dealer for testing and repair. Note a short circuit on the 24VDC power supply to the volume pedal will not cause this fault; it has short circuit protection at a much lower level and does not cause the main PSU to indicate an overload.
- 4) Check all ¼" jack to jack leads function when used on their own. Check the Steel Mixer is wired as shown in Figure 4. Check that all pedals are powered-up and ON leds are lit if applicable.
- 5) If the problem is with the Delay or Reverb not being heard; check that pedal operates when used on its own. Check the level controls on the Remote Box are in the 12 o'clock position.
- 6) If the unit outputs nothing this may indicate the volume pedal is not connected. Try unplugging the volume pedal; with no volume pedal plugged in the Steel Mixer connects the send to the return (unless the jumper is removed – see website).
- 7) After carrying out the above checks if no output is generated by the Steel Mixer, the unit should be returned to the dealer for testing and repair. Further advice about common problems using the Steel Mixer is published on the website.

GENERAL SPECIFICATION

INPUTS

Guitar Input; Volume pedal return; Delay pedal return; Reverb return R; Reverb return L. These inputs are 1/4" unbalanced jack connections.

OUTPUTS

Volume pedal send; Delay pedal send; Reverb pedal send; Tuner output; Main output R; Main output L. These inputs are 1/4" unbalanced jack connections.

POWER

Power supply mains input, 100 – 240VAC, 47 - 53Hz. Power supplied to Steel Mixer Floor Box; regulated 12VDC, 1.25A, 15W. Twist lock connector fitted to output lead. IEC type mains lead connection to power supply. Power supply unit efficiency: Energy Star Level V compliant. EMC and Safety: CEC 2008 compliant, EISA compliant and CCC qualified. A 1.8m (6') long output lead is fitted to the supply.

Pedal supply output 3 x 9VDC regulated; maximum load 300mA. Socket type 2.1mm effect pedal industry standard polarity connection.

OTHER CONNECTIONS

7 Pin DIN Socket:-

Volume pedal power; use 3 Pin 180deg DIN plug. Provides an isolated +/- 12VDC or 24VDC supply, 125mA per rail max.

Other signals and supplies are available on this connector. Use ONLY with compatible equipment.

SIZE

Floor box : 158L x 93W x 70H - excludes cabling; includes footswitch.

Remote box : 95L x 73W x 80H - excludes cabling ; includes leg clip.

WEIGHT

Steel Mixer Floor box and Remote box :- 0.75kg (1.65lbs)

Steel Mixer PSU + Mains Lead:- 0.31Kg (0.70lbs)