



OWNER'S MANUAL

**THE DEFENDER V50 and V100 GUITAR AMPLIFIERS**



# ENGLISH

## Danger

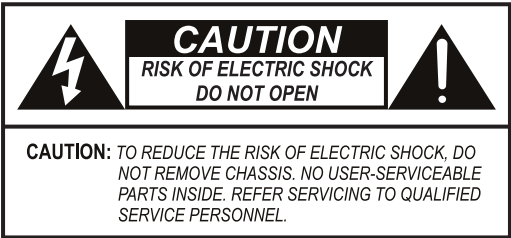
Exposure to extremely high noise levels may cause a permanent hearing loss. Individuals vary considerably to noise induced hearing loss but nearly everyone will lose some hearing if exposed to sufficiently intense noise for a sufficient time.

The U.S. Government's Occupational Safety and Health Administration (OSHA) has specified the following permissible noise level exposures:

DURATION PER DAY (HOURS)	8	6	4	3	2	1
SOUND LEVEL (dB)	90	93	95	97	100	103

According to OSHA, any exposure in the above permissible limits could result in some hearing loss. Ear plugs or protectors in the ear canal or over the ears must be worn when operating this amplification system in order to prevent a permanent hearing loss. If exposure in excess of the limits as put forth above, to insure against potentially harmful exposure to high sound pressure levels, it is recommended

that all persons exposed to equipment capable of inducing high sound pressure levels, such as this amplification system, be protected by hearing protectors while this unit is in operation.



**AVIS: RISQUE DE CHOC ELECTRIQUE-NE PAS OUVRIR.**



THIS SYMBOL IS INTENDED TO ALERT THE USER TO THE PRESENCE OF NON-INSULATED "DANGEROUS VOLTAGE" WITHIN THE PRODUCT'S ENCLOSURE THAT MAY BE OF SUFFICIENT MAGNITUDE TO CONSTITUTE A RISK OF ELECTRIC SHOCK TO PERSONS.



THIS SYMBOL IS INTENDED TO ALERT THE USER TO THE PRESENCE OF IMPORTANT OPERATING AND MAINTENANCE (SERVICING) INSTRUCTIONS IN THE LITERATURE ACCOMPANYING THE UNIT.



APPARATUS SHALL NOT BE EXPOSED TO DRIPPING OR SPLASHING AND THAT NO OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, SHALL BE PLACED ON THE APPARATUS.

## IMPORTANT SAFETY INSTRUCTIONS

1. Read all safety and operating instructions before using this product.
2. All safety and operating instructions should be kept for future reference.
3. Read and understand all warnings listed on the operating instructions.
4. Follow all operating instructions to operate this product.
5. This product should not be used near water, i.e. Bathtub, sink, swimming pool, wet basement, etc.
6. Only use dry cloth to clean this product.
7. Do not block any ventilation openings, It should not be placed flat against a wall or placed in a built-in enclosure that will impede the flow of cooling air.
8. Do not install this product near any heat sources ;such as, radiators, heat registers, stove or other apparatus (including heat producing amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord being walked on or pinched,

particularly at Plugs, convenience receptacles and the point where they exit from the apparatus. Do not break the ground pin of the power supply cord.

11. Only use attachments specified by the manufacturer.
12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer or sold with the apparatus. When a cart is used, use caution when moving cart/apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Care should be taken so that objects do not fall and liquids are not spilled into the unit through the ventilation ports or any other openings.
15. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way; such as, power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally or has been dropped.
16. **WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
17. When the MAINS plug, or an appliance coupler, is used as the disconnect device, the disconnect device shall remain readily operable.



# FRENCH

## Danger

L'exposition a des niveaux eleves de bruit peut provoquer une perte permanente de l'audition, Chaque organisme humain reagit differemment quant a la perte de l'audition, mais quasiment tout le monde subit une diminution de l'acuite auditive lors d'une exposition suffisamment longue au bruit intense. Les autorites competentes en reglementation de bruit ont defini les expositions tolerees aux niveaux de bruits:

DURE EN HEURES PAR JOUR	8	6	4	3	2	1
INIVEAU SONORE CONTINU EN dB	90	93	95	97	100	103

Selon les autorites, toute exposition dans les limites citees ci-dessus, peuvent provoquer certaines pertes d'audition. Des bouchons ou protections dans l'appareil auditif ou sur l'oreille doivent etre portes lors de l'utilisation de ce systeme d'amplification afin de prevenir le risque de perte permanente de l'audition, Dans le cas d'expositions superieures aux limites precitees il est recommande, afin de se premunir contre les expositions

aux pressions acoustiques elevees potentiellement dangeereuses, aux personnes exposees aux equipements capables de delivrer de telles puissances, tels ce systeme d'amplification en fonctionnement, de proteger l'appareil auditif.



CE SYMBOLE A POUR BUT D'AVERTIR L'UTILISATEUR DE LA PRESENCE DE VOLTAGE DANGEREUX NON-ISOLE A L'INTERIEUR DE CE PRODUIT QUI PEUT ETRE DE PUISSANCE SUFFISAMMENT IMPORTANTE POUR PROVOQUER UN CHOC ELECTRIQUE AUX PERSONNES.



CE SYMBOLE A POUR BUT D'AVERTIR L'UTILISATEUR DE LA PRESENCE D'INSTRUCTIONS D'UTILISATION ET DE MAINTENANCE DANS LES DOCUMENTS FOURNIS AVEC CE PRODUIT.



AFIN DE REDUIRE LES RISQUÉ D'INCENDIE ET DE DECHARGE ELECTRIQUE, NE PAS EXPOSER CET APPAREIL A LA PLUIE OU A L'HUMIDITE.

## IMPORTANTES INSTRUCTIONS DE SECURITE

1. Lire avec attention toutes les recommandations et précautions d'emploi avant d'utiliser ce produit.
2. Toutes les recommandations et précautions d'emploi doivent être conservées afin de pouvoir s'y reporter si nécessaire.
3. Lire et comprendre tous les avertissements énumérés dans les précautions d'emploi.
4. Suivre toutes les précautions d'emploi pour utiliser ce produit.
5. Ce produit ne doit pas être utilisé près d'eau, comme par exemple baignoires, éviers, piscine, sous-sol humides ... Etc.
6. Utiliser exclusivement un chiffon sec pour nettoyer ce produit.
7. Ne bloquer aucune ouverture de ventilation. Ne pas placer le produit tout contre un mur ou dans une enceinte fermée, cela générerait le flux d'air nécessaire au refroidissement.
8. Ne pas placer le produit près de toute source de chaleur telle que radiateurs, arrivées d'air chaud, fourneaux ou autres appareils générant de la chaleur (incluant les amplificateurs producteurs de chaleur) .
9. Ne pas négliger la sécurité que procure un branchement polarisé ou avec raccordement à la terre, Un branchement polarisé comprend deux fiches dont l'une est plus large que l'autre. Un branchement à la terre comprend deux fiches plus une troisième reliée à la terre. Si la fiche secteur fournie ne s'insert pas dans votre prise de courant. consulter un 'électricien afin de remplacer votre prise obsolète.
10. Protéger le cordon d'alimentation de tout écrasement ou pincement, particulièrement au niveau des fiches, des réceptacles utilisés et à l'endroit de sortie de l'appareil. Ne pas

casser la fiche de terre du cordon d'alimentation.

11. Utiliser uniquement les accessoires spécifiés par le constructeur.
12. Utiliser uniquement avec le chariot de transport, le support, le trépied, la console ou la table spécifiés par le constructeur ou vendus avec l'appareil. Lors de l'utilisation d'un chariot, bouger avec précaution l'ensemble chariot/appareil afin d'éviter les dommages d'un renversement.
13. Débrancher cet appareil lors d'orages ou s'il n'est pas utilisé pendant une longue période.
14. Des précautions doivent être prises afin qu'aucun objet ne tombe et qu'aucun liquide ne se répande à l'intérieur de l'appareil par les orifices de ventilation ou n'importe quelle autre ouverture.
15. Pour toutes interventions techniques s'adresser à un technicien qualifié. L'intervention technique est nécessaire lorsque l'appareil a été endommagé de n'importe quelle façon, comme par exemple si le cordon secteur ou sa fiche sont détériorés, si du liquide a coulé ou si des objets sont tombés à l'intérieur de l'appareil, si l'appareil a été exposé à la pluie ou à l'humidité, s'il ne fonctionne pas normalement ou s'il est tombé.
16. **ATTENTION:** Pour réduire le risque d'incendie ou de choc électrique ne pas exposer l'appareil à la pluie ou à l'humidité.
17. Quand la prise MAINS, au coupler, est utilisé pour la source d'alimentation électrique, il est conseillé de garder cette prise facilement accessible.



# FCC Statements

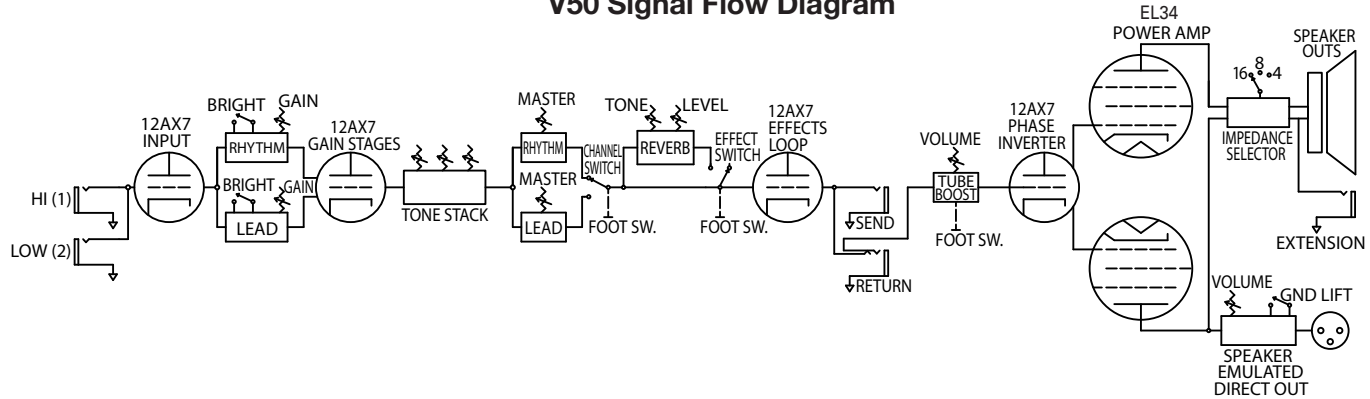
**1. Caution:** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**2. Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

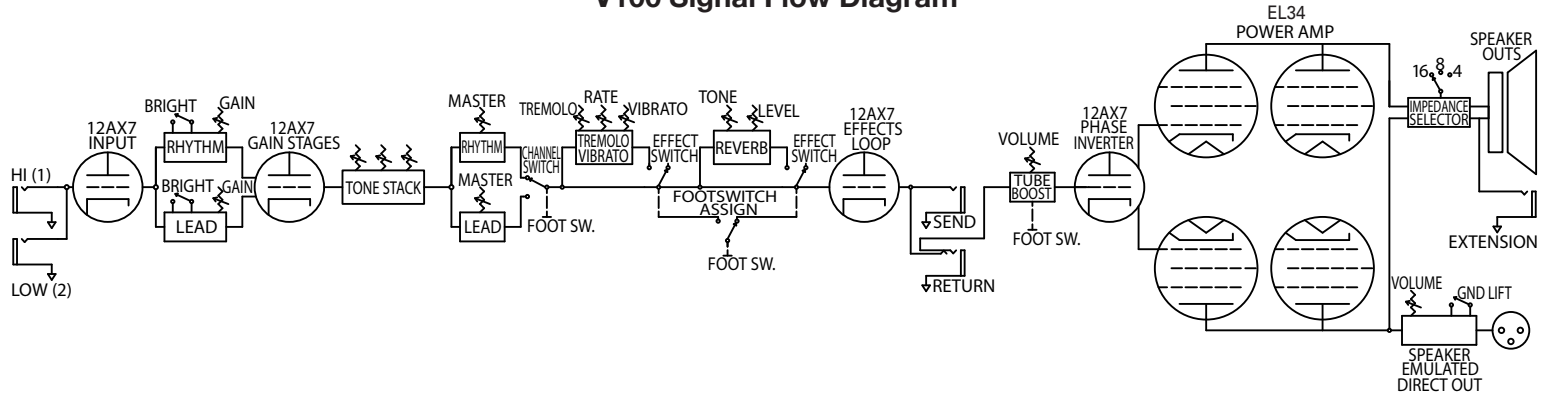
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



## V50 Signal Flow Diagram



## V100 Signal Flow Diagram



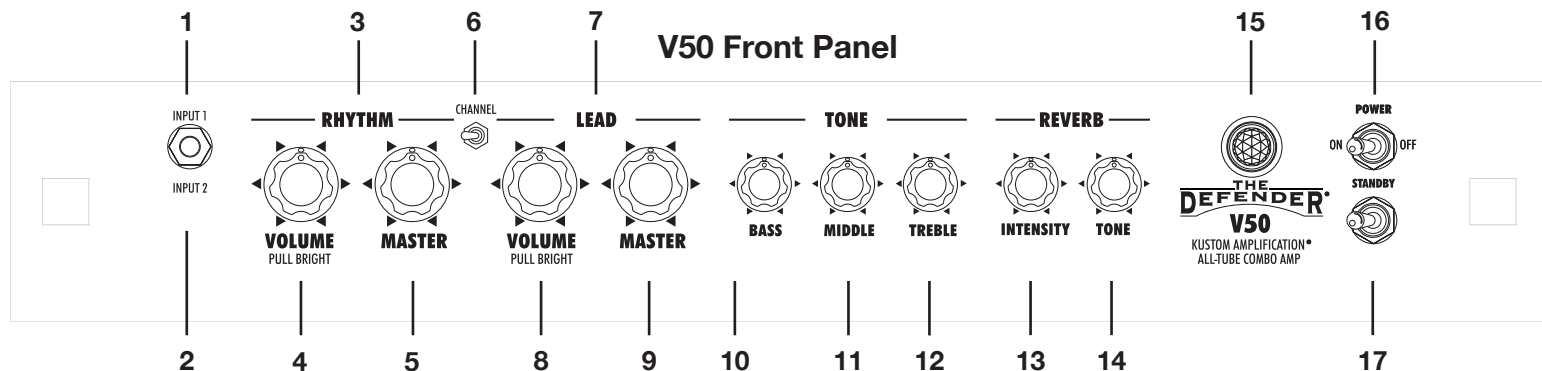
## V50 Specifications

<b>Model</b>	Defender V50	All Tube guitar amp
<b>Tubes</b>	Power Amp Tubes	2-EL34 power tubes
	Preamp Tubes	4-12AX7 preamp tubes(2 preamp, 1 effects loop, 1 phase inverter)
<b>Output Power</b>	50 W RMS	16, 8, or 4 Ohms @ 5% THD
<b>Speakers</b>	1 X 12 inch	Celestion Vintage 30
<b>Input Impedance</b>	1M ohms Input 1, 100K ohms Input 2	
<b>Hum &amp; Noise</b>	-85 dBV	Residual Noise, all level controls 0% (minimum)
<b>System Gain</b>  All measurements taken with 1 KHz input signal, Tone controls flat, Volume Halfway and Master Maximum, Boost on 10, Reverb controls at 0. Measured at speaker jack at 16 ohms unless noted.	48 dB	Rhythm Channel Nominal gain, Input 1, Volume @ 5
	62 dB	Rhythm Channel Maximum gain, Input 1, Volume @ 10
	75 dB	Lead Channel Nominal gain, Input 1, Volume @ 5
	90 dB	Lead Channel Maximum gain, Input 1, Volume @ 10
	+10 dB	Maximum gain of footswitchable Volume Boost
	+3 dB	Gain increase at 1 kHz when Bright is pulled
	-6 dB	Gain decrease when using Input 2
	30-40 dB	Power amp gain(Effects Return to Speaker, depending on Boost)
<b>Nominal Signal to Noise</b>	70 dB	Rhythm Channel, with Volume half and Master Maximum, Boost on 10
<b>Effects Loop</b>	0.15 VRMS (-16 dBV)	Levels w/Boost on 10 to reach full power output
	0.6 VRMS (-4 dBV)	Levels w/Boost on 0 to reach full power output
	Effects Send	Tube driven, Nominal load >10k ohms
	Effects Return	Tube driven, >100K ohm input impedance
<b>Footswitchable Boost</b>	Master Volume Boost	Adjustable from 0 to +10dB boost AFTER the Effects Loop
<b>XLR Direct Output</b>		After power amp with speaker emulation
	Output level	Adjustable from 0 to +10 dBV, nominal -6 dBV
<b>Footswitch</b>	Supplied Footswitch selects Rhythm or Lead Channel, Boost, and Reverb On/Off	
	Uses a standard stereo shielded cable, but can use mono cable for emergency limited functions.	
<b>Power Requirements</b>	USA/Canada	120VAC/60Hz, 180W nominal
	Europe	230VAC/50Hz, 180W nominal
	UK	230VAC/50Hz, 180W nominal
	Australia	240VAC/50Hz, 180W nominal
	Japan	100VAC/50-60Hz, 180W nominal
<b>Dimensions/Weight</b>	mm/kg	475 mm (Height) x 575 mm(Width) x 270 mm(Depth), 20.5kg
	Inches/Pounds	18.75" (Height) x 22.75" (Width) x 10.625" (Depth), 45 lbs



## V100 Specifications

<b>Model</b>	Defender V100	All Tube guitar amp
<b>Tubes</b>	Power Amp Tubes	4-EL34 power tubes
	Preamp Tubes	4-12AX7 preamp tubes (2 preamp, 1 effects loop, 1 phase inverter)
<b>Output Power</b>	100 W RMS	16, 8, or 4 Ohms @ 5% THD
<b>Speakers</b>	2 X 12 inch	Celestion Vintage 30
<b>Input Impedance</b>	1M ohms Input 1, 100K ohms Input 2	
<b>Hum &amp; Noise</b>	-85 dBV	Residual Noise, all level controls 0% (minimum)
<b>System Gain</b> All measurements taken with 1 KHz input signal, Tone controls flat, Volume Halfway and Master Maximum, Boost on 10, Reverb controls at 0. Measured at speaker jack at 16 ohms unless noted.	50 dB	Rhythm Channel Nominal gain, Input 1, Volume @ 5
	64 dB	Rhythm Channel Maximum gain, Input 1, Volume @ 10
	75 dB	Lead Channel Nominal gain, Input 1, Volume @ 5
	90 dB	Lead Channel Maximum gain, Input 1, Volume @ 10
	+10 dB	Maximum gain of footswitchable Volume Boost
	+3 dB	Gain increase at 1 kHz when Bright is pulled
	-6 dB	Gain decrease when using Input 2
	34-44 dB	Power amp gain(Effects Return to Speaker, depending on Boost)
<b>Nominal Signal to Noise</b>	70 dB	Rhythm Channel, with Volume half and Master Maximum, Boost on 10
<b>Effects Loop</b>	0.15 VRMS (-16 dBV)	Levels w/Boost on 10 to reach full power output
	0.6 VRMS (-4 dBV)	Levels w/Boost on 0 to reach full power output
	Effects Send	Tube driven, Nominal load >10k ohms
	Effects Return	Tube driven, >100K ohm input impedance
<b>Footswitchable Boost</b>	Master Volume Boost	Adjustable from 0 to +10dB boost AFTER the Effects Loop
<b>XLR Direct Output</b>		After power amp with speaker emulation
	Output level	Adjustable from 0 to +6 dBV, nominal -3 dBV
<b>Footswitch</b>	Supplied Footswitch selects Rhythm or Lead Channel, Boost, and Reverb On/Off	
	Uses a standard stereo shielded cable, but can use mono cable for emergency limited functions.	
<b>Power Requirements</b>	USA/Canada	120VAC/60Hz, 300W nominal
	Europe	230VAC/50Hz, 300W nominal
	UK	230VAC/50Hz, 300W nominal
	Australia	240VAC/50Hz, 300W nominal
	Japan	100VAC/50-60Hz, 300W nominal
<b>Dimensions/Weight</b>	mm/kg	495 mm (Height) x 686 mm(Width) x 270 mm(Depth), 28.5kg
	Inches/Pounds	19.5" (Height) x 27" (Width) x 10.625" (Depth), 63 lbs



**1) Input 1**—This 1/4" input jack provides the highest gain through the amp. It is considered to be the “normal” input.

**2) Input 2**—This 1/4" input jack provides 6dB lower gain through the amp, so it will allow for a cleaner sound. It can also be useful when using pedals in front of the amp, since it provides them more headroom through the front end. If a guitar is plugged into both Inputs, then they will mix together and will both be 6dB lower in gain.

**3) Rhythm Indicator**—the word “Rhythm” lights up when the Rhythm channel is active.

**4) Rhythm Volume/Pull Bright**—The Rhythm Volume control adjusts the gain at the input of the amplifier when the Rhythm channel is active. It is used in conjunction with the Rhythm Master to adjust the amount of distortion and volume for the channel. For cleaner sounds, this control should be set to lower settings and the Master set higher...for slight breakup, the controls should be set in their middle ranges...for heavier distortion, set the Rhythm Volume higher and the Master lower. Pulling the Pull Bright will increase the high frequencies of the signal, while also reducing low frequencies for a chunkier,

tighter attack. This function is very useful for fine-tuning the amp’s tone and feel for different guitars.

**5) Rhythm Master**—The Rhythm Master sets the overall volume of the Rhythm channel, and can be used to balance the volumes between it and the Lead channel. The inclusion of individual Master volumes for each channel means that the Rhythm channel of the V50 can be used for slight breakup sounds at lower volumes, rather than strictly being a “clean” channel. These settings are described in detail in the previous section entitled 4) Rhythm Volume/Pull Bright.

**6) Channel Selector Switch**—When the footswitch is NOT plugged into the footswitch jack, this switch allows the user to select either Rhythm or Lead channels on the V50. If the footswitch IS plugged in, it over-rides the front panel switch.

**7) Lead Indicator**—the word “Lead” lights up when the Lead channel is active.

**8) Lead Volume/Pull Bright**—The Lead Volume control adjusts the gain at the input of the amplifier when the Lead channel is active. It is used in conjunc-

tion with the Lead Master to adjust the amount of distortion and volume for the channel. For cleaner sounds, this control would be set to lower settings and the Master set higher...for slight breakup, the controls would be set in their middle ranges...for heavier distortion, set the Lead Volume higher and the Master lower. Pulling the Pull Bright will increase the high frequencies of the signal, while also reducing low frequencies for a chunkier, tighter attack. This function is very useful for fine-tuning the amp's tone and feel for different guitars.

**9) Lead Master**—The Lead Master sets the overall volume of the Lead channel, and can be used to balance the volumes between it and the Rhythm channel. The interactions between Volume and Master are described in detail in the previous section entitled 8) Lead Volume/Pull Bright.

**10) Bass EQ**—This passive EQ adjusts the low frequency equalization of the amplifier. It interacts with the Middle and Treble as described in the 12) Treble EQ section. For a tighter low end, use the Bass EQ set to lower settings. This is particularly helpful when using the amp at very loud settings. This EQ works for both Rhythm and Lead channels.

**11) Middle EQ**—This passive EQ adjusts the midrange equalization of the amplifier. It interacts with the Bass and Treble EQ as described in the 12) Treble EQ section. For a heavier, more distorted sound, set the Middle lower. For more of a vintage-style, cleaner sound, set the Middle higher. This EQ works for both Rhythm and Lead channels.

**12) Treble EQ**—This passive EQ adjusts the high frequency equalization of the amplifier, but also interacts with the Bass and Middle controls as follows: As the Treble is increased, the Bass automatically decreases and the Middle slides down in frequency. Conversely, if the Treble is decreased, the Bass automatically increases and the Middle slides up in frequency. This interaction is typical of vintage-style passive EQ, and is responsible for the increased effectivity of such a simple system.

**13) Reverb Intensity**—The Reverb Intensity controls the amount of reverb effect in the amplifier. This effect is created by an authentic spring reverb pan, and sounds essentially like playing the amp in a large room. The Reverb can be defeated with the footswitch, or by turning the Intensity control fully counter-clockwise.

**14) Reverb Tone**—A traditional Kustom feature, the Reverb Tone allows the user to fine-tune the sound of the reverb effect. Turning this Tone fully clockwise yields a very bright reverb effect with emphasized “spring.” By turning the Reverb Tone down, a warmer, less-springy sounding reverb effect results. The warmer reverb tone allows for more reverb intensity without dominating the sound.

**15) Jeweled Pilot Light**—Indicates that the amplifier's power switch is in the On position.

**16) On/Off Power**—Provides AC power to the amplifier when in the “On” position—switched to the left.

**17) Standby**—This allows the amplifier to be powered up, but with the tubes in a non-operational mode. The Standby can be used instead of the power switch between performance sets, since it allows the amp to “shut down” while keeping the tubes warm and ready to go. It's also best to power the amp up with this switch set to the right/off position until the tubes have had a few minutes to warm up, although modern tubes are more tolerant of this.



**1) Footswitch**—The Footswitch jack on the V50 is a stereo jack that connects the V50 footswitch to the amplifier. It uses a special circuit to decode the three switches through a simple stereo cable. In an emergency, a mono instrument cable can be used to allow footswitching of the channels only. In this setup, the LEDs will not be visible, but at least the footswitch will select Rhythm or Lead channels.

**2) Ground Lift**—The Ground Lift switch disconnects pin 1 of the XLR Direct Out jack to eliminate a “ground loop” hum. A ground loop can exist when the V50 and the mixer it is plugged into are connected to grounded outlets that are in physically different locations and/or on different circuits, and should only be used if there is an audible hum. Pressing the ground lift does not disconnect the ground connection from the V50’s chassis.

**3) Direct Out**—The XLR Direct Out jack is designed to connect the V50 amplifier to a recording or live mixer. The output is speaker-emulated, and mimics the sound of the Celestion Vintage 30 loudspeaker. This output is very useful for direct recording, and especially helpful for live applications since it eliminates a live microphone on stage and the resulting feedback potential. *The V50 amplifier should never be operated without a speaker plugged into a speaker jack.*

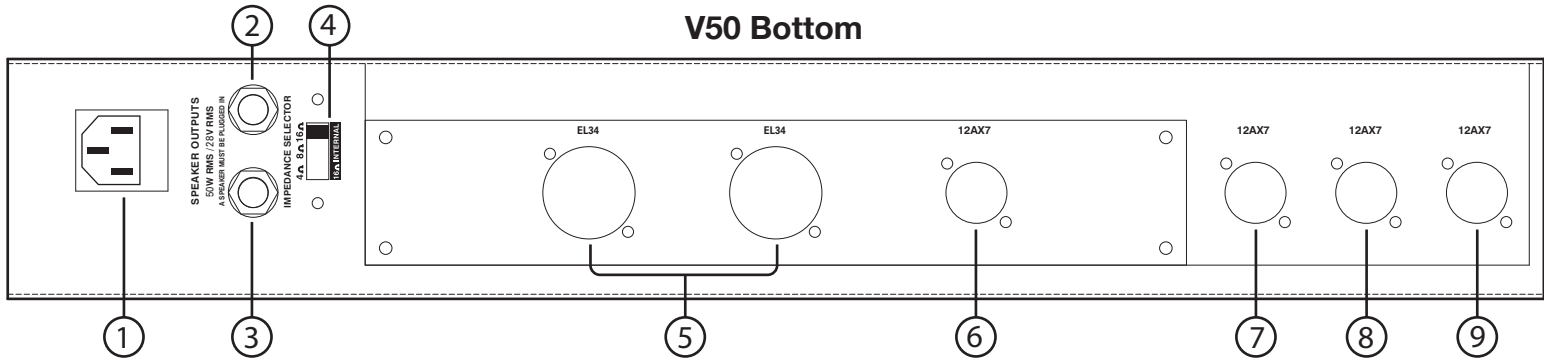
**4) Direct Volume**—Sets the level of the speaker-emulated direct out. This control should be set as high as possible for the best signal-to-noise ratio.

**5) Boost Volume**—The Boost Volume knob controls the amount of footswitchable boost, and is particularly useful for solos. It will provide up to 10dB of “Master Volume” boost, and boosts both channels. The tone is optimized to increase the volume without sacrificing too much headroom in the power amp, so the resulting solo cuts through. The boost is active if the footswitch is unplugged.

**6) Effects Return**—This 1/4” jack breaks the flow of amplifier signal to allow an external effects device to “return” to the amp. The Return jack can also be used for a power amp input, when using an external preamp. This all-tube effects loop is known as a “series” loop, since it breaks the path of the amplifier and “inserts” the effect in series.

**7) Effects Send**—This 1/4” jack delivers a tube-driven preamp signal to external effects devices. It can be used to send the signal to another amplifier to run multiple amps. Connecting a 1/4” plug does NOT break the flow of the amplifier signal. To connect two Defender amplifiers in stereo, a stereo effects device can be driven from one Defender amp’s Send, and the device’s two stereo outputs can be returned to both Defender amps’ Returns.

## V50 Bottom



**1) Power Cord Receptacle/Fuse Holder:** Insert the AC cord (provided) firmly into the AC connector. NOTE: Replace the AC power cord if protective jacket is damaged or ground pin is damaged or removed. The fuse is located in a housing just below the receptacle. Replace only with same type and size. To remove the fuse, remove AC power cord and pull out on the tab above the fuse symbol located on the fuse carriage. Place the new fuse in the carriage clip and re-insert. NOTE: To prevent an electrical hazard, DO NOT replace fuse without using the fuse carriage. Replace the fuse carriage if lost or damaged before re-inserting the AC power cord.

**2 & 3) Speaker Outputs**—These 1/4" jacks are provided to connect the internal and/or external speakers to the V50 amplifier. The V50 amplifier should never be operated without a speaker plugged into a speaker jack.

**4) Impedance Selector**—This switch is used to select the appropriate impedance, and is important in achieving the desired results from the V50 amplifiers. The correct impedance should be selected using the Impedance Selector Switch as follows:

- Internal speaker only: 16 ohm setting
- Internal speaker + external 16 ohm speaker: 8 ohm setting
- Internal speaker + external 8 ohm speaker: 4 ohm setting, although it's not matched
- External 16 ohm speaker alone: 16 ohm setting

Incorrectly "mismatching" the amp to the speaker should not damage the amplifier, but would result in lower output powers, and could result in shorter output tube life.

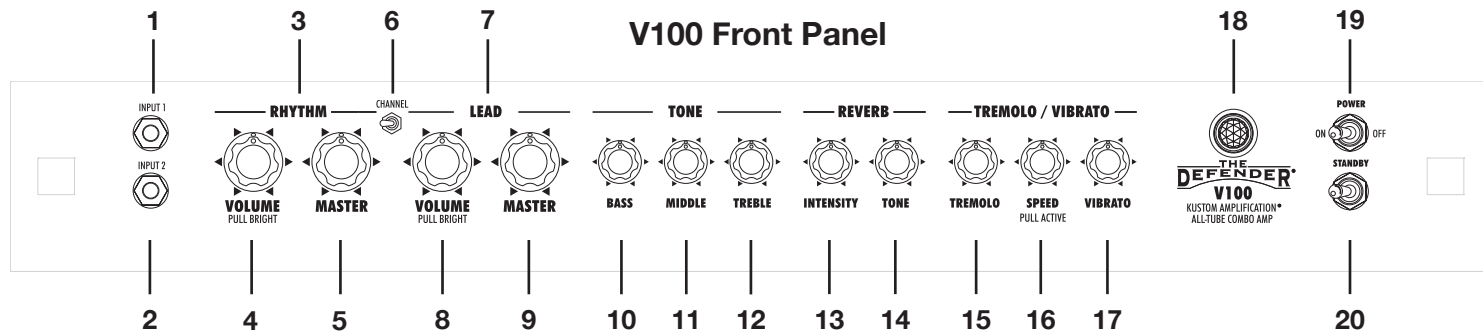
**5) EL34 Output Tubes**—These power tubes were selected to provide the best combination of performance and tube life, and shouldn't require adjustment to their bias. The amp uses a mixed-bias system which is a combination of fixed and self-bias techniques to give the user the best of both worlds. The result is that the amp will control its own bias to a certain point, but without the typical reduction in power associated with normal self-biased amp designs. The V50 uses two EL34s in a "push-pull" amplifier configuration.

**6) Phase Inverter Tube**—The phase inverter tube uses a single 12AX7 in what's called a long-tail pair configuration. This results in the most signal swing possible for driving a power amp, and the most symmetrical drive capability, as well.

**7) Effects Loop/Boost Tube**—The Defender amplifiers use an all-tube effects loop to preserve the tube sound through the signal path. This single tube is used for both the Effects Loop Send/Return and the footswitchable Volume Boost circuit.

**8) Preamp Tube 2**—This 12AX7 is used on both channels, but has the biggest impact to the lead channel since it has the additional stage required for the very large amount of gain.

**9) Preamp Tube 1**—This 12AX7 is the input tube, and as such, is the most likely to cause microphonic problems, especially in the lead channel, and it is also shared by both channels. If tube feedback occurs, it can usually be corrected by swapping this first tube with one of the other tube locations, since they have less gain following them and are less prone to feedback. The first tube also has the greatest affect on the "cleaned up" tone of the amp, i.e. the tone when the guitar is turned down.



**1) Input 1**—This 1/4" input jack provides the highest gain through the amp. It is considered to be the “normal” input.

**2) Input 2**—This 1/4" input jack provides 6dB lower gain through the amp, so it will allow for a cleaner sound. It can also be useful when using pedals in front of the amp, since it provides more headroom through the front end. If a guitar is plugged into both inputs, then they will mix together and will both be 6dB lower in gain.

**3) Rhythm Indicator**—the word “Rhythm” lights up when the Rhythm channel is active.

**4) Rhythm Volume/Pull Bright**—The Rhythm Volume control adjusts the gain at the input of the amplifier when the Rhythm channel is active. It is used in conjunction with the Rhythm Master to adjust the amount of distortion and volume for the channel. For cleaner sounds, this control would be set to lower settings and the Master set higher. For slight breakup, the controls would be set in their middle ranges. For heavier distortion, set the Rhythm Volume higher and the Master lower. Pulling the Pull Bright will increase the high frequencies of the signal, while also reducing low frequencies for a chunkier, tighter attack. This function is very useful for fine-tuning the amp’s tone and feel for different guitars.

**5) Rhythm Master**—The Rhythm Master sets the overall volume of the Rhythm channel, and can be used to balance the volumes between it and the Lead channel. The inclusion of individual Master volumes for each channel means that the Rhythm channel of the V100 can be used for slight breakup sounds at lower volumes, rather than strictly being a “clean” channel. These settings are described in detail in the previous section entitled 4) Rhythm Volume/Pull Bright.

**6) Channel Selector Switch**—When the footswitch is NOT plugged into the footswitch jack, this switch allows the user to select either Rhythm or Lead channels on the V100. If the footswitch IS plugged in, it over-rides the front panel switch.

**7) Lead Indicator**—the word “Lead” lights up when the Lead channel is active.

**8) Lead Volume/Pull Bright**—The Lead Volume control adjusts the gain at the input of the amplifier when the Lead channel is active. It is used in conjunction with the Lead Master to adjust the amount of distortion and volume for the channel. For cleaner sounds, this control would be set to lower settings and the Master set higher. For slight breakup, the controls would be set in their middle ranges. For heavier distortion, set the Lead Volume higher and the Master lower.



Pulling the Pull Bright will increase the high frequencies of the signal, while also reducing low frequencies for a chunkier, tighter attack. This function is very useful for fine-tuning the amp's tone and feel for different guitars.

**9) Lead Master**—The Lead Master sets the overall volume of the Lead channel and can be used to balance the volumes between it and the Rhythm channel. The interactions between Volume and Master are described in detail in the previous section entitled 4) Lead Volume/Pull Bright.

**10) Bass EQ**—This passive EQ adjusts the low frequency equalization of the amplifier. It interacts with the Middle and Treble as described in the 12) Treble EQ section. For a tighter low end, use the Bass EQ set to lower settings. This is particularly helpful when using the amp at very loud settings. This EQ works for both Rhythm and Lead channels.

**11) Middle EQ**—This passive EQ adjusts the midrange equalization of the amplifier. It interacts with the Bass and Treble EQ as described in the 12) Treble EQ section. For a heavier, more distorted sound, set the Middle lower. For more of a vintage-style, cleaner sound, set the Middle higher. This EQ works for both Rhythm and Lead channels.

**12) Treble EQ**—This passive EQ adjusts the high frequency equalization of the amplifier, but also interacts with the Bass and Middle controls as follows: As the Treble is increased, the Bass automatically decreases and the Middle slides down in frequency. Conversely, if the Treble is decreased, the Bass automatically increases and the Middle slides up in frequency. This interaction is typical of vintage-style passive EQ, and is responsible for the increased effectivity of such a simple system.

**13) Reverb Intensity**—The Reverb Intensity controls the amount of reverberation effect in the amplifier. This effect is created by an authentic spring reverb pan, and sounds essentially like playing the amp in a large room. The Reverb can be defeated with the footswitch, or by turning the Intensity control fully counter-clockwise.

**14) Reverb Tone**—A traditional Kustom feature, the Reverb Tone allows the

user to fine-tune the sound of the reverb effect. Turning this Tone fully clockwise yields a very bright reverb effect with emphasized “spring.” By turning the Reverb Tone down, a warmer, less-springy sounding reverb effect results. The warmer reverb tone allows for more reverb intensity without dominating the sound.

**15) Tremolo**—This control sets the intensity of the Tremolo effect. Tremolo is also called Amplitude Modulation, since it is an effect that changes the amplitude of the dry signal using a low frequency oscillator, or LFO. This vintage Kustom circuit uses the Speed control to set the speed of the oscillation, and can be set from very slow to a very high speed.

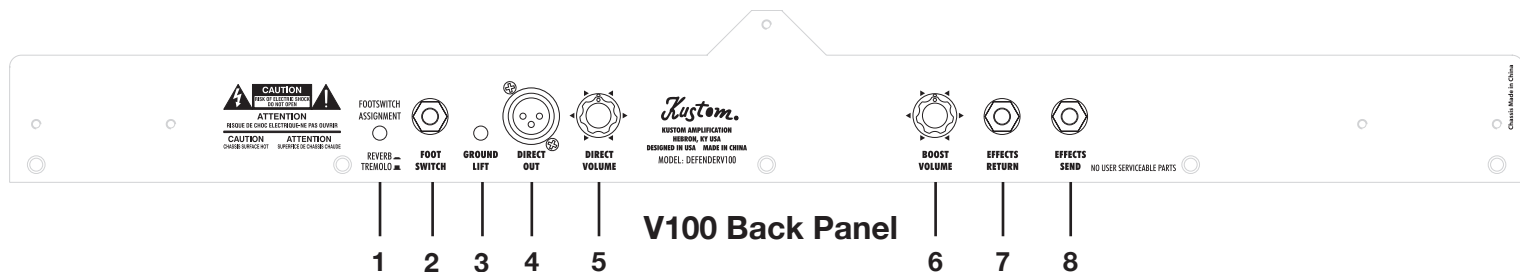
**16) Speed/Pull Active**—This control sets the speed of the Vibrato and Tremolo effects, which are synchronized. If the switch is pushed in, the Vibrato/Tremolo circuit is not in the signal path. When the footswitch is engaged, it will override the Pull Active switch if the Footswitch Assignment Switch is in the Out position.

**17) Vibrato**—This vintage Kustom circuit creates a pitch shift, otherwise known as Frequency Modulation, since it affects the apparent frequency of the dry signal using the LFO. It uses the Speed control to set the speed of oscillation, and when combined with the Tremolo control, can simulate many different effects, from simple Tremolo, to phase shifter sounds, to rotary speaker simulations.

**18) Jeweled Pilot Light**—Indicates that the amplifier's power switch is in the “On” position.

**19) On/Off Power**—Provides AC power to the amplifier when in the “On” position—switched to the left.

**20) Standby**—This allows the amplifier to be powered up, but with the tubes in a non-operational mode. The Standby can be used instead of the power switch between performance sets, since it allows the amp to “shut down” while keeping the tubes warm and ready to go. It's also best to power the amp up with this switch set to the right/off position until the tubes have had a few minutes to warm up, although modern tubes are more tolerant of this.



**1) Footswitch Assignment**—This button selects which of the amp’s effects are controlled by the “Effects” button on the footswitch. If the switch is IN, the footswitch will control the Reverb and the Tremolo will only be controlled by the Pull Active Switch on the Speed control. If the Footswitch Assignment button is OUT, then the Reverb will be active always, and the footswitch will remotely control the Tremolo/Vibrato, overriding the setting of the Pull Active Switch on the Speed control.

**2) Footswitch**—The Footswitch jack on the V100 is a stereo jack that connects the V100 footswitch to the amplifier. It uses a special circuit to decode the 3 switches through a simple stereo cable. In an emergency, a mono instrument cable can be used to allow footswitching of the channels only. In this setup, the LEDs will not be visible, but at least the footswitch will select Rhythm or Lead channels.

**3) Ground Lift**—The Ground Lift switch disconnects pin 1 of the XLR Direct Out jack to eliminate a “ground loop” hum. A ground loop can exist when the V100 and the mixer it is plugged into are connected to grounded outlets that are in physically different locations and/or on different circuits, and should only be used if there is an audible hum. Pressing the ground lift does not disconnect the ground connection from the V100’s chassis.

**4) Direct Out**—The XLR Direct Out jack is designed to connect the V100 amplifier to a recording or live mixer. The output is speaker-emulated, and mimics the sound of the Celestion Vintage 30 loudspeaker. This output is very useful for direct recording, and especially helpful for live applications since it eliminates a live mi-

crophone on stage and the resulting feedback potential. The V100 amplifier should never be operated without a speaker plugged into a speaker jack.

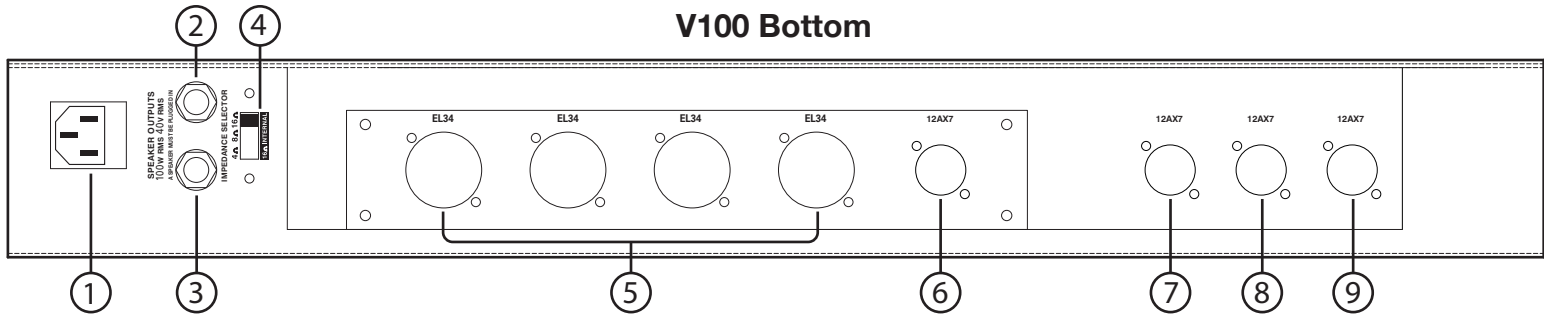
**5) Direct Volume**—Sets the level of the speaker-emulated direct out. This control should be set as high as possible for the best signal-to-noise ratio.

**6) Boost Volume**—The Boost Volume knob controls the amount of footswitchable boost, and is particularly useful for solos. It will provide up to 10dB of “Master Volume” boost, and boosts both channels. The tone is optimized to increase the volume without sacrificing too much headroom in the power amp, so the resulting solo cuts through. The boost is active if the footswitch is unplugged.

**7) Effects Return**—This 1/4” jack breaks the flow of amplifier signal to allow an external effects device to “return” to the amp. The Return jack can also be used for a power amp input, when using an external preamp. This all-tube effects loop is known as a “series” loop, since it breaks the path of the amplifier and “inserts” the effect in series.

**8) Effects Send**—This 1/4” jack delivers a tube-driven preamp signal to external effects devices. It can be used to send the signal to another amplifier to run multiple amps. Connecting a 1/4” plug does NOT break the flow of the amplifier signal. To connect two Defender amplifiers in stereo, a stereo effects device can be driven from one Defender amp’s Send, and the device’s two stereo outputs can be returned to both Defender amp Returns.

## V100 Bottom



**1) Power Cord Receptacle/Fuse Holder:** Insert the AC cord (provided) firmly into the AC connector. NOTE: Replace the AC power cord if protective jacket is damaged or ground pin is damaged or removed. The fuse is located in a housing just below the receptacle. Replace only with same type and size. To remove the fuse, remove AC power cord and pull out on the tab above the fuse symbol located on the fuse carriage. Place the new fuse in the carriage clip and re-insert. NOTE: To prevent an electrical hazard, DO NOT replace fuse without using the fuse carriage. Replace the fuse carriage if lost or damaged before re-inserting the AC power cord.

**2 & 3) Speaker Outputs**—These 1/4" jacks are provided to connect the internal and/or external speakers to the V100 amplifier. The V100 amplifier should never be operated without a speaker plugged into a speaker jack.

**4) Impedance Selector**—This switch is used to select the appropriate impedance, and is important in achieving the desired results from the V100 amplifiers. The correct impedance should be selected using the Impedance Selector Switch as follows:

- Internal speaker only: 16 ohm setting
- Internal speaker + external 16 ohm speaker: 8 ohm setting
- Internal speaker + external 8 ohm speaker: 4 ohm setting, although it's not matched
- External 16 ohm speaker alone: 16 ohm setting

Incorrectly “mismatching” the amp to the speaker should not damage the amplifier, but would result in lower output powers, and could result in shorter output tube life.

**5) EL34 Output Tubes**—These power tubes were selected to provide the best combination of performance and tube life, and shouldn't require adjustment to their bias. The amp uses a mixed-bias system which is a combination of fixed and self-bias techniques to give the user the best of both worlds. The result is that the amp will control its own bias to a certain point, but without the typical reduction in power associated with normal self-biased amp designs. The V100 uses four EL34s in a “push-pull” amplifier configuration.

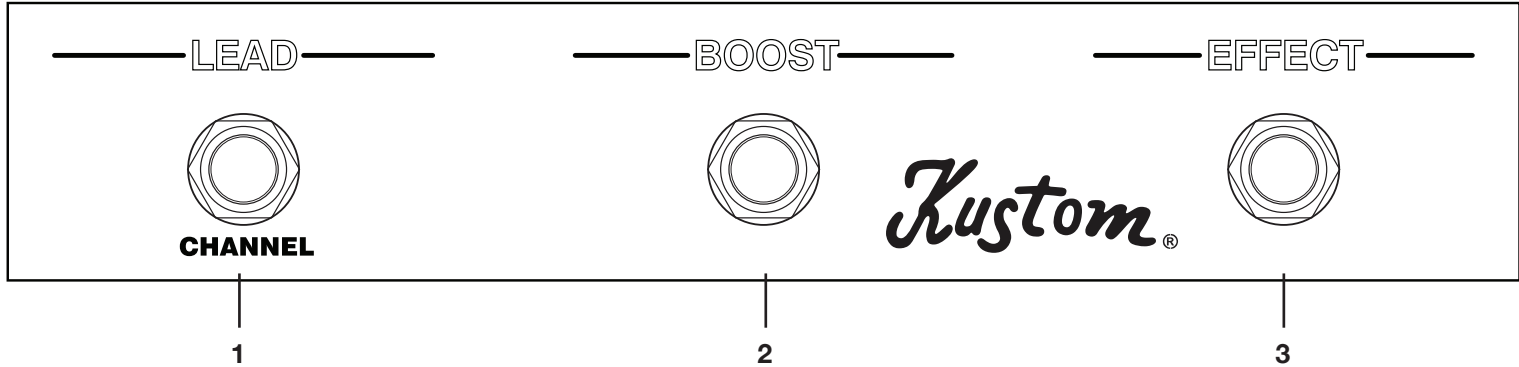
**6) Phase Inverter Tube**—The phase inverter tube uses a single 12AX7 in what's called a long-tail pair configuration. This results in the most signal swing possible for driving a power amp, and the most symmetrical drive capability, as well.

**7) Effects Loop/Boost Tube**—The Defender amplifiers use an all-tube effects loop to preserve the tube sound through the signal path. This single tube is used for both the Effects Loop Send/Return and the footswitchable Volume Boost circuit.

**8) Preamp Tube 2**—This 12AX7 is used on both channels, but has the biggest impact to the lead channel since it has the additional stage required for the very large amount of gain.

**9) Preamp Tube 1**—This 12AX7 is the input tube, and as such, is the most likely to cause microphonic problems, especially in the lead channel, and it is also shared by both channels. If tube feedback occurs, it can usually be corrected by swapping this 1st tube with one of the other tube locations, since they have less gain following them and are less prone to feedback. The first tube also has the greatest affect on the “cleaned up” tone of the amp, i.e. the tone when the guitar is turned down.

## Footswitch



**1) Lead**—The Lead footswitch selects between Rhythm and Lead Channels on the amplifier, regardless of the setting of the channel selector switch on the front panel. If the LEAD word is backlit, then the Lead channel is active. If the LEAD word is unlit, then the Rhythm channel is active.

**2) Boost**—The Boost footswitch selects the adjustable volume boost as determined on the back of the Defender amplifier. This gives up to 10dB of “master” volume boost and the tone is optimized for solos. It affects either channel, and when the Boost is backlit, the Volume Boost control on the amp is functional.

**3) Effect**—The Effect footswitch activates the Reverb on the V50, and is switch assignable for Reverb or Tremolo on the V100. When Effect is backlit, the appropriate effect is activated.

**Emergency Mono Cable Use:** If the stereo cable or footswitch were damaged, a regular instrument amp cable or single button footswitch can be used to provide limited capability. If a mono cable were used, the Channel Selection(Lead) button would select between Rhythm and Lead, but it would not illuminate. Also, the Boost function would be disabled, and on the V50, the Reverb would also be disabled. On the V100, either Reverb or Tremolo could still be used since selecting the other with the footswitch assign button would disable it.





[www.kustom.com](http://www.kustom.com)

Kustom Amplification, Inc.  
3015 Kustom Drive  
Hebron, Kentucky  
USA 41048  
888-4-KUSTOM (888-458-7866)

All specifications are subject to change without prior notice. ©2010 Kustom

