

Owner's Manual

SPL-1 Power Limiter



TD-40005-00
Rev. C

SPL-1 STEREO POWER LIMITER

I. GENERAL DESCRIPTION

The SPL-1 is a high performance, low cost, two-channel power limiter designed to be used with QSC amplifiers that accept BusCards or have Open Input Architecture™. The limiter circuitry features industry-standard VCAs from THAT Corporation and makes use of feedback from the amplifier outputs to accurately limit power to one of sixteen user-adjustable threshold values.

The SPL-1 has three selectable attack/decay settings to optimize limiter response to specific types of program material and loudspeaker types: “Fast” is ideal for protection of compression drivers in systems using active crossovers and for clip limiting in passive systems; “Medium” is optimized for limiting full-range program material in systems using passive crossovers; “Slow” is used for limiting long-term power to woofers, while allowing short peaks to pass unaffected.

II. APPLICATIONS

The SPL-1 is a low-cost solution for any application that requires adjustable but secure limiting of amplifier output power. It mounts internally, so it needs no additional rack space or AC, making it suitable for situations where rack-mount limiters might not be economical.

Sample applications

Bi-amplified speaker protection: A stereo amplifier may be used for bi-amplification of a two-way loudspeaker. The size of the amplifier is determined by the power needs of the woofer, which may amount to hundreds of watts. However, that amount of power could easily destroy the high-frequency compression driver. An SPL-1 may be used to limit peak power to the compression driver while allowing the full amplifier power, plus clip limiting, to the woofer.

Rental amplifiers and unattended power amplifiers: The SPL-1 may be configured to protect against speaker damage by unskilled sound system operators. Its internal mounting discourages tampering by unauthorized persons.

III. SPECIFICATIONS

	Nominal	Limit
General Information		
Dimensions	5.1 × 1.2 × 0.63 in	
Net Weight	1.2 oz (0.076 lb); 34 g	
Supply Voltage Regulated	±15 VDC	
Supply Current	25 mA	36 mA
Operating Temperature Range	0–70° Celsius	
Accessories Included	Jumpers	12 pcs.
Controls		
Attack/Decay Speed	Jumper selectable: fast, medium, slow	
Threshold	Jumper selectable; 16 steps: 0 dBr to -10.8 dBr	
Default setting	0.0 dBr (0 dBr = rated power of amplifier)	
Connectors		
Input/Output/Power Supply	Two 10-pin headers	

	Nominal	Limit
General Audio Performance		
Input Stage Type	Electronically balanced differential	
Differential Input Impedance	20 k Ω	$\pm 2\%$
Common-Mode Input Impedance	10 k Ω	$\pm 2\%$
Input Overload 20 Hz–20 kHz	+18 dBV	+17 dBV
Output Stage Type	Single-Ended	
Output Impedance	68 Ω	$\pm 5\%$
Minimum Resistive Load	—	2 k Ω
Maximum Capacitive Load	—	1 nF
Equivalent Input Noise		
20 Hz–20 kHz, $R_s = 50\Omega$	-100 dBV	-97 dBV
Output Offset Voltage	< ± 1.5 mV	± 10 mV
Dynamic Range	118 dB	114 dB
THD+N, 0 dBV out, 1 kHz	0.006%	0.02%
(no limiting) 20 Hz–20 kHz	0.04%	0.1%
Frequency Response, 20 Hz–20 kHz	+0 dB, -0.1 dB	+0 dB, -0.25 dB
+0/-3 dB	1Hz–176 kHz	
CMRR		
200 Hz	55 dB	40 dB
20 kHz	40 dB	30 dB
 Limiter Performance		
Compression Ratio		
(Threshold @ -5 dBr and 5 dB overdrive)	16:1	$\pm 10\%$
THD+N, 10 Hz–20 kHz, Slow Time Constants		
(Threshold @ -5 dBr and 5 dB overdrive)		
20 Hz	0.15%	0.5%
1 kHz	0.017%	0.05%
20 kHz (10 Hz–80 kHz bandwidth)	0.035%	0.1%
THD+N, 10 Hz–20 kHz, Fast Time Constants		
(Threshold @ -5 dBr and 5 dB overdrive)		
20 Hz	1.9%	5%
1 kHz	0.06%	0.2%
20 kHz (10 Hz–80 kHz bandwidth)	0.048%	0.15%
THD+N, 10 Hz–20 kHz, Medium Time Constants		
(Threshold @ -5 dBr and 5 dB overdrive)		
20 Hz	0.43%	1.5%
1 kHz	0.021%	0.06%
20 kHz (10 Hz–80 kHz bandwidth)	0.037%	0.12%
Threshold Settings	0.00 dBr	± 0.26 dB
	-0.7 dBr	± 0.22 dB
	-1.5 dBr	± 0.20 dB
	-2.2 dBr	± 0.17 dB
	-2.9 dBr	± 0.14 dB
	-3.6 dBr	± 0.11 dB
	-4.3 dBr	± 0.07 dB
	-5.0 dBr	± 0.03 dB
	-5.8 dBr	± 0.39 dB
	-6.5 dBr	± 0.37 dB
	-7.2 dBr	± 0.35 dB
	-8.0 dBr	± 0.33 dB
	-8.7 dBr	± 0.32 dB
	-9.4 dBr	± 0.31 dB
	-10.1 dBr	± 0.30 dB
	-10.8 dBr	± 0.30 dB
Attack Time Constants		
Fast	0.05 ms	$\pm 30\%$
Medium	0.65 ms	$\pm 30\%$
Slow	1.9 ms	$\pm 30\%$
Release Time Constants		
Fast	200 ms	$\pm 30\%$
Medium	1000 ms	$\pm 30\%$
Slow	2800 ms	$\pm 30\%$

IV. OPERATION AND ADJUSTMENT

Each channel of the SPL-1 has two user-adjustable settings: one is the output voltage threshold at which limiting begins; the other is the limiter's attack and decay rates. The parameters are programmed by placing jumpers across appropriate pin headers. There are 16 selectable threshold settings, which reference to the amplifier's maximum output voltage, and there are three selectable attack and decay rates. The use of this device does not constitute an implied warranty by QSC Audio Products, Inc. that loudspeakers will not be damaged due to overpowering.

Figure 1 shows the locations of the jumpers.

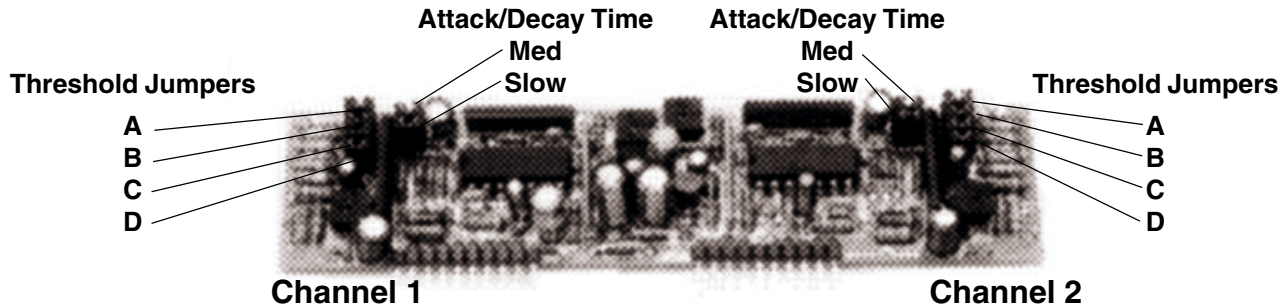


Figure 1—Location of Programming Jumpers

V. THRESHOLD JUMPER SETTINGS

The amplifier provides the limiter circuitry with a sample of each channel's output signal voltage, scaled so that at full rated power into 8 ohms its voltage is 5 volts RMS. This way the limiter's circuitry can detect the amplifier's actual output levels, and its threshold settings use the 8-ohm full-power level as their 0 dB reference point, or 0 dBr. The threshold choices range from 0 dBr (100% of full power at 8Ω, or no limiting) down to -10.8 dBr (8.3% of full power at 8Ω), in steps of approximately 0.7 dB.

Each channel's limiting threshold is programmed independently by placing four jumpers, A through D. Table 1 on the next page shows the jumper configuration for each threshold setting. You can store any unused programming jumpers by engaging one side on an unused pin, but make sure they do not make inadvertent connections with other pins. See Figure 2 for details.

Table 2 shows the power limiting thresholds for all 16 settings at 8, 4, and 2 ohms, at various common amplifier power ratings; choose the setting that most closely matches the power level you desire. For example, if the amplifier's 8Ω power rating is 800 watts per channel and you wish to limit the power to 600 watts into a 4Ω load, you would select the -4.3 dBr setting.

For load impedances or power ratings not listed in Table 2, calculate the appropriate threshold setting as described below:

Programming for 8Ω loads

Divide the power level you wish to limit to by the 8Ω power rating of the amplifier. Multiply by 100 to state the figure as a percentage, then choose the threshold from Table 1 that most closely matches it.

For example, if you have an amplifier rated at 350 watts per channel at 8Ω and wish to limit its output on Channel 1 to 250 watts and on Channel 2 to 150 watts, both at 8Ω: $250 \div 350 \times 100 = 71.4\%$; and $150 \div 350 \times 100 = 42.9\%$. According to Table 1, the -1.5 dBr (71.6%) setting is the closest match for Channel 1, so you would place jumpers on headers A and C. On Channel 2, the -3.6 dBr (43.4%) most closely matches 42.9%, so you would place one jumper on header B.

Programming for 4Ω, 2.7Ω, and 2Ω loads

Any output voltage into an 8Ω load will produce a certain amount of power. The same voltage into a 4Ω load will produce *twice* as much power; into a 2.7Ω load (e.g., three 8Ω speakers in parallel), *three times as much power*; and into a 2Ω load, *four times as much power*. Therefore, a limiting threshold of

150 watts at 8Ω would equate to 300 watts at 4Ω, 450 watts at 2.7Ω, and 600 watts at 2Ω.

Choose your desired power limiting threshold. If the amplifier channel’s speaker load is 4Ω, divide your figure by 2; if the load is 2.7Ω, divide it by 3; if the load is 2Ω, divide by 4.

Divide the result by the amplifier’s 8Ω power rating, then multiply by 100 to express it as a percentage. Then choose the threshold from Table 1 that most closely matches it.

For example, if you have an amplifier rated at 350 watts per channel at 8Ω and wish to limit its output on Channel 2 to 260 watts at 4Ω: $260 \div 2 \div 350 \times 100 = 37.1\%$. On Table 1, the closest match is the -4.3 dBr setting (37.2%). You would place one jumper on header A of Channel 2.

If you are using load impedances of less than 8 ohms, be careful when selecting thresholds. An amplifier’s maximum output voltage decreases at lower load impedances, so a threshold that is set too high may allow the amplifier to clip before limiting begins.

Threshold (0 dBr = full rated 8Ω power)	% of Rated 8Ω Power	Jumpers			
		A	B	C	D
0.0 dBr	100.0	ON	ON	ON	—
-0.7 dBr	84.6	—	ON	ON	—
-1.5 dBr	71.6	ON	—	ON	—
-2.2 dBr	60.7	—	—	ON	—
-2.9 dBr	51.3	ON	ON	—	—
-3.6 dBr	43.4	—	ON	—	—
-4.3 dBr	37.2	ON	—	—	—
-5.0 dBr	31.6	—	—	—	—
-5.8 dBr	26.3	ON	ON	ON	ON
-6.5 dBr	22.3	—	ON	ON	ON
-7.2 dBr	18.9	ON	—	ON	ON
-8.0 dBr	15.9	—	—	ON	ON
-8.7 dBr	13.5	ON	ON	—	ON
-9.4 dBr	11.4	—	ON	—	ON
-10.1 dBr	9.7	ON	—	—	ON
-10.8 dBr	8.3	—	—	—	ON

Table 1—Threshold Jumper Settings

VI. ATTACK/DECAY SPEED JUMPER SETTINGS

The three attack and decay rates are optimized for woofer (slow), full-range (medium), and high-frequency driver protection (fast). However, you can experiment to determine the best settings for any given application. See Figure 1 to locate the two jumpers on each channel.

The following table correlates the time constants and the jumper settings. Unused programming jumpers may be stored by engaging *one* side of the jumper on an unused pin. Make sure that stored jumpers do not make any unintended connections with other pins.

VII. INSTALLATION

Installing the SPL-1 requires PCB soldering skills, so only qualified technicians should attempt it. Any authorized QSC service center or QSC Technical Services can perform it for a nominal fee. When the SPL-1 is installed in an amplifier, its adjustments are not externally accessible; this helps prevent tampering by unauthorized users.

The SPL-1 installs on the input board of an QSC EX, MXa, or legacy CX (CX6, CX6T, CX12, or CX12T) Series amplifier, or on a BusCard installed in a PowerLight, PLX, CX, DCA, or PowerLight 2 amplifier. Early EX amplifiers may require an upgrade to the later version of the input module. Contact QSC Technical Services for information on amplifier compatibility.

To install the SPL-1, you will need a soldering iron and rosin-core solder (60/40 or 63/37), a Phillips screwdriver, and wire cutters. If you are installing the SPL-1 onto an input board, you will also need either a desoldering iron or suitable desoldering equipment. We do not recommend using solder braid for desoldering because it can easily damage the small solder pads, and it tends to do an inadequate job of absorbing solder.

Amp Rated Power @ 8Ω (watts)	100		150		175		200		250		300		350		400		450		500		600		650	
	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω
Actual load Z	100	150	175	200	250	300	350	400	450	500	600	650	100	150	175	200	250	300	350	400	450	500	600	650
0.0 dBr	85	127	148	169	212	254	296	339	381	423	466	508	550	592	634	677	719	762	804	846	889	931	974	1016
-0.7 dBr	85	127	148	169	212	254	296	339	381	423	466	508	550	592	634	677	719	762	804	846	889	931	974	1016
-1.5 dBr	72	103	125	147	189	221	263	295	337	379	421	463	505	547	589	631	673	715	757	800	842	884	926	968
-2.2 dBr	61	81	103	125	167	189	231	253	295	317	359	381	423	445	487	509	551	573	615	637	679	701	743	765
-2.9 dBr	51	71	93	115	157	179	221	243	285	307	349	371	413	435	477	500	542	564	606	628	670	692	734	756
-3.6 dBr	43	63	85	107	149	171	213	235	277	299	341	363	405	427	469	491	533	555	597	619	661	683	725	747
-4.3 dBr	37	57	79	101	143	165	207	229	271	293	335	357	399	421	463	485	527	549	591	613	655	677	719	741
-5.0 dBr	32	52	74	96	138	160	202	224	266	288	330	352	394	416	458	480	522	544	586	608	650	672	714	736
-5.8 dBr	26	46	68	90	132	154	196	218	260	282	324	346	388	410	452	474	516	538	580	602	644	666	708	730
-6.5 dBr	22	42	64	86	128	150	192	214	256	278	320	342	384	406	448	470	512	534	576	598	640	662	704	726
-7.2 dBr	19	39	61	83	125	147	189	211	253	275	317	339	381	403	445	467	509	531	573	595	637	659	701	723
-8.0 dBr	16	32	54	76	118	140	182	204	246	268	310	332	374	396	438	460	502	524	566	588	630	652	694	716
-8.7 dBr	14	27	49	71	113	135	177	199	241	263	305	327	369	391	433	455	497	519	561	583	625	647	689	711
-9.4 dBr	11	23	45	67	109	131	173	195	237	259	301	323	365	387	429	451	493	515	557	579	621	643	685	707
-10.1 dBr	10	19	39	59	101	123	165	187	229	251	293	315	357	379	421	443	485	507	549	571	613	635	677	699
-10.8 dBr	8	17	33	51	93	115	157	179	221	243	285	307	349	371	413	435	477	500	542	564	606	628	670	692

Amp Rated Power @ 8Ω (watts)	720		750		800		900		1000		1100		1200		1400		1500		1800		2000		2400	
	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω	8Ω	4Ω
Actual load Z	720	750	800	900	1000	1100	1200	1400	1500	1800	2000	2400	720	750	800	900	1000	1100	1200	1400	1500	1800	2000	2400
0.0 dBr	609	1219	2438	3657	4876	6095	7314	8533	9752	10971	12190	13409	14628	15847	17066	18285	19504	20723	21942	23161	24380	25599	26818	28037
-0.7 dBr	609	1219	2438	3657	4876	6095	7314	8533	9752	10971	12190	13409	14628	15847	17066	18285	19504	20723	21942	23161	24380	25599	26818	28037
-1.5 dBr	515	1031	2061	3091	4121	5151	6181	7211	8241	9271	10301	11331	12361	13391	14421	15451	16481	17511	18541	19571	20601	21631	22661	23691
-2.2 dBr	437	874	1748	2622	3496	4370	5244	6118	6992	7866	8740	9614	10488	11362	12236	13110	13984	14858	15732	16606	17480	18354	19228	20102
-2.9 dBr	369	738	1476	2164	2852	3540	4228	4916	5604	6292	6980	7668	8356	9044	9732	10420	11108	11796	12484	13172	13860	14548	15236	15924
-3.6 dBr	313	625	1250	1875	2500	3125	3750	4375	5000	5625	6250	6875	7500	8125	8750	9375	10000	10625	11250	11875	12500	13125	13750	14375
-4.3 dBr	268	536	1072	1608	2144	2680	3216	3752	4288	4824	5360	5896	6432	6968	7504	8040	8576	9112	9648	10184	10720	11256	11792	12328
-5.0 dBr	227	455	910	1365	1820	2275	2830	3385	3940	4495	5050	5605	6160	6715	7270	7825	8380	8935	9490	10045	10600	11155	11710	12265
-5.8 dBr	189	378	756	1134	1512	1890	2268	2646	3024	3402	3780	4158	4536	4914	5292	5670	6048	6426	6804	7182	7560	7938	8316	8694
-6.5 dBr	160	320	640	960	1280	1600	1920	2240	2560	2880	3200	3520	3840	4160	4480	4800	5120	5440	5760	6080	6400	6720	7040	7360
-7.2 dBr	136	272	544	816	1088	1360	1632	1904	2176	2448	2720	2992	3264	3536	3808	4080	4352	4624	4896	5168	5440	5712	5984	6256
-8.0 dBr	115	229	458	687	916	1145	1374	1603	1832	2061	2290	2519	2748	2977	3206	3435	3664	3893	4122	4351	4580	4809	5038	5267
-8.7 dBr	98	195	390	585	780	975	1170	1365	1560	1755	1950	2145	2340	2535	2730	2925	3120	3315	3510	3705	3900	4095	4290	4485
-9.4 dBr	82	165	329	493	657	821	985	1149	1313	1477	1641	1805	1969	2133	2297	2461	2625	2789	2953	3117	3281	3445	3609	3773
-10.1 dBr	70	140	280	420	560	700	840	980	1120	1260	1400	1540	1680	1820	1960	2100	2240	2380	2520	2660	2800	2940	3080	3220
-10.8 dBr	60	119	239	358	477	596	715	834	953	1072	1191	1310	1429	1548	1667	1786	1905	2024	2143	2262	2381	2500	2619	2738

Table 2—Limiter Thresholds

CAUTION: The SPL-1 contains active components that are easily damaged by electrostatic discharge. Practice standard ESD precautions, and always ground yourself and your workstation before handling exposed circuit cards.

Limiter Setting	Attack Time Constant	Release Time Constant	Jumper Position	
			MED	SLOW
Fast	0.05 ms	200 ms	—	—
Medium	0.65 ms	1000 ms	ON	—
Slow	1.9 ms	2800 ms	—	ON

Table 3—Limiter Attack/Decay Settings

Check your programming!

Because it will be inaccessible once it is fully installed into the amplifier, program the SPL-1 first if you know what settings you need.

Installing the SPL-1 onto a BusCard

To install the SPL-1 on a BusCard for use in a PLX, PowerLight, CX, DCA, or PowerLight 2 amplifier, see the instructions included with the BusCard.

Installing the SPL-1 onto an input board

Use the following procedure to install the SPL-1 onto the input board of an EX, MXa, or legacy CX amplifier.

NOTE: *Preparing an EX or MXa input board for installing the SPL-1 involves removing solder from plated-through holes on a two-sided printed circuit board. Prolonged or excessive heat from a soldering iron can easily damage the solder pads on these holes. Thus, proper equipment and experience with desoldering delicate PCB circuitry are absolutely essential to successfully installing the SPL-1. Any damage caused by improper installation will void the amplifier warranty. Please contact QSC Technical Services if you feel not sufficiently qualified to perform the installation yourself.*

Before starting any work, turn off the amplifier and disconnect its power cord from the AC source. Also, disconnect any cables from the amplifier’s inputs.

Position the amplifier so the rear of the chassis is facing you. The input panel is located on the left side of the rear panel. See Figure 2.

Remove the screws that secure both the upper blank panel and the lower input panel to the chassis. Remove the upper panel.

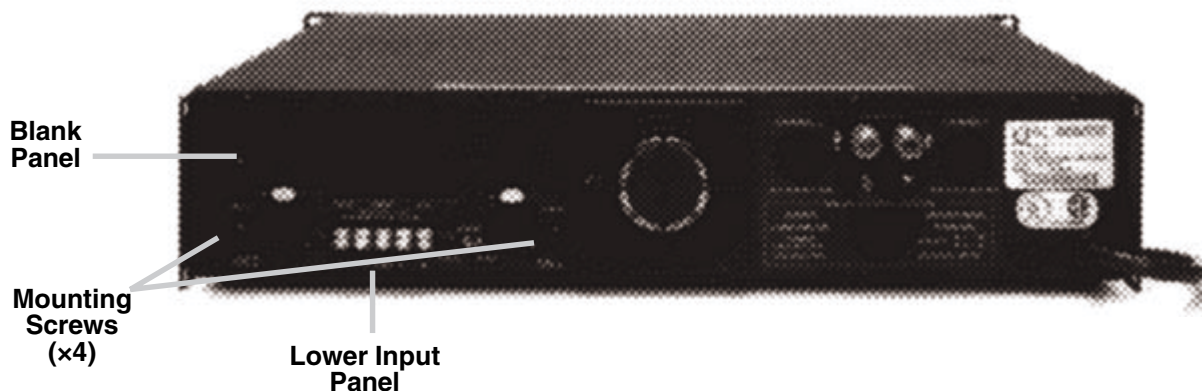


Figure 2—Rear Amplifier Panel

Gently pull the lower input panel out from the amplifier. You will notice a ribbon cable that connects the input board to the amplifier circuitry. Disengage the locking wing clamps on the ribbon cable socket (J32 on the EX input board or J33 on the MXa or legacy CX) and carefully detach the ribbon cable header from the socket. Now the input module is completely free from the amplifier. See Figure 3.

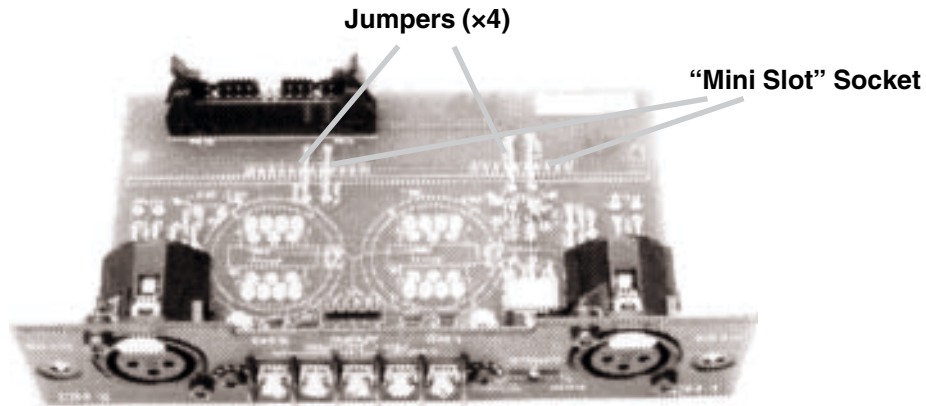


Figure 3—The input board (EX version shown)

Next, desolder and remove the two pairs of wire jumpers (W303/W304 and W403/W404 on the MXa or legacy CX input board, or W305/W306 and W405/W406 on the EX). Each pair of jumpers had crossed over a row of 10 or 12 holes; these make up the “Mini-Slot” socket, which accommodates accessory boards such as the SPL-1. See Figure 3.

Remove the solder from the “Mini-Slot” socket holes.

NOTE: The row next to the ribbon cable connector has twelve holes, but only ten require desoldering. Visually identify the holes to be desoldered by lining up the pins of the SPL-1 with the “Mini-Slot” socket’s holes.

The input board is now ready to accept the SPL-1. The component side of the SPL-1 should face the rear of the input PCB, as shown in Figure 4.

NOTE: If you know the settings you want to use on the SPL-1, configure it now rather than later, when you will have to pull out the input panel from the amplifier chassis to make adjustments.

Carefully insert the SPL-1 into the “Mini-Slot” socket. Verify that the two 10-pin headers of the SPL-1 are fully inserted into the input PCB mini-slot sockets before proceeding. Turn the assembly over and solder the SPL-1 in place. Visually inspect for cold solder joints and verify that you have sufficient clearance to reinstall the ribbon connector on the top side of the assembly. Finish up the assembly by trimming SPL-1 header pins as required.

Reconnect the ribbon cable to the input board connector (J32 for EX or J33 for MXa). Ensure that the connector clamp wings are fully closed. You will feel them snap into place.

Carefully replace the input/SPL-1 assembly into the amplifier chassis and secure by fastening the two panel mounting screws. Be sure the screws are tightened snugly. Reinstall the upper blank panel.

This completes the installation of the SPL-1, and your amplifier is ready to be put back into the system.

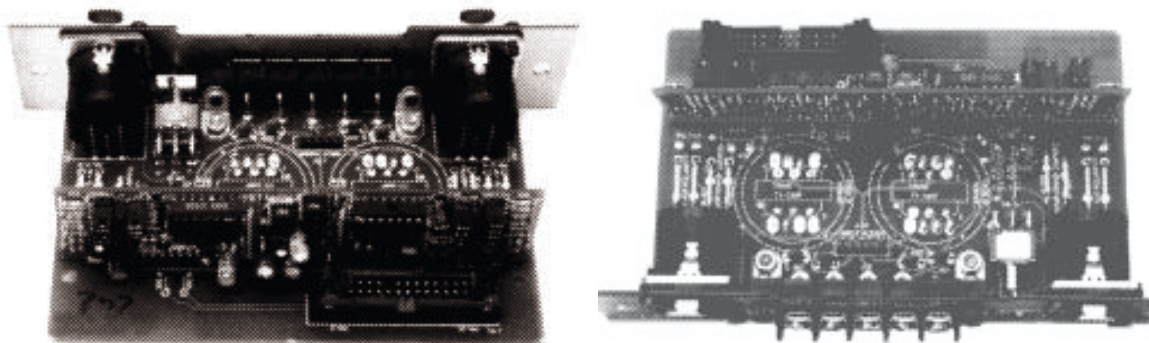


Figure 4—Correct Orientation of the SPL-1

VIII. WARRANTY AND DISCLAIMERS

Disclaimer

QSC Audio Products, Inc. is not liable for any damage to speakers, amplifiers, or any other equipment that is caused by negligence or improper installation and/or use of the SPL-1.

Product Warranty

QSC Audio Products, Inc. guarantees the SPL-1 to be free from defective material and/or workmanship for a period of three years from date of sale, and will replace defective parts and repair malfunctioning products under this warranty when the defect occurs under normal installation and use—provided the unit is returned to our factory via prepaid transportation with proof of purchase (sales receipt). This warranty provides that examination of the returned product must disclose, in our judgment, a manufacturing defect. This warranty does not extend to any product which has been subject to misuse, neglect, accident, improper installation, or where the date code has been removed or defaced.

International Servicing

For QSC products that are purchased outside of the United States, service must be referred to the distributor or dealer from where the product was purchased. There are numerous service centers in many countries. The service centers in your country may be located by your dealer, distributor, or by contacting QSC Technical Services.

IX. TECHNICAL ASSISTANCE & SERVICE

Servicing your unit requires a trained technician capable of performing the type of service you need. There are no user serviceable components inside your unit and the danger of electric shock exists. Additionally, some of the components in your unit has QSC specific parts that require QSC replacements. Comprehensive service manuals for some models are available at QSC.

Technical Assistance

If you suspect that your SPL-1 Stereo Power Limiter is defective, check your system configuration and settings to determine the origin of the problem. Incorrect audio interfacing, poor cabling, or other system level impairments are frequent causes of problems in audio systems. For technical assistance beyond the information given in this manual, contact QSC Technical Services.

Factory Service

If your product need factory service, contact QSC Technical Services for return instructions and a Return Authorization (RA) number. QSC is not responsible for products that are returned to us without a Return Authorization number.

Product Return Guidelines

1. Call QSC Technical Services for a Return Authorization number. We will need your name, telephone number, shipping address, and the serial number of the product you wish to return.
2. Pack the product well for protection during shipment. Upon request, QSC will provide a suitable shipping box free of charge.
3. For warranty repairs, include a photocopy of the sales receipt. Please also include correspondence with your name, return address, phone number, and a description of the problem.
4. Write the Return Authorization number on the outside of the packaging.
5. Ship the product prepaid to QSC Audio Products. We recommend United Parcel Service.

QSC Technical Services

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<http://www.qscstore.com>

Qualified Service Centers

QSC maintains a service center network for your convenience. If you choose to return your product to a local service center, you may call QSC Technical Services for a referral. Accessories, input modules and other peripheral QSC products must be returned to the factory for service.



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