

AAREFF

TRANSMISSION SYSTEMS

Audio Compressor Limiter (ALM-2011)



CIRCUIT DESCRIPTION

All audio broadcast systems require some form of signal control and limiting to prevent over modulation. Most broadcast stations transmit a constant level of audio optimised as near as possible to 100%. This gives the listener the loudest audio possible and prevents constant re-adjustment on the receiver volume control. The Aareff (formerly Veronica) audio limiter compressor is specifically designed to achieve a constant 100% modulation using an FM broadcasting transmitter without any over modulation. The result is a professional sound on your station output with all music and speech inputs.

The limiter compressor circuit operates the audio gain around a fast attacking limiter in conjunction with a gentle AGC. action. Audio compression and output level are constant for input levels between -12dBu and +24dBu. The limiter circuitry also includes selectable pre-emphasis.

Some audio equipment, eg. CD players and computer sound cards output high frequency signals above the audio spectrum. Signals such as these entering a transmitter or stereo coder are very undesirable and cause many problems. The Limiter Compressor is fitted with a 15KHz active low pass filter to block the high frequencies.

Please Note: This unit prevents modulation distortion but cannot remove distortion from an already distorted audio input signal (i.e. From a mixer which is being 'overdriven'). Also, any graphic equalizer system used must be placed before this unit.



SOLDERING TIPS

For good soldered joints it is vital that the PCB is clean and free of grease. If the PCB has become dirty or greasy, clean it down with alcohol or some other suitable electrical cleaning solvent before starting construction.

Keep everything clean, that's the answer to successful soldering. The iron tip always needs to be clean and shiny, if the iron looks all grey, black and burnt, the solder will not flow properly. A small piece of sponge dampened with water is ideal for cleaning the iron. After a few soldered joints, wipe the tip of the iron on the damp sponge to remove the dirt build up.

Always apply the iron to the joint first, this heats the joint up, then apply the solder. This will give the joint a shiny and cone shaped appearance, which is correct. Never put a blob of solder on the iron and then apply this blob of solder to the joint. This will not work because the blob of solder will not bond to the cold joint.

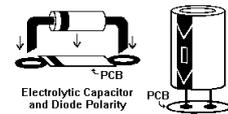


CONSTRUCTION

Before attempting any construction, check all the components against the component list. If any of the components are missing or damaged, immediately contact Aareff or your supplier before going any further with this kit. If you are unsure about soldering, see the 'Soldering Tips' section.

The PCB is printed with a legend showing the component shapes and reference numbers (R1, R2, R3, C1, C2, etc). Use the legend together with the component list to find the correct component for the PCB. Take extreme care when placing the components on the PCB. If a component is incorrectly placed, the circuit will not work properly and may even be damaged.

It's normal to assemble the PCB with the smaller components first, progressing through to the larger components. Use the PCB legend as a positioning aid, solder the components into the board and trim back the excess leads in the following order.



1. **R1 to R52, D1 to D5.** Flat to board with very short leads. Line up diode with legend for correct polarity (see diagram)
2. **IC1 and IC2.** CAUTION STATIC SENSITIVE DEVICES. (Soldering Iron must have good earth. Avoid touching the IC pins with your fingers). Gently bend IC pins with small pliers to allow fit to PCB. Make sure all pins go into PCB and IC is flat down. Line up with legend for correct polarity. The IC pins are close together, so take great care not bridge any of the pins with solder.
3. **VR1, Ferrite Bead Tubes.** Pass an off-cut lead through the tube and solder very close to PCB.
4. **TR1, TR2, TR3, IC3, LED1, LED2, LED3, J1 and J2.** Line up with legend for correct polarity. The Transistors and IC3 will not push flat to the board without damage. As a compromise to keep the leads short, push the components gently, slightly bending the leads until the black casing is about 3 mm above the board.
5. **C1 to C38.** Line up Electrolytic Capacitors with legend for correct polarity (see diagram) and solder flat to PCB with no leads showing at all. Solder all other capacitors close to the PCB keeping leads as short as possible.
6. **Phono/RCA Sockets, IDE Pins 2 x 3 way and 1 x 6 way Sil Pins.** Line up with legend and flat to PCB



SPECIFICATIONS

Comp. Thresh.	170mV rms, -12dBu
Maximum Input	12Vrms, +24dBu
Pre-emphasis	50uS, 75uS or None
Output Level	775mV rms, 0dBu
Freq. Response	30Hz-15KHz rel. to pre-emph
S/N Ratio:	-80dBu
Distortion:	Less than 0.2% THD at limiting
Attack Time:	Less than 1mS
Release Time:	AGC controlled
Indicators:	3 LED's for limiting -6dB, 0dB and +6dB
DC Power	11-16 V DC regulated
Audio Sockets:	All Phono RCA Type

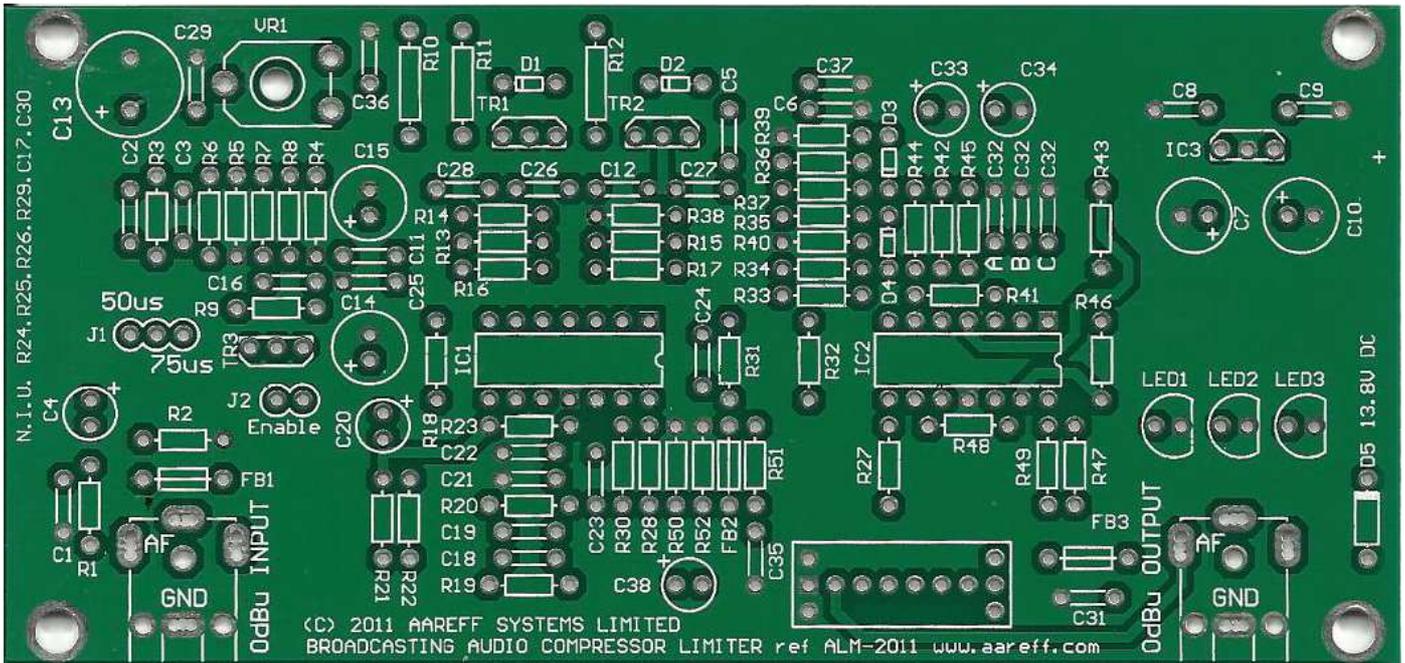
All measurements taken with power supply at 13.8 volts DC

*POLARISED COMPONENTS TAKE GREAT CARE TO INSERT THE COMPONENT LEADS INTO THE PCB THE CORRECT WAY

R1	47R	Yellow purple black gold
R2	270K	Red purple yellow gold
R3	33K	Orange orange orange gold
R4	10K	Brown black orange gold
R5	1K8	Brown grey red gold
R6	1K	Brown black red gold
R7	1K	Brown black red gold
R8	3K9	Orange white red gold
R9	100K	Brown black yellow gold
R10	68R	Blue grey black gold
R11	47R	Yellow purple black gold
R12	47R	Yellow purple black gold
R13	4K7	Yellow purple red gold
R14	39K	Orange white orange gold
R15	47K	Yellow purple orange gold
R16	4K7	Yellow purple red gold
R17	4K7	Yellow purple red gold
R18	47K	Yellow purple orange gold
R19	27K	Red purple orange gold
R20	27K	Red purple orange gold
R21	10K	Brown black orange gold
R22	27K	Red purple orange gold
R23	1K	Brown black red gold
R24		NOT USED
R25		NOT USED
R26		NOT USED
R27	680R	Blue grey brown gold
R28	2K2	Red red red gold
R29		NOT USED
R30	27K	Red purple orange gold
R31	1K	Brown black red gold
R32	4K7	Yellow purple red gold
R33	1K	Brown black red gold
R34	1M2	Brown red green gold
R35	270R	Red purple brown gold
R36	270R	Red purple brown gold
R37	680K	Blue grey yellow gold
R38	4K7	Yellow purple red gold
R39	4K7	Yellow purple red gold
R40	4K7	Yellow purple red gold
R41	22K	Red red orange gold
R42	1K	Brown black red gold
R43	39K	Orange white orange gold
R44	33K	Orange orange orange gold
R45	1K5	Brown green red gold
R46	2K2	Red red red gold
R47	680R	Blue grey brown gold
R48	1K5	Brown green red gold
R49	680R	Blue grey brown gold
R50	100K	Brown black yellow gold
R51	47R	Yellow purple black gold
R52	100K	Brown black yellow gold
D1*	1N4148	4148
D2*	1N4148	4148
D3*	1N4148	4148
D4*	1N4148	4148
D5*	1N4007	4007

IC1*	TL074	TL074
IC2*	TL074	TL074
VR1	2K2	2K2
FB1	1T	1 TURN FERRITE BEAD
FB2	1T	1 TURN FERRITE BEAD
FB3	1T	1 TURN FERRITE BEAD
TR1*	BC548/9	BC548 or BC549
TR2*	BC548/9	BC548 or BC549
TR3*	2N3819	2N3819
IC3*	78L09	78L09
LED1*	5mm	BLUE
LED2*	5mm	BLUE
LED3*	5mm	RED
J1	3 way SIL pin and 2 way jumper	
J2	2 way SIL pin and 2 way jumper	
IDE CONN.	2 x 3 way and 1 x 6 way SIL pins	
C1	100p	101
C2	1n5	152
C3	2n2	222
C4*	1u	1uF63V
C5	1n	102
C6	1n	102
C7*	220u	220uF 16V
C8	1n	102
C9	1n	102
C10*	220u	220uF 16V
C11	1n	102
C12		NOT USED
C13*	1000u	1000uF
C14*	220u	220uF 16V
C15*	220u	220uF 16V
C16	100p	101
C17		NOT USED
C18	220p	221
C19	220p	221
C20*	10u	10uF 16V
C21	220p	221
C22	220p	221
C23	100p	101
C24	100n	100K 100
C25	1n	102
C26		NOT USED
C27		NOT USED
C28		NOT USED
C29	1n	102
C30		NOT USED
C31	1n	102
C32	3 x 220nF	3 x 220K
C33*	10u	10uF 16V
C34*	1u	1uF 63V
C35	100p	101
C36	100p	101
C37	1n	102
C38*	10u	10uF 16V
1 x Limter PCB		
0.5m Red and Black DC power lead		

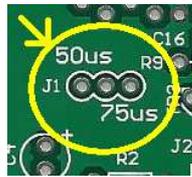




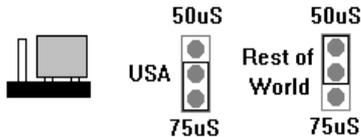
PRE EMPHASIS

The limiter circuitry features built in pre emphasis that can be set at 50uS, 75uS or None. In the USA the setting should be 75uS and for the rest of the world the setting should be 50uS.

To set the pre-emphasis configure the PCB jumper J1 so that the center pin is connected to one of the outer pins. The outer pins are marked 50uS and 75uS. If no pre-emphasis is required remove the jumper all together so that no pins are connected.



Pre-Emph Jumper Setting



Important: To prevent over modulation and interference to others the pre-emphasis should always be applied at or before the audio limiter. Any pre-emphasis on any other equipment that follows the limiter i.e. transmitter or stereo coder, needs to be disabled for correct operation.

CIRCUIT TESTING

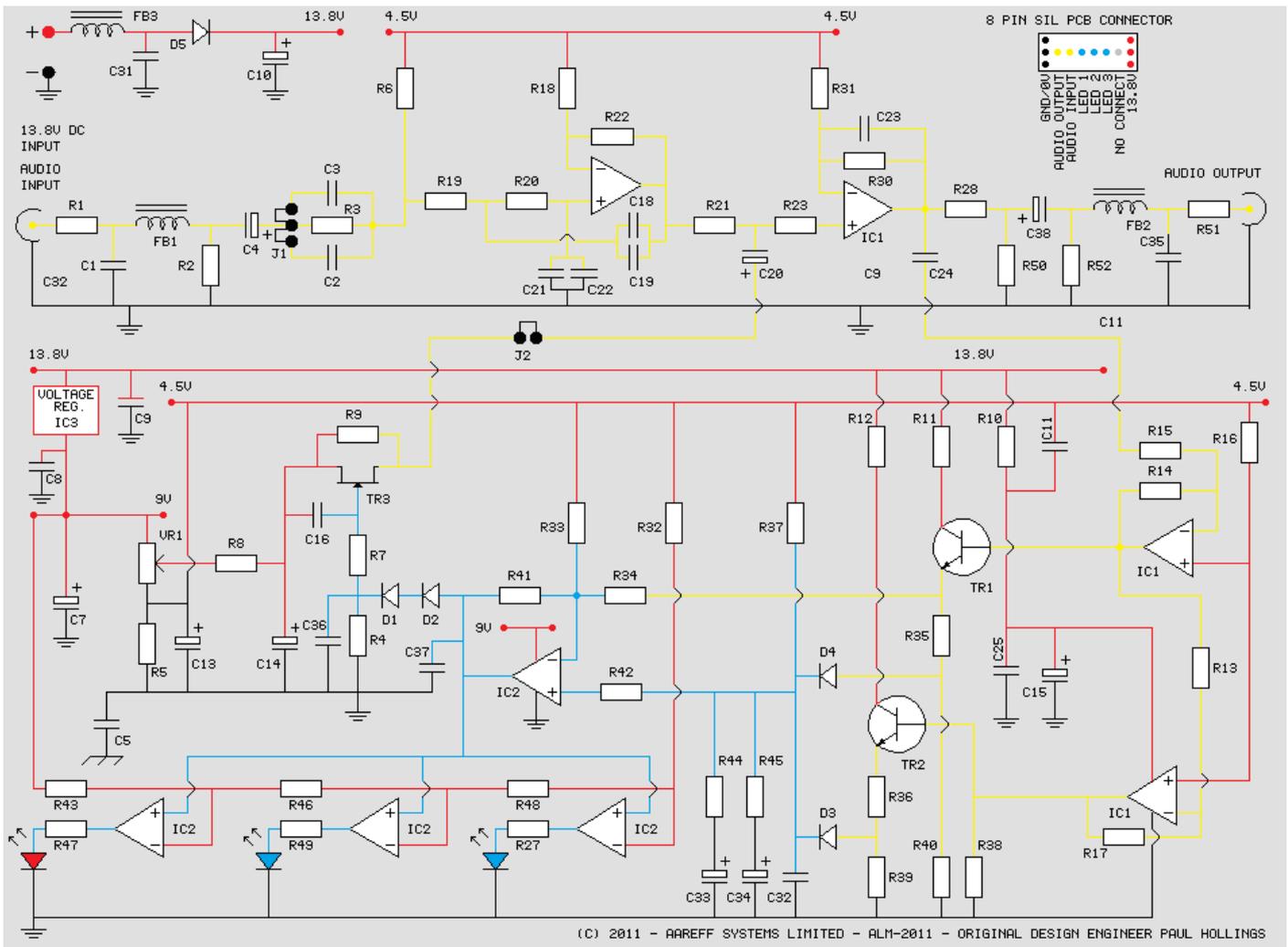
Before applying a power supply to the circuit, check and double check that all the components are in the correct position with the right polarisation. Check all the soldered joints, these should be shiny in appearance and all components should be rigid. Look carefully for accidental solder bridges and shorts. When all the checks are complete and okay, continue with the procedure below.

Fit the Jumper to the two sil pins on J2. Adjust VR1 to mid position. Connect a regulated power supply that is between 12 and 13.8V DC to the DC lead, RED to +, Black to GND or -. **DO NOT EXCEED 16V DC.**

Connect the limiter audio output socket to the transmitter, stereo coder audio input or audio amplifier using a phono to phono lead. Apply an audio source from an HiFi CD player, one with phono/RCA outputs. Start to play a good quality pre-recorded audio CD. Adjust VR1 slowly and carefully on the limiter so that LED3 just flashes on the music peaks. VR1 is a sensitive adjustment for the limiter gain circuit. Abrupt adjustments to VR1 may cause a large temporary gain reduction. If the audio appears to disappear, wait a few seconds for the limiter gain to re-settle. This procedure calibrates the limiter DC conditions and LED3 to +6dBu.

Using an FM radio, monitor the audio from the transmitter. Adjust the variable resistor on the transmitter or stereo coder audio input to give the correct level of FM deviation.

You can now apply any audio source between -12dBu and +24dBu to the limiter and the output will be held to a maximum of +6dBu.



Do the LEDs flicker at switch on? If not;

- Check the power supply (12-13.8V DC).
- Check that the 100mA fuse has not blown.

No compression/limiting or audio gain unstable;

- Ensure that the audio input is greater than -12dBu 170mVrms).
- J2 jumper is fitted

Due to the complexity of the circuit, other faults are more difficult to locate without test equipment. All of the components in the kit are new and of a high quality, it is very likely that a fault is caused by incorrect construction. Using the PCB legend and component list, check that all components are in the correct positions and have correct polarity.

Carefully check the PCB soldering; excessive soldering may have shorted out adjacent tracks on the PCB. Solder splashing from the iron could have shorted out the adjacent tracks. A magnifying glass or multimeter may help to find any small hairline short circuits, which are not visible to the naked eye. All soldered joints should be shiny in appearance, any solder joint which appears dull may be a 'dry joint', which could cause the circuit to malfunction.

Any dull looking joint should be re-soldered.

If the circuit still has a malfunction, please put it in writing, using diagrams if necessary and we will respond as soon as possible.

Aareff Systems Limited (UK)

Email info@aareff.com

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

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