

# Professional Limiter Compressor



## CIRCUIT DESCRIPTION

In any sound broadcasting system the audio level must be controlled to prevent over modulation. The current trend is for broadcast stations to transmit a constant level of audio optimised to 100%. This gives the listener 'loud' audio and prevents constant re-adjustment on the receiver volume control. The Veronica Limiter Compressor is specifically designed to achieve constant 100% modulation without any over modulation using an FM broadcasting transmitter. 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 3 individual time constants. These control a smooth AGC combined with a very fast attack on audio signal peaks. Audio compression and output level are constant for input levels between -6dBu and +24dBu. The limiter circuitry also includes built in pre-emphasis.

Some audio equipment, usually CD players 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 Veronica Limiter Compressor is fitted with a 15KHz brick wall low pass filter to block the high frequencies. From 30Hz to 15KHz the filter response is flat. At 20KHz there is virtually no trace of signal



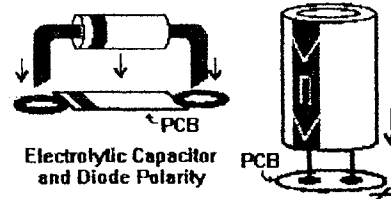
## CONSTRUCTION DETAILS

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

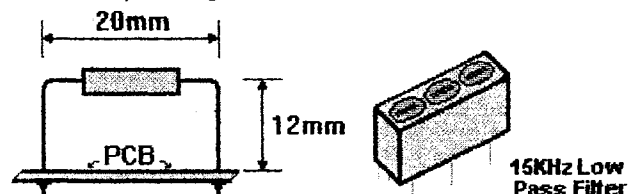
The PCB is printed with a legend showing the component shapes and reference numbers (R1, R2, R3, C1, C2, etc). Use the legend together with the component list to find the correct component for the PCB.

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.



- Resistors (except R45) and Small Diodes.** Flat to board with very short leads. Line up diode with legend for correct polarity(see diagram)
- Links.** Use the scrap leads previously cut off the resistors to form the short wire links.
- Integrated Circuits (IC).** 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, take great care not bridge any of the pins with solder.
- VR1, Ceramic Disc Capacitors and Ferrite Bead Chokes.** Leads very short and components close to PCB.
- D1.** Line up with legend for correct polarity.
- Transistors.** Line up with legend for correct polarity. The Transistors 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.
- LEDs.** Line up with legend for correct polarity. These can be fitted flat to PCB or raised on bent leads to face away from the PCB for front panel applications.
- Electrolytic Capacitors.** Line up Electrolytic Capacitors with legend for correct polarity (see diagram). All flat to PCB with no leads showing at all.
- C9 and C17.** Leads as short as possible and close to PCB.
- R45 and ZD1.** DO NOT mount flat to PCB. Bend the leads of R45 and ZD1 and mount to the PCB using the dimensions shown in the diagram below. This is important as these components run HOT under normal operating conditions.



- 15KHz Low Pass Filter.** Line up with legend and mount flat to PCB. AVOID prolonged contact with the soldering iron as this may damage the filter internally. The filter pins are close together, take great care not bridge any of the pins with solder. DO NOT ADJUST THE FILTER CORES.
- Phono Sockets and Fuse Holder Clips.** Line up with legend and flat to PCB.

## Veronica FM PRE EMPHASIS

The limiter circuitry features built in pre emphasis. If the limiter is used with a Veronica 1W PLL transmitter, Stereo Transmitter or Stereo Coder, the pre emphasis needs disabling from these units.

To disable the pre-emphasis on the Veronica stereo coder/ transmitter remove C5 and C6 from the transmitter/ coder PCB.

To disable the pre-emphasis on the Veronica 1W PLL transmitter remove C2 from the PLL transmitter PCB.

## Veronica FM 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.

Adjust VR1 to mid position. Connect a regulated power supply of about 13.8V DC to the PCB position marked 13.8v + and -. **DO NOT EXCEED 16V DC.**

Connect the limiter audio output socket to the transmitter or stereo coder audio input using a phono to phono lead. Apply an audio source from a good quality cassette tape deck with VU metering and a pre recorded tape to the limiter audio input phono socket. Switch on the limiter and wait a few seconds for the limiter gain to settle. Play the tape. The VU metering on the tape deck should be hitting 0dB on the VU scale. Adjust VR1 on the limiter so that LED2 flashes simultaneously with the 0dB indication on the tape deck metering. 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 LED2 to 0dBu.

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 -6dBu and +24dBu to the limiter.

## Veronica FM SPECIFICATIONS

Type:	Back feed multiple time constant with AGC
Input Limiting Threshold:	350 mV rms, -6dBu <i>1.5v peak</i>
Maximum Input:	12V rms, +24dBu <i>17v peak</i>
Pre-emphasis:	50 uS
Output Level:	775 mV rms, 0dBu <i>1.1v peak</i>
Frequency Response:	30 Hz - 15 KHz relative to pre-emphasis
Signal to Noise Ratio:	-75dBu
Distortion:	Less than 0.2% THD at limiting
Attack Time:	Less than 1 mS
Release Time:	AGC controlled
Indicators:	3 LED's for limiting -6dB, 0dB and +6dB
Power Requirement:	11-16 V DC regulated
Audio Sockets:	All Phono

All measurements taken with power supply at 13.8 volts DC

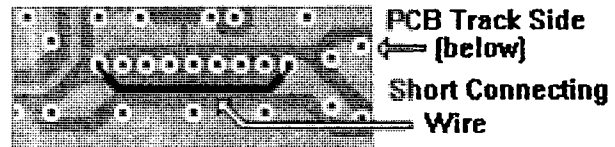
## Veronica FM TROUBLE SHOOTING

Do LEDs flicker on switch on, if not

- Check power supply for about 13.8V
- Check 1 amp fuse has not blown
- Check soldered joints and polarity on FB1, FB2, fuse holder clips, C3, D1, R45, VR1, R44, C24, C22, ZD1, LED1, LED2, LED3 and IC2

No Audio or Poor Quality Audio

- Check audio source and connection lead.
- Check soldered joints and polarity on phono sockets, R1, FB3, R2, C5, R3, C6, R4, R5, R6, IC1, R9, C8, R10, R11, C10, R12, FB4 and R13.
- Check 15KHz low pass filter, Switch off the limiter at the power supply. Bypass the filter by carefully soldering a short piece of wire across the filter PCB connections as shown in the diagram below. Switch the limiter on and if the audio is okay, the filter is damaged.



No compression/ limiting or audio gain unstable.

- Is the audio input greater than -6dBu (350mV)?
- Check soldered joints and polarity on C9, R14, R15, TR1 R19, IC1, R17, R18, C14, R22, R46, TR2, R20, R21, R23, R24, R25, D2, D3, R27, R26, C19, C18, R30, C17, R28, R31, R39, D4, D5, R41, R40, R42, R43, C21, TR3 and C7.

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 high quality and brand new, it's very likely that a fault is down to the construction. Using the PCB legend and Component List, check that all 94 components are in the correct positions and have the 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 adjacent tracks. A magnifying glass or multimeter may help to find any small hairline short circuits not visible to the naked eye. All soldered joints should be shiny in appearance. Any dull looking soldering may be a 'dry joint', causing the circuit to malfunction. Re-solder dull looking joints.

If the circuit still has a fault after double checking everything, contact your supplier or Veronica FM via Post or Email. Describe in writing or with a diagram the exact problem and we will take steps to get you working.

Veronica Kits, 18 Victoria Street, Queensbury  
BRADFORD, BD13 1AR, UK

Tel/Fax 01274 816200 Email [veronica@legend.co.uk](mailto:veronica@legend.co.uk)  
Website <http://www.legend.co.uk/~veronica/>

## COMPONENT LIST

\* 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	27K	red purple orange gold
R4	3K9	orange white red gold
R5	3K9	orange white red gold
R6	10K	brown black orange gold
R7	1K	brown black red gold
R8	1K	brown black red gold
R9	56K	green blue orange gold
R10	2K2	red red red gold
R11	3K3	orange orange red gold
R12	100K	brown black yellow gold
R13	47R	yellow purple black gold
R14	47K	yellow purple orange gold
R15	39K	orange white orange gold
R16	4K7	yellow purple red gold
R17	4K7	yellow purple red gold
R18	68R	blue grey black gold
R19	47R	yellow purple black gold
R20	47R	yellow purple black gold
R21	270R	red purple brown gold
R22	4K7	yellow purple red gold
R23	4K7	yellow purple red gold
R24	4K7	yellow purple red gold
R25	270R	red purple brown gold
R26	33K	orange orange orange gold
R27	1K5	brown green red gold
R28	680K	blue grey yellow gold
R29	2M	red black green gold
R30	1K	brown black red gold
R31	1K	brown black red gold
R32	4K7	yellow purple red gold
R33	1K5	brown green red gold
R34	2k2	red red red gold
R35	39K	orange white orange gold
R36	680R	blue grey brown gold
R37	680R	blue grey brown gold
R38	680R	blue grey brown gold
R39	22K	red red orange gold
R40	10K	brown black orange gold
R41	1K	brown black red gold
R42	100K	brown black yellow gold
R43	3K9	orange white red gold
R44	2K2	red red red gold
R45	33R	orange orange black gold
R46	4K7	yellow purple red gold
C1	1n	102
C2	1n	102

C3*	220u	220uF 16V
C4	100p	101J
C5*	1u	1uF 63V
C6	1n8	182
C7*	10u	10uF 16V
C8	100p	101J
C9	100n	100K 100
C10*	10u	10uF 16V
C11	10n	103
C12	100p	101J
C13	1n	102
C14*	220u	220uF 16V
C15	1n	102
C16	1n	102
C17	680n	680K 100
C18*	10u	10uF 16V
C19*	1u	1uF 63V
C20	100p	101J
C21*	220u	220uF 16V
C22*	1000u	1000uF 6.3V
C23	1n	102
C24*	220u	220uF 16V
VR1	2K2	Variable Resistor
D1*	1N5402	5402
D2*	1N4148	4148
D3*	1N4148	4148
D4*	1N4148	4148
D5*	1N4148	4148
ZD1*	9V1	1N5346
LED1*	5mm Standard	Green
LED2*	5mm Standard	Green
LED3*	5mm Standard	Green
TR1*	BC548	548C
TR2*	BC548	548C
TR3*	2N3819	3819
IC1*	TL074	TL074
IC2*	TL074	TL074
FB1	2 turn ferrite bead	
FB2	2 turn ferrite bead	
FB3	2 turn ferrite bead	
FB4	2 turn ferrite bead	
	1 x 15KHz Low Pass Filter	
	2 x PCB Phono Sockets	
	2 x Fuse Clips	
	1 x 1 A Fuse	
	2 x Terminal Pins	
	1 x Limiter PCB	



## 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 meths 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.

