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# EC-1 Mono Channel Compressor / EQ / Mic Pre



# Subised oipnH Toft



## Toft Audio Designs

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**TOFT AUDIO DESIGNS**

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# Toft Audio Designs

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## ABOUT THE DESIGNER

Malcolm Toft started his career in the late 60's as a recording engineer and was the first engineer to be employed at the famous Trident Recording Studios in London. Among his credits are the recordings of David Bowie's 'Space Oddity' album, James Taylor's first album, and three albums with T-Rex. He was also the mixing engineer on the Beatles' 'Hey Jude' single.

In 1972 Trident studios decided to buy a new recording console and Malcolm was able to convince the owners that they could in fact build one themselves. From this idea was borne Trident Audio Developments Ltd. that went on to become a leading manufacturer of music recording consoles. One of the company's earliest advertising slogans was 'designed by recording engineers for recording engineers'. This became a key component of what made the 'Trident Sound' so unique. Coming from a background of being a recording engineer rather than an electronics engineer, Malcolm has always designed with his ears rather than a text book and it is this coupled with over thirty years experience that has enabled him to develop his own 'philosophy of sound' that is his trademark.

Consoles designed by Malcolm have been used to record just about every major artist in the past three decades, including Elton John, Dire Straits, David Bowie, Rod Stewart and Stevie Wonder to name but a few. More recently they have been used to record artists such as Radiohead and Pavarotti. The Toft Audio range therefore brings with it an historic pedigree, but what excites Malcolm tremendously is the fact that he is able to offer his designs at a price that is now affordable to the smaller studios and home recordists.

## PRODUCT DESCRIPTION

The EC-1 is a combined microphone/line amplifier, F.E.T. compressor and four band equalizer. Because of the wide range of facilities it offers, the EC-1 effectively provides a complete recording channel. It will take the signal from a microphone or instrument and process it so that it is ready to feed straight into a recording device such as a computer controlled digital audio workstation or analog storage device such as a multi-track tape recorder. It can also be inserted into the path of a mixer channel to provide additional signal processing (particularly equalization and compression).

All three sections offer a wide range of control coupled with extremely high quality analog electronics that have a real pedigree. The microphone amplifier is the same design as used in Malcolm Toft's top range of recording consoles, while both the compressor and equalizer section borrow heavily from vintage Trident designs.

The equalizer section is a four band swept design identical to that found in the MTA Series 980 music recording console. As a recording engineer and console designer with over 25 years experience, Malcolm Toft has gained a reputation for designing consoles and equalizers that are both highly musical and intuitive to use. The EC-1 equalizer follows that tradition of excellence in every way.

One of the main features of the equalizer is its ability to enhance bass frequency signals without introducing the unwanted 'boom' so often found in many modern console equalizers. The frequencies and curve shapes of each range have been carefully chosen after painstaking listening tests in order to provide the precise degree of control that creative recording engineers require. Whilst a level adjustment of  $\pm 15\text{dB}$  in each range has been provided, use of the unit will show that only a small amount of boost or cut is needed to provide the desired effect. In severe cases where it may be necessary to remove unwanted frequencies to provide a particular effect (such as telephone voice simulation), the full boost and cut range can be used to great advantage.

The EC-1 can be used to provide a pristine signal path of exceptional quality when required allowing subtle control of the audio path, or it can be used to provide extra punch and dynamics to an otherwise lackluster signal.

## CONNECTING THE UNIT

The rear panel of the unit provides both x-I-R and 1/4" jack inputs for the line input and output, whilst a female x-I-R only connects the microphone input. These connectors use the standard industry convention of pin 1 ground, pin 2 + and pin 3- for x-I-R connectors and tip +, ring -, and sleeve ground for jacks. The jacks can also be connected unbalanced, tip + and sleeve ground. When connecting a microphone, the input level control for each channel should be at minimum and the phantom power +48V switch off (led extinguished). The front panel instrument jack is also unbalanced and follows the same wiring code. The microphone input is designed to accept low impedance balanced microphones of either dynamic, ribbon or condenser types. The line input is designed to accept balanced or unbalanced, line level audio signals and like the microphone input is selected via the front panel 'MIC/LINE' switch.

The outputs from the unit is low impedance and designed to operate with long cable runs without signal degradation such as loss of high frequencies. The front panel instrument input is high impedance designed to work with a wide range of musical instruments such as guitars, basses and electronic keyboards. A large amount of amplification is provided with this input and it will operate in both the microphone and line mode (determined by the front panel 'MIC/LINE' switch). Setting the input switch to 'MIC' will provide slightly more amplification if needed for very low output instruments.

A standard I.E.C. mains inlet is provided for A.C mains power and universal voltages of either 110 or 240 volts are selectable by rotating the fuse holder incorporated in the mains inlet socket.

## INPUT SECTION

The input section of the EC-1 consists of a very high quality microphone amplifier designed specifically for professional audio applications. It exhibits near theoretical minimum noise figures, has an extremely fast transient response and will handle a wide range of input levels with a frequency response that extends above 40kHz. Naturally, best results will be achieved using a high quality condenser microphone of either the F.E.T or tube variety. The microphone amplifier will however bring out the best in either a dynamic or ribbon microphone. The large amount of gain and low noise available in the amplifier is particularly useful when working with ribbon microphones as these have an inherently low output level and noise can therefore become a problem.

When connecting a microphone to the input of the unit, the 'Mic/Line' selector switch to the left of the gain control should be selected to 'Mic' and the 'Mic/Line Gain' control sets to its' minimum position (fully anti-clockwise). The 'Comp' switch should be set to 'OUT' (led extinguished). If +48V phantom power is to be used, this should be selected whilst the 'Mic/Line Gain' control is at minimum and the associated led will show that phantom power is present. A few moments (up to 30 seconds) should be allowed for the microphone to reach normal operating level and the 'Mic/Line Gain' control advanced until a suitable level is achieved at the output of the EC-1. The V.U meter can be used to monitor the output level of the unit after having first selected the 'Meter' switch (situated to the left of the meter) to the 'Output' position. The 'Mic/Line Gain' control should be set so that signal peaks go just into the red portion of the meter scale and should never cause the meter to deflect fully right for sustained periods. This will provide a suitable operating level for the unit and will match other professional audio equipment. The EC-1 is in fact capable of very high output levels (up to +26dBm) but by setting the level as described above, adequate overload margins are maintained and there should be no danger of overloading following equipment.

When using a line level input, the 'Mic/Line' switch should be selected to 'Line' and the 'Mic/Line Gain' control set to its midway position. +48V phan-

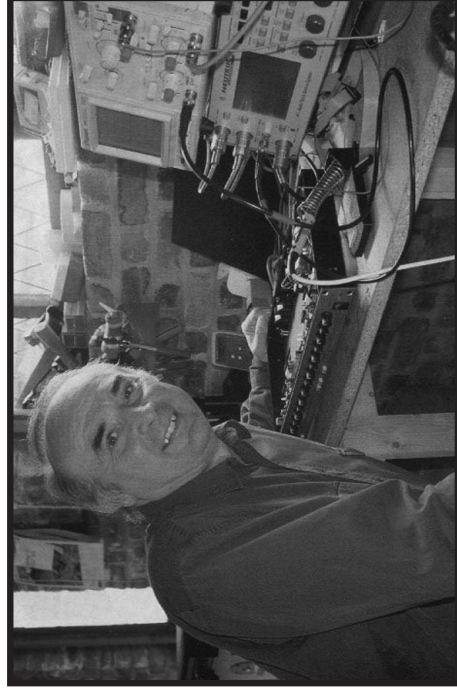
tom power should never be selected in the 'Line' mode. At it's midway position in line mode, the unit is designed to give unity or 0dB gain. This makes an easy reference point when using line level inputs and a '0' is placed at the centre point of the 'Mic/Line Gain' control for this reason. In the same way as described above, the VU meter can be used to set an appropriate level through the unit.

## F.E.T. COMPRESSOR

There are many ways to control or reduce the dynamic range of signal and these include photo-optical devices where the signal triggers a light emitting device such as an led which in turn shines on to a photo electric cell. The cell then varies in resistance according to the light shining upon it and the more light, the lower the resistance gets. This can then be used to reduce the signal level and therefore control the dynamic range. Compressors based on these devices were particularly popular in the sixties and are known for their characteristic 'soft' form of compression. This is also true of tube based compressors which usually operate on a 'variable mu' principle to control the dynamic range. More modern developments use either a voltage controlled amplifier, which is very easy to mathematically predict, and provides extra facilities such as 'hard and soft knee' compression, or the one we have chosen, the F.E.T. This way of controlling signal dynamics was particularly popular in the seventies and has unique characteristics of its own. Because of the nature of the device it can provide extremely fast attack times and consequently has the ability to really control the dynamics of audio signal. The design of the compressor is based around a circuit used by Trident in the early eighties that proved very popular with many recording studios. Whilst there are many companies producing optical, tube and vca based compressors, F.E.T based designs are much rarer and normally very expensive as they need care in setting up. We have been able to minimize the setup needed and are able to offer the unique F.E.T. characteristics at an affordable price.

## Operating The Compressor

All the compressor related controls, 'Attack', 'Release', 'Ratio' and 'Make Up Gain' should first be set to their minimum positions (fully anti-clockwise). The input level should be set in accordance with the instructions given in the preceding section 'Input Section'. This is very important as the compressor section works on the principle of a fixed 'threshold'. This is the preset position at which the compressor starts to operate. Signals below the 'threshold' will not be compressed and therefore the circuitry will not operate at its optimum. The 'Comp' switch should be set to the 'IN' position (led illuminated) and the 'Make Up Gain' control advanced to its midway point. Like the 'Mic/Line Gain' control, this is set up so that in it's midway position, the unit is designed to give unity or 0dB gain. The signal on the VU meter should now read the same whether the 'Comp' switch is set to 'IN' or 'OUT'. Now switch the 'Gain Reduction' switch to the left of the meter to 'G.R.' (Gain Reduction). The meter will now indicate '0' whether signal is present or not and irrespective of signal level. This is because in 'G.R' mode the meter is designed to give an indication of the amount that the signal is being attenuated by the compressor circuit. Now advance the 'Ratio' control slowly and compression of the signal will take place. On most programme material it will not be necessary to advance the ratio control very far to get the desired effect. The 'Make Up Gain' control can be advanced clockwise to adjust for any difference in output level caused by the compressor. The 'Attack' and 'Release' control settings depend on the nature of the audio signal through the compressor. For example, a bass guitar is best processed using a slower attack time ('Attack' control advanced clockwise), as the extremely fast attack time of the compressor may not be desirable on such a percussive instrument. For vocals, a fast attack time and slow release could be favored in order to avoid 'pumping' effects common in many compressors without the range of control that the ATC-2 offers. In using compressors, it is very much a case of experimentation to find what suits different instruments and different program material.



Malcolm Toft, Designer

## EQUALIZER

The EC-1 incorporates a classic four band sweep equalizer that is extremely similar to that employed on the MTA Series 980 console. It consists of four independent ranges each with continuously sweepable frequency and continuously variable boost and cut. A feature of each band is that the boost and cut is completely reciprocal. That is to say that the boost shape is a mirror image of the cut shape. This provides not only an extremely musical sound but also a high degree of control. All frequency ranges have been carefully chosen to have maximum effect on music programme and a good degree of overlap is provided.

All four bands are of the 'peaking' type. For those not familiar with the term, a peaking equaliser is one that as its name suggests, reaches a peak and then falls back down. The period over which it reaches it's peak and then falls down is known as the bandwidth. The bandwidth of the equaliser design in the EC-1 has been chosen for its musical characteristics and has been developed over many years of listening tests and studio appraisal. Because this type of design reaches a peak and then falls away, it is possible to 'home' in on a particular area of frequencies and adjust them without affecting the others around them. This can be particularly useful when working with instruments such as bass guitars and snare drums.

### Operating The Equalizer

To use the four band equaliser section, first make sure that all of the boost and cut controls are in their mid way positions. This will be apparent when a small click is felt at the mid rotation point, which denotes the 'flat', i.e. no boost or cut position. Next it is necessary to switch the 'EQ' push-button to 'IN' which will illuminate its associated i.e.d. to indicate that the equaliser is now in circuit. According to the programme material connected to the unit, a frequency should be chosen from one of the four sections (starting with bass to the left hand side advancing to treble frequencies on the extreme

right), which the operator wishes to process. By turning the centre detented boost or cut control, the chosen frequency can be either attenuated (anti-clockwise) or accentuated (clockwise).

If a large amount of accentuation (boost) is used either on one section or more, it may be necessary to reduce the input level control to either avoid distortion through the unit or overloading of the device to which the equaliser is connected.

Similarly, if a large amount of attenuation (cut) is used either on one or more sections, it may be necessary to increase the input level to bring the signal back up to it's original setting.

Use of the 'EQ' button will allow comparison of the signal for both difference in sound and level before and after the equaliser section.

It should be noted that the AFC equaliser is capable of handling high input signal levels (up to +20dBm) at the inputs and throughout the device and also delivering up to a +24dBm balanced output signal. It is important therefore when checking if distortion should occur, that the mixer or device that the unit is connected to, is not itself being overloaded.

A final word in general about the use of equalisation. If you find that you are having to use all four sections of the equaliser and with quite large amounts of boost or attenuation (other than for a specific 'effect' you are trying to make), I would suggest that you go back a step and check the source that is feeding the equaliser. In most cases, selecting a different microphone for the job or moving the microphone position can be far more effective than applying large amounts of equalisation. By the very nature of their design, equalisers introduce phase changes at specific frequencies and these are to be avoided as much as possible.

## TROUBLESHOOTING

### 1) No Power.

Make sure the unit is selected for the correct mains voltage via the selector incorporated in the mains inlet socket on the back of the unit. Check the fuse (also in the mains inlet socket) if the unit has been powered with the wrong voltage.

Check there is a main supply reaching the unit.

### 2) The microphone doesn't work.

Is it connected to the correct input on the back of the unit?

Is the phantom power switched on? (condenser microphones)

Is the 'Mic/Line' switch selected to 'MIC'

Make sure the 'Mic/Line Gain' control is turned up

### 3) The line input doesn't work.

Is it connected to the correct input on the back of the unit?

Is the 'Mic/Line' switch selected to 'LINE'

Make sure the 'Mic/Line Gain' control is turned up.



### 4) The instrument input doesn't work.

Check the lead from the instrument.

Make sure the 'Mic/Line Gain' control is turned up.

### 5) The compressor doesn't work.

Is the 'Comp In' switch selected to 'IN' ?(led illuminated).

Is the 'Ratio' control advanced clockwise?

Is the 'Make Up Gain' control advanced clockwise? (set to midway).

Is there enough signal (set by the 'Mic/Line Gain' control) to 'drive' the compressor?

### 6) The equalizer doesn't work.

Is the 'EQ In' switch selected to 'IN' ?(led illuminated).

Make sure the 'Mic/Line Gain' control is turned up.

Make sure the 'Make Up Gain' control is turned up if the compressor is switched in.

## EC-1 TECHNICAL SPECIFICATIONS

### Input Impedance

Microphone: >1.2K- ohm balanced  
 Line: >15K ohm electronically balanced  
 Instrument: >100K ohm unbalanced

### Output Impedance

x-l-r: <100 ohm electronically balanced  
 Jack: <100 ohm unbalanced

### Gain

Microphone: 60dB  
 Line: -16 to +30dB  
 Instrument: 36dB

### Noise

Microphone: <-128dBu ref 150 ohm (20Hz-20kHz)  
 Line: <-75dBu (Eq. In, 20Hz-20kHz)  
 <-70dBu (Compressor In, 20Hz-20kHz)

### Maximum Levels

Mic Input: <+24dBu at all frequencies (Compressor out)  
 <+15dBu at all frequencies (Compressor in)  
 Line Input: <+24dBu at all frequencies (Compressor out)  
 <+15dBu at all frequencies (Compressor in)  
 Instrument Input: <+24dBu at all frequencies (Compressor out)  
 <+15dBu at all frequencies (Compressor in)

### Distortion

Mic Input: <0.05% T.H.D. (-50dBu input, +4dBu output)  
 Line Input: <0.05% T.H.D. (+4dBu input, +4dBu output)  
 Instrument Input: <0.05% T.H.D. (-30dBu input, +4dBu output)  
 Compressor: <0.5% T.H.D.(maximum compression)

### Frequency Response

Mic Input: ±1dB 20Hz to 20kHz  
 Line Input: ±1dB 20Hz to 20kHz  
 Instrument Input: ±1dB 20Hz to 20kHz

### Nominal Operating Level

+4dBu

In accordance with our policy of continuing product improvement, we reserve the right to alter specifications without prior notice.

## TOFT AUDIO DESIGNS LIMITED WARRANTY

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PMI Audio Group warrants that all products will be free from defects in material or workmanship:

A: For a period of (3) three years from the date of purchase (hereinafter the labor warranty period), PMI Audio Group will repair or replace this Product if determined to be defective. After the expiration of the labor warranty period, the Purchaser must pay labor charges.

B: In addition, PMI Audio Group will supply, at no charge, replacements for defective parts for a period of (three years) from the date of purchase. During the labor warranty period, to repair the Product, Purchaser must return the defective Product, freight prepaid, or deliver it to PMI Audio Group Service Center. The product to be repaired is to be returned in either its original carton or a similar package affording an equal degree of protection. PMI Audio Group will return the repaired Product freight prepaid to the Purchaser. PMI Audio Group is not obligated to provide Purchaser with a substitute unit during the warranty period or at any time.

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replacement by Purchaser of any Product or part thereof shall extend the warranty period as to the entire Product. The specific warranty on the repaired part only shall be in effect for a period of ninety (90) days following the repair or replacement of that part or the remaining period of the Product warranty, whichever is greater.

2. Exclusive Remedy: Acceptance: Purchaser's exclusive remedy and PMI's sole obligation is to supply (or pay for) all labor necessary to repair any product found to be defective within the warranty period and to supply, at no extra charge, new or rebuilt replacements for defective parts. If repair or replacement fails to remedy the defect, then and only in such an event, shall PMI exchange to Purchaser a new or reconditioned unit. Purchaser's failure to make a claim as provided in paragraph 1 above or continued use of the product shall constitute an unqualified acceptance of such Product and a waiver by Purchaser of all claims thereto.

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4. Proof of purchase: The dealer's dated bill of sale must be retained as evidence or the date of purchase and to establish warranty eligibility

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Specifications and model numbers are subject to change without notice

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Model Purchased: \_\_\_\_\_ Date Purchased: \_\_\_\_\_  
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