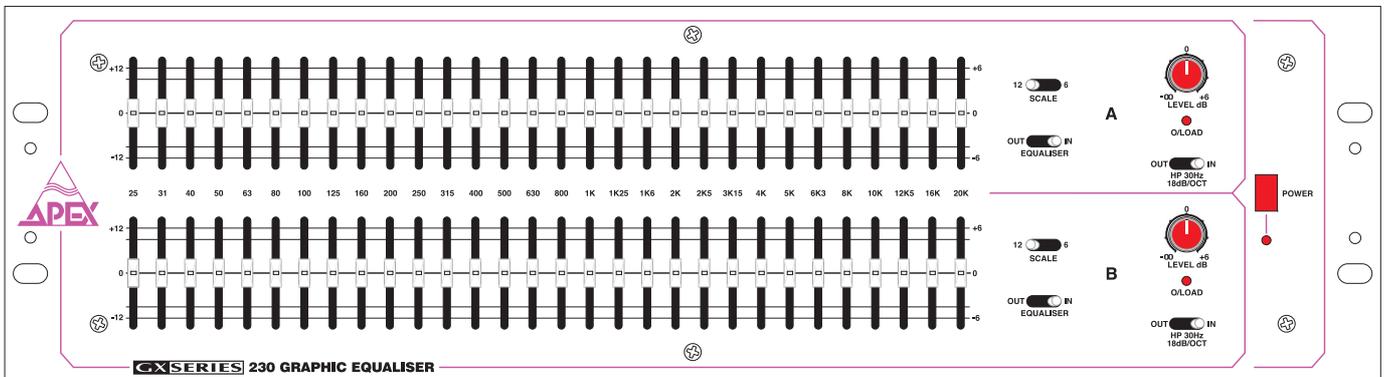


APEX GX Series Graphic Equalisers **GX 230**

USER MANUAL
version 2.0 - english



APEX nv
Schoebroekstraat, 62
B-3583 Beringen
BELGIUM
Tel. +32 11 28 61 91
Fax. +32 11 25 56 38
www.apex-audio.be

CE approval

The APEX equaliser is CE approved when you use cables with maximum length of 10 m. Pay attention that the apparatus has to be earthed !

CE

Contents

Section 1 : Contents	3
Section 2 : Introduction	5
2.1 The GX 230	5
Section 3 : Performance Highlights	7
Section 4 : Installation	9
4.1 Unpacking the unit	9
4.2 Checking the mains voltage	10
4.3 Setting the mains voltage	10
4.4 Replacing the mains fuse	10
5.5 The rear pannel	11
5.6 Rack mounting	13
Section 5 : Signal connections	15
5.1 Input	15
5.2 Output	16
5.3 Grounding	17
Section 6 : The Equaliser	19
Section 7 : General operating instructions	21
7.1 Introduction	21
7.2 Level control, O/load and power	21
7.3 HP filter	22
7.4 Graphic equaliser	22
Section 8 : Specifications	23
Section 9 : Maintenance and service information	25
Section 10 : Warranty	27
Technical Information	29

The GX 230

The APEX GX230 is a dual channel 30 band 1/3 octave graphic equaliser, incorporating our newly developed DLT hybrid circuits. A high-pass filter precedes the equaliser in each channel and is switchable in and out of the signal path. The unit is built to the highest professional standards both for electronics and mechanics.

The heart of each graphic equaliser is a bank of 30 bandpass filters, one filter for each 1/3 octave frequency. Conventional equaliser designs use discrete components to realise these bandpass filters. Although it is possible to build good equalisers with this technology using precision components, far better results can be achieved with dynamically trimmed hybrid circuits. This is what DLT stands for: Dynamic Laser Trimming.

At the factory, each filter of the graphic equalisers is laser trimmed to match “mother nature’s” prescription for ideal response. This results in perfect combining of the individual filter response curves and, therefore, a perfectly flat amplitude and phase response.

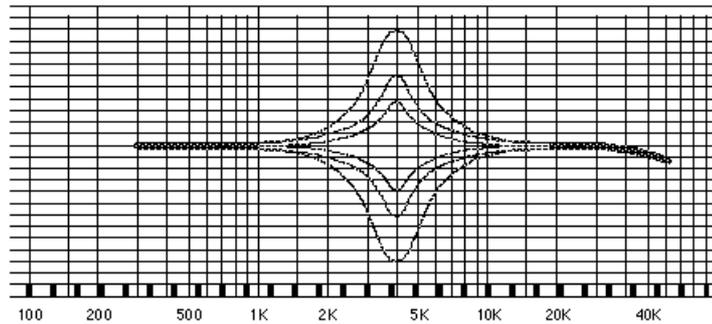
All the filter components are incorporated on the hybrid circuits. As a final production step, each bandpass filter is adjusted for the correct 1/3 octave centre frequency and bandwidth, using a specially developed trimming algorithm for adjusting the centre frequency and bandwidth simultaneously. Incorporating all filter components on the hybrid circuits yet has another important advantage : because of the largely reduced number of soldered connections, reliability is boosted to an extent only exceeded by integrated circuits (some call it “fit and forget technology”).

The controls of the graphic equalisers provide up to 12 dB of reciprocal cut and boost at the 30 distinct centre frequencies. The filters of the GX230 preserve optimal filter bandwidth, whatever the

settings of the controls.

Because of this 'constant Q' circuitry, filter response does not broaden at low cut or boost settings (fig 1.2). In this way filter interaction is minimised and the 'graphic' qualities of the equaliser preserved.

The graphic equalisers of the GX230 are switchable IN and OUT of the signal paths. The complete unit can be bypassed by switching it off. The failsafe relays will react as if there were a mains failure and will link the input of each channel to its corresponding



output.

The GX230 has electronically balanced inputs and balanced, floating output stages. Each output circuit actually simulate a transformer with a 10KOhm impedance to ground for each leg. Both the input and output circuits are factory adjusted for optimum balance at low and high frequencies. This results in increased interference immunity of the unit.

The overall gain of each channel of the GX230 is variable from - to +6 dB with the front panel level control. All potential overload points of each channel are continuously monitored by an extremely fast "peak" overload detector, followed by a "peak-stretching" circuit for clear indication of overload conditions. The detector thresholds are chosen for approximately 2 dB headroom when the overload led illuminates, giving the user the ability to make corrections before peak clipping becomes audible.

Performance Highlights

3

- Two independent channels.
- 30 band constant Q precision DLT graphic equalisers
- Switchable 30Hz highpass filters with 18dB/oct slope.
- Graphic equalisers in-out switchable.
- Switchable scale 6/12 dB on graphic equalisers.
- 6 dB of gain available.
- Extremely low distortion and noise.
- True differential input circuitry.
- Effective HF interference cancelation on in- and outputs through perfectly HF balanced stages
- XLR in- and outputs.
- Accurate “peak-stretching” overload indicators.
- Failsafe bypass.
- Earth-lift switch.
- Power transformer with low flux windings and magnetic screening, reducing magnetic stray field to other units.
- Wide mains-voltage range.
- Professional parts and construction

In addition to these operating instructions and the GX 230 equaliser, the packaging also contains :

- A power cord (see note for U.K.).

NOTE

This apparatus must be earthed.

The wires of the mains lead are coloured in accordance with the following code :

Green and yellow :	Earth
Blue :	Neutral
Brown :	Live

As the colours of the wires in the mains lead may not correspond with the coloured marking in your plug proceed as follows;

The wire coloured GREEN-and-YELLOW must be connected to the terminal in the plug which is marked with the letter E or by the safety earth symbol  or coloured GREEN or GREEN-and-YELLOW. The wire coloured BLUE must be connected to the terminal which is marked with the letter N or coloured BLACK. The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or coloured RED.

Unpacking the unit

The equaliser comes in a cardboard safety box, specially designed for protection of the unit against damage during transport. **Save all the packing materials** for future use if you ever need to ship the unit again.

Please **inspect the unit** carefully for any signs of damage occurred during transport. Your GX230 has undergone stringent quality control inspection and tests at the factory. It left in perfect condition. **If damage is found, notify the transport company immediately.**

Only you, the consignee, may institute a claim against the carrier for damage during shipment. Make sure to retain the damaged carton as evidence for the carrier's inspection.

Checking the mains voltage

- Check if the voltage selector on the rear of the equaliser indicates the correct supply voltage **before** connecting the equaliser to the mains.
- If not, the unit should be set to the correct mains voltage. If the local mains supply is 230 V, the equaliser should be set to 240 V. When changing the voltage setting, it is also necessary to change the mains fuse to one of the correct ratings.

Setting the mains voltage

- Remove the plug from the wall socket and check if the mains fuse is of the correct rating.
- Use a screwdriver to slide the voltage selector to the correct value.

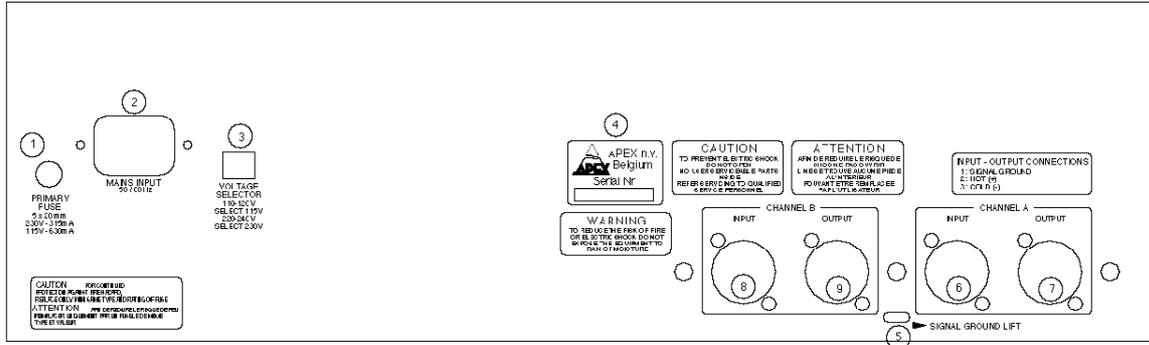
Replacing the mains fuse

- Withdraw the fuse holder from the equaliser by turning the locking screw a half revolution counter clockwise and pull out the fuse holder of the socket
- Remove the old fuse and replace with fuse of the correct rating
 - T630 mA (slow blow fuse) Littlefuse 213.630 for 100/120 V
 - T315 mA (slow blow fuse) Littlefuse 213.315 for 220/240 V
- Refit the fuse holder.

NOTE

Delivery position is 220 V / T315mA Wickemann 19195 in all cases

The rear panel



1 MAINS FUSE

Holds the mains fuse.

2 MAINS SOCKET

- Insert the plug of the mains lead into the mains socket. The mains connector is a standard 3 pin IEC connector. The centre terminal of the connector is directly connected to the chassis of the equaliser.
- Connect the other end to your mains supply via a wall socket that has a connection to earth!. Mains frequency is 50/60Hz.

- For units set at 100 V/120 V: use a UL listed cord set consisting of a minimum 18 AWG, type SVT or SJT three conductor cord, a maximum of 15-feet in length and a parallel blade, grounding type attachment plug, rated 15 A, 125 V.
- For units set at 230 V (domestic USA): use a UL listed cord set consisting of a minimum 18 AWG, type SVT or SJT three conductor cord, a maximum of 15-feet in length and a tandem blade, grounding type attachment plug, rated 15 A, 250 V.
- For units set at 220V/230 V - 240 V (Europe except U.K): use a cord set consisting of a minimum 18 AWG cord and grounding type attachment plug, rated 15 A, 250 V.

The cord set should have the appropriate safety approvals for the country in which the equipment will be installed and marked HAR.

3 MAINS VOLTAGE SELECTOR

The equaliser is designed to be operated with nominal mains voltages of 115V and 230V. The circuits can tolerate a deviation of $\pm 15\%$ on the mains, covering the range 98V to 132V and 195V to 264V.

4 SERIAL NUMBER

IMPORTANT



This number is the fingerprint of the unit and should be quoted in any correspondence concerning the unit.

5 SIGNAL GROUND LIFT

This switch disconnects the signal ground from the mains and chassis earth. The switch should be used if hum due to ground loops is experienced and will generally solve the problem.

6,8 Balanced IN A/B

Connects the equaliser to balanced outputs. The connector is a female Neutric XLR NC3FD. For wiring details see section 'Signal connections'.

7,9 Balanced OUT A/B

Connects the equaliser to balanced inputs. The connector is a male Neutric XLR NC3MD. For wiring details see section 'Signal connections'.

Rack mounting

The GX 230 is designed for standard 19" rack mounting as well as free standing outside a rack cabinet. The unit requires three standard rack units.

Mounting the unit directly over large heat-producing devices may shorten component life and therefore, is not recommended. Ambient temperature should not exceed 50 degrees Celsius when the equipment is powered.

Because of the chassis' mechanical construction, the GX230 has no need for support at the rear when mounted in a rack cabinet. This feature facilitates manipulation of the unit while ensuring perfect mechanical stability.

Make sure there is enough room for air circulation between different pieces of equipment and through the heatsink at the back of the GX230.

Signal connections

For maximum performance, the use of two-conductor shielded cable is recommended. Because the shield does not carry signal, interference between signal current and shield current is minimised in this way. Ordinarily the shield is connected to ground at one end only.

Input

The inputs of the equaliser are electronically balanced. The input impedances of the “+” and “-” legs are made equal so that common mode rejection (CMR) is practically independent from the impedance of the driving source. HF and LF trims are provided to optimise the CMR and null-out circuit tolerances.

These electronically balanced inputs are compatible with most professional and semi-professional balanced or unbalanced sound equipment.

A low pass filter precedes the input stages of the equaliser. When driving the equaliser from a high impedance source, overall frequency response can be compromised because of the low pass filter capacitors.

When the source impedance is higher than 2K unbalanced or 4K balanced, it is advisable to change the cutoff frequency of the input filters. In this case, contact your dealer to make the modifications. Generally, the output impedance of modern audio equipment is very low in comparison with the figures above and no problems should be expected.

Some general rules for input connections :

- Although not necessary, because of input circuit symmetry, it is best to always use the “+” and “-” input terminals when wiring the equaliser. In this way, hum pick-up from the open terminal is avoided.
- When the GX230 is driven from a balanced source, ground the shield at the source-end only and leave terminal 1 (SG) on the GX230 disconnected. Wiring of the other input terminals is straightforward. Check carefully for correct phase (relative to output connections). (See figure A and B p18).
- When the equaliser is driven from an unbalanced source, connect the shield to the circuit ground of the source and to terminal 1 (signal ground) of the input XLR connector. Depending on whether the circuit ground of the driving equipment is connected to earth or not, it may be advantageous to lift circuit ground from chassis ground on the equaliser using the ground-lift switch. You can experiment with this and leave the switch in the position that gives minimum hum or buzz. Terminal 2 (+) should be connected to the driving source output. Terminal 3 (-) should be connected to the shield. (See figure C and D p18).

Output

The output electronics of the equaliser simulate true transformer operation. The impedance to ground from each output terminal is approximately 10 K.

Output connections are via a standard 3 pin XLR male socket. Because the output is made electronically floating, you may ground either terminal 2 (+) or 3 (-) without fear of short-circuiting an op-amp output to ground. Moreover, you lose 6dB of signal amplitude if you don't do so, when driving an unbalanced load.

Some general rules for output connections :

- Always ground the shield at the equaliser side only, by connecting it to terminal 1 (SG) of the XLR socket.
- When driving an unbalanced load, connect terminal 2 (+) to the signal input and terminal 3 (-) to the circuit ground of the driven equipment. (See figure B and D p18).
- When driving a balanced input, connections are straightforward. Check carefully for correct phase (relative to input connections). (See figure A and C p18).

Grounding

Because it is not always possible to determine whether the equipment connected to the equaliser have their circuit ground connected to earth and because the mains earth is not always of good quality, it is hardly possible to give general rules for grounding.

- One and only one ground path should exist between each piece of equipment.
- The circuit ground of the equaliser should not be left floating.

A ground loop generally causes a steady hum. If you encounter a ground loop, you can often break it using the ground-lift switch on the rear panel. When using the ground lift switch, the circuit ground of the equaliser is disconnected from the chassis ground. Chassis ground is always connected to earth for safety reasons. Signal ground remains connected to terminal 1 of the XLR sockets.

The input/output/supply board of the equaliser is provided with place for adding a resistor and a capacitor (R107,C107) for those who do not wish to completely disconnect the chassis and circuit grounds. Providing a small ceramic capacitor between the two grounds can be helpful for solving HF buzz problems, often encountered when using mains ground.

The figures below shows some grounding schemes for the equaliser. If you follow these figures while setting up your system and hum or noise appears, don't be afraid to experiment. Just keep safety earth connected to the chassis of the equaliser. A ground loop consists of two connections to ground, so there is always another solution than to disconnect the chassis of the equaliser from earth and because the input and output are balanced, it should not be too difficult to find a proper solution for your problem.

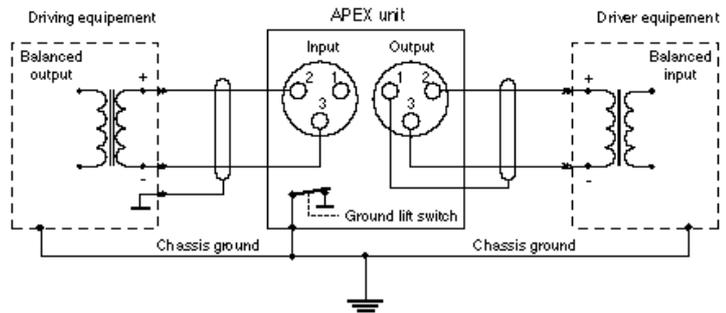


Figure A

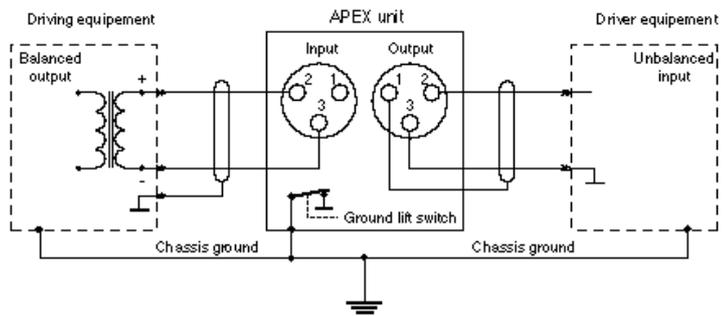


Figure B

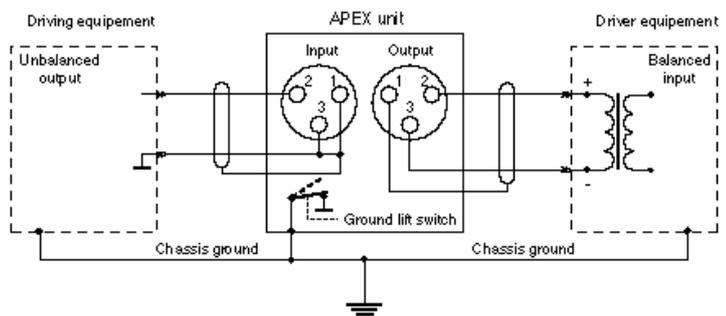


Figure C

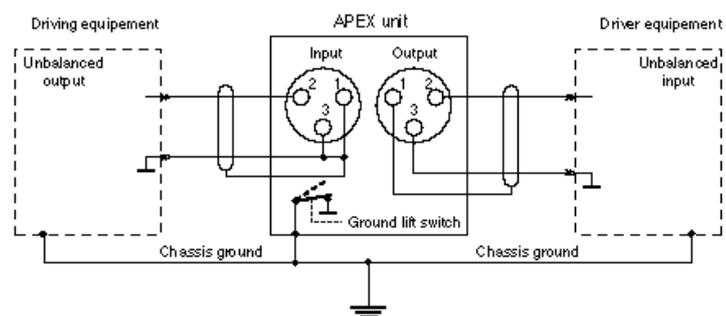
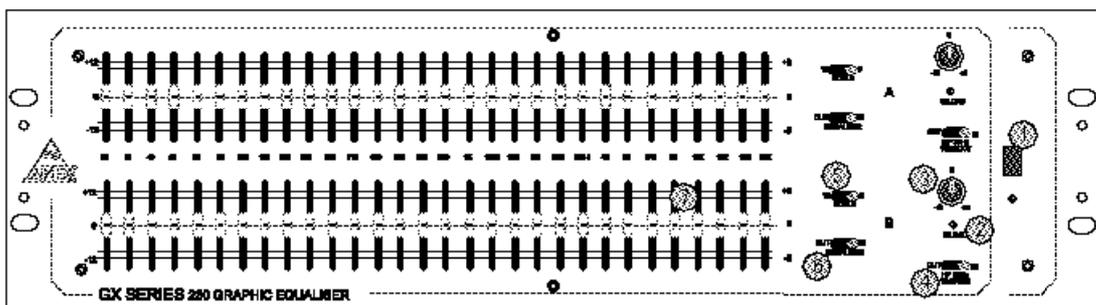


Figure D

The Equaliser

6



POWER

1

When pressing the power button, AC mains is applied to the unit. The red led below the power switch illuminates as you switch on the apparatus. The fail safe relays will open, switching the filters between the input and the output of the unit. When switching power off, the fail safe relays will link the input of each channel to its corresponding output.

O/LOAD

2

The O/LOAD indicator illuminates when the peak signal voltage anywhere in the unit exceeds +18dBm. This level is about 2 dB below clipping of the equaliser's internal circuits. The overload led is commanded by a "peak-stretching" circuit, for better visualisation of overload conditions and will light for approximately 200ms if the unit's headroom comes below 2dB.

LEVEL dB

3

The LEVEL control adjusts the input level to the equaliser and filter sections of the unit. Being preceded by the input stage, the level control does not permit to adjust signal level in this part of the circuit. The equaliser has 6dB of available gain and can be used as a low noise and distortion gain make-up amplifier. The level control lets you adjust gain between -infinity to +6dB in a continuous manner.

HP

4

The HP filter has a cutoff frequency of 30Hz. The filter has a roll-off slope of 18dB/octave and is of the Butterworth type for maximally flat response. It is particularly useful in situations where potentially harmful subsonic signals are likely to cause speaker or amplifier overload.

SCALE

5

The SCALE switch switches the range of the corresponding graphic equaliser section to 6dB or 12dB full scale.

IN/OUT

6

The IN/OUT switch activate or deactivate the corresponding graphic equaliser section.

SLIDERS

7

The sliders of the graphic equaliser allow centre gain adjustment for each of the indicated centre frequencies. Calibration tolerance is approximately $\pm 0.5\text{dB}$

NOTE

Note :The rotary controls of the GX 230 are high quality conductive plastic potentiometers. However, calibration accuracy of these controls is only modest. Indications on the front panel therefore are principally intended as reference guides, not as exact figures.

General operating instructions

7

Introduction

If you are not familiar with equalisers, the best thing to do before first turn-on is to put all controls in their central position. When the unit is not powered or the power supply fails, the fail-safe relay of the equaliser links input and output. By putting the controls in their central position, you make sure that the overall gain of your system is not changed when the fail-safe relay activates. This is a good starting point for the exploration of the equaliser's functions.

Once all mains and input and output connections are made correctly, switch the unit on by pressing the "power" switch. After app 0,2 seconds the fail-safe relay will activate and thereby link the unit in the signal path.

The graphics on the equaliser's front panel illustrate the different functions of the unit and make it ergonomically pleasant to work with. We use the same group-division of functions for illustrating the operation of the different sections.

Level control, O/load and power

The level control is preceding the filter section of the equaliser and levels the input signals of the filter section. The input stage of the equaliser is located before the level control. The level control has thus no effect on the levels in the input stage. In case the overload led illuminates and decreasing the level with this control has no effect, it probably means that the input stage is in overload. The only solution to this problem is lowering the signal level at the input of the unit by lowering the output of the driving equipment or by adding an external loss pad to the input wiring.

Of course the power switch is for turning the unit on and off, but if the system is set up well (LEVEL at 0dB...), it can be used as a bypass for the complete equaliser, making use of the fail-safe relay.

HP filter

The HP filter has a turnover frequency of 30Hz. The filter has a roll-off slope of 18dB/octave and is of the Butterworth type for maximally flat response. It is particularly useful in situations where potentially harmful subsonic signals are likely to cause speaker or amplifier overload. Phono cartridges and wind in microphones are examples of sources that can produce excessive subsonic outputs. It will not have a dramatic effect on sound while providing serious protection against overload.

Graphic equaliser

The centre frequencies of the graphic equaliser are chosen for perfect filter interpolation. For some frequencies this means a slight deviation from the ISO proposed centre frequencies. The maximum deviation is about 2% so there should be no problem when using the equaliser in combination with commercial real time analysers that, generally, use the ISO centre frequencies.

The 30 controls of the graphic section provide you with a lot of possibilities for shaping sound. In doing so, it is best to regard following principles :

- It is generally better to attenuate peaks, rather than to boost the surrounding frequencies to the same level.
Noise will be lower and the sound will be more natural in this way.
- Do not attempt to correct narrow peaks or dips with the graphic section. Use the parametric filters for this purpose. These are designed for narrowband operation and are much more versatile .
- Do not use the graphic equaliser as a gain fix-up device. It is far better to use the 6dB of available gain from the LEVEL control than to put a lot of equaliser controls in the boost position.

INPUT:

- Electronically balanced
- Absolute overload point : +22dBu
- Impedance: 10 K (each leg)
equal impedance for "+" and "-" legs
- CMRR better than 65dB (20Hz-20KHz)
- XLR-3 type connector
connections : 1 signal ground; 2 hot (+); 3 cold (-)

OUTPUT:

- Electronically balanced and floating, simulating transformer output with app. 10 K to ground impedance for each leg
- Max level: >+21dBm into 600
- Impedance: 51 (each leg)
- Output symmetry balance better than 65dB (20Hz-20KHz IEC)
- XLR-3 type connector
connections : 1 signal ground; 2 hot (+); 3 cold (-)

PERFORMANCE:

- Frequency response: +0 -0.5dB, 20Hz-20KHz (graphic eq IN)
- THD: <.01% (20Hz-20KHz)
- Noise: <-92dBm (typ. -94dBm), graphic and parametric equalisers in circuit (0dB settings)
measurements : 22Hz-22KHz RMS unweighted
- Level control: - to +6dB
- Level control '0dB' cal. accuracy: +0.2dB (overall gain input to output)
- Overload indicator: lights for approximately 200ms if the instantaneous peak voltage at any point in the equaliser comes within 2dB of clipping

FILTERS:

- 30 ISO centre frequencies: 25Hz-20KHz 1/3 octave

- Centre frequency tolerance: $\pm 1\%$ (typically better than $\pm 0.5\%$)
- Q tolerance: $\pm 1\%$
- Max boost/cut: 6 or 12dB ± 0.5 dB reciprocal
- Switchable

POWER REQUIREMENTS:

- Voltage: 110/120/220/240V 50/60Hz
- Consumption: 40VA equaliser
- IEC type connector

SIZE:

- 482mm(19 inch) wide x 133mm(5.2 inch) high x 255mm(10 inch) deep equaliser

WEIGHT:

- app. 7 Kg

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Preventive maintenance

Preventive maintenance consists of cleaning and visual inspecting the unit. When accomplished regularly, preventive maintenance may prevent malfunction and lengthen the apparatus life. The severity of the environment in which the equaliser is used determines the required frequency of preventive maintenance.

Regular cleaning prevents accumulated dust from penetrating potentiometers.

The front panel can be cleaned with a soft cloth or a small soft-bristle brush. The brush is particularly useful for dislodging dirt on and around the controls and inside the slider slots. Dirt that remains can be removed with a soft cloth dampened in a mild detergent-and-water solution. Do not use strong solvents as they may damage the paint, the screened lettering or the plastic control knobs. Be careful not to let detergent leak into the potentiometer slots as it may damage the carbon resistance tracks.

The rear panel can be cleaned in the same way as the front panel.

The top cover minimizes accumulation of dust inside the unit and should normally be in place when using the equaliser. Dirt on components acts as an insulating blanket, preventing efficient heat dissipation. It also provides an electrical conduction path that could result in failure, especially under high-humidity conditions.

Normally, cleaning of the internal portions of the equaliser is not necessary when the cover is left in place.

Corrective maintenance

Corrective maintenance consists of component replacement and repair of the unit.

Unless you are a highly skilled technician, do not try to repair this unit. Moreover, specialised components are used in this apparatus and for several of them it is very doubtful if you could find a correct replacement. Therefore, contact your dealer in the event of failure. He (or she) has notice of the Apex authorised service centres and can advise you about what to do. Copy the service request form on the next page, fill it out and ship it with the defective unit. It will help the service technician to localise the problem.

It is often more expedient to call your dealer or our factory explaining the nature of your problem. In many cases the problem can be solved without service.

SERVICE REQUEST FORM

Please copy and complete this form as completely as possible and return it to Apex or an authorised Apex service centre together with the defective unit.

Name/Company:.....

Address:.....

.....

Telephone:..... Country:.....

Model No:..... Serial No:.....

Purchased from:..... Date:.....

• Describe symptoms of malfunction:

• Under what conditions does the malfunction occur?

- A. All the time
- B. After a while
- C. At high signal levels
- D. At high temperatures
- E. Other (please explain)

• How often did the problem occur?

• What did you do to isolate the problem to this unit?

• Further comments

WARRANTY

10

Summary

We, APEX nv Bosdel 52 3600 GENK Belgium warrant to you, the original purchaser and any subsequent owner of this Apex product, for a period of one year from the date of purchase by the original purchaser that the product is free of defects in components and factory workmanship under normal use and service. The date of purchase is the date appearing on the first end-user's bill of sale or other proof of original purchase from an authorised Apex dealer.

Items excluded from warranty

We are not responsible for product failure caused by misuse, accident or neglect. This warranty shall not be applicable to any product on which the serial number has been defaced, altered or removed. It does not cover damage to other components, connected to the Apex product, resulting from Apex product failure. This warranty shall be considered void if this product is subjected to repair work or alteration by persons other than authorised by Apex in such a manner as to injure, in the sole judgement of Apex, the performance, stability, reliability or safety of this product. The warranty does not apply to finish or appearance items.

Our commitment

During the warranty period, when failing to perform as specified, Apex will undertake to repair or at its option, replace this product at no charge to its owner, provided the unit is returned, shipping pre-paid, to the factory or authorised service facility. You must notify us of your need for warranty service, preferably by filling in the service request form and returning it to us. We will give you notice of the authorised service centres to whom you may deliver the product or we will give you an authorization to return it to the factory. All components must be shipped in a factory pack, shipping prepaid. If needed replacement packing can be obtained from us.

Corrective action will be taken within a reasonable time of the date

of receipt of the defective product by us or the service centre. If the repairs made by Apex or the authorised service centre are not satisfactory, notify Apex or the service centre immediately. Repairs and replacement parts provided under the terms of this warranty shall carry only the unexpired portion of this warranty.

Product changes

We reserve the right to change the design on any product without prior notice and with no obligation to make corresponding changes in products previously manufactured.