



Jelmax Technical Report

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FOR BETTER CD SOUND

Great advancements in analog signal digitization have been made recently. In this case, 6 dB/bit is required as the S/N ratio on the analog side of A-D converters; and in the case of 16 bits, it reaches a surprising -96 dB. However, usually analog circuits have a limit of about -70 dB at most, and with this value, the



digitization of 12 bits can barely be achieved. Therefore, *to pursue digital gets back to analog.* The major cause of the deterioration of the S/N ratio results from the noise generated from the power source, being ion noise and stemming from inside the electrolyte capacitors. It is 20 - 40 dB more than that of the other elements, and this control is the right track to reach high-fidelity way. The Black Gate series scarcely emits this type of noise, and is perfectly suitable for this purpose. It has been used already for PCM processors in digital studios, and its power is gradually being demonstrated. The high quality CD record disks, which have been put on sale one after another recently, is the result of the merits of this series. Also, the CD players on the playback side are entirely similar, and the S/N ratio of the built-in D-A converters should be raised. *The Black Gate series capacitorize for power sources, bypasses and so on. is an absolute necessity.*

For those who are already using it, an explanation is unnecessary, but the effect is quite outstanding. The manager of the Acoustic Research Institute who has used it, concluded that it is superior in every point to players priced at least 500,000 yen higher.

For power sources, the Black Gate K series, and for the coupling circuits on buffer amplifiers, the Black Gate C series are the most suitable. These series will provide maximum effect at the minimum cost.

The Black Gate Is The Best Choice For DX

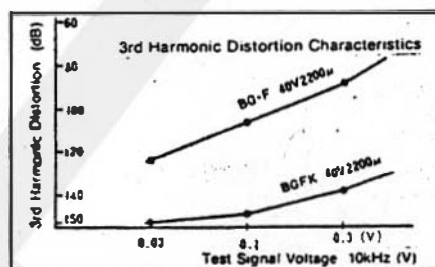
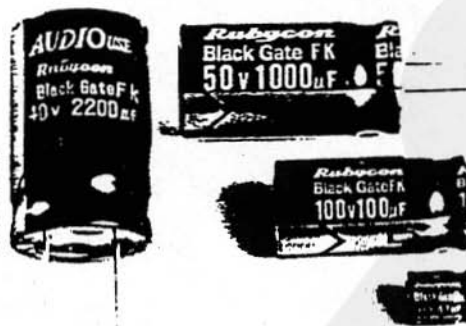


In long distance receiving (DX), you should first consider the antenna to be used. The second most important factor may be how to improve the S/N ratio of your receiver. Lowering the noise level of active components such as electric tubes and transistors may well be of serious concern to you. However, do you pay the same attention to passive components such as resistors and capacitors? A receiver power source and signal bypassing device, consisting of passive components, are liable to generate a very high level of noise. In this case, electrolytic capacitors are the chief culprit due to their generation of ion noise. The noise level is 20 to 40 dB higher than that of other components. The S/N ratio of your receiver can therefore be improved substantially by suppressing the noise generated by the electrolytic capacitors. The Black Gate Series is a family of electrolytic capacitors, generating almost no noise. They are the best choice for DX purposes. There are people in Sendai and Sapporo, 350km and 1,000km from Tokyo, respectively, who enjoy FM programs provided by Tokyo broadcast stations by using FM tuners with Black Gate capacitors. Also, there are DXers who send very long distance SW programs every day. Models for general circuits can improve the performance of your equipment. But the Black Gate F Series and Black Gate K Series are particularly recommendable because of their superior high-frequency E.S.R characteristics.

The Peak at Last Attained - Black Gate K series created

You may wonder if a higher grade is attainable - and the answer is - YES.

We have finally overcome the nonlinear distortion noises based on non-reversibility of electrodes, the last remaining problem of BG which has greatly outstripped general electrolysis by eliminating ion distortions. As shown in the photo, a letter "K" is affixed to BG on the label. The figure below shows that the distortion decreased at -30 ~ -40 dB finally arriving at the desired limit of -150 dB.



This means that Black Gate K products are comparable to high-quality film condensers and that Jelmax has finally eliminated all distortion noises attributable to electrolysis condensers. With the use of products of the K series, distortions cannot be detected with the human ear and amplifiers using one of these products have a superb sound. For other applications than that for audio, these products are suitable indeed for the removal of the internal noise of a switching power source. We have at last attained the peak. In the future, BG-F, BG-V and other important items will be replaced as follows to be graded up and standard items will remain as before: for example, BG-F50V1000µF → BG-FK50V1000µF, BG-F100V100µF → BG-FK100V100µF. You may consider that the fundamental characteristics are the same in spite of the above-mentioned changes and that distortions will be reduced dramatically. Some items may be a little larger in size.

Black Gate Can Differentiate Your Products to Meet the Requirements of the Time (No. II)

Black Gate applications include:

Studio equipment (used by broadcasting stations, recording companies, audio studios)

- Two-way capacitor microphones ... Wider dynamic range; high S/N; very high level of reproducibility in the mid and high ranges. (BGNX, BGN)
- Monitor amplifiers for studio use ... Improves S/N (more than ten times); improved sound quality in all ranges; better positioning and depth; increased amount of information. (BGK, BGFK, BGN)
- Mixing consoles ... Substantially improved S/N in all ranges; better separation and positioning. (BGFK, BGC)
- Master tape recorders ... Improved S/N; wider dynamic range; better sound quality. (BGFK, BGC, BGK, BGN)
- Program equalizers ... Improved S/N in all ranges; better separation in the mid and low ranges. (BGFK, BGC, BGN)
- Record cutting amplifiers ... Improved S/N (more than ten times); better reproducibility in the mid and low ranges; dramatically increased amount of information; super analog recording. (BGK, BGFK, BGN, BG)
- PCM processors ... Improved S/N in all ranges for CD; high definition DC recording. (BG, BGFK, BGC, BGK)
- Studio limiters ... Improved S/N; decreased peak level distortion; better separation and positioning; increased amount of information. (BGFK, BGC, BGN)

Audio equipment for general use (Used by Japanese, U.S., Hong Kong, Taiwanese and Danish manufacturers)

- Preamplifiers, integrated amplifiers, main amplifiers, tuners, CD players, SP systems ... Improved S/N; increased amount of information in the mid and low ranges. (BG, BGFK, BGN, BGSK, bipolar BG)
- Cassette decks ... Elimination of hysteresis noise; expanded dynamic range; better sound quality. (BG, BGFK, BGC, BGN)

TV, OA equipment, camera equipment

- Color monitors ... Improved S/N, color quality and coloring (BG, BGFK, BGC)
- TV receivers ... Clear images; elimination of buzzing noise. (BG, BGFK, BGC)
- Antenna boosters ... Elimination of snow noise; better receiving condition. (BGFK)
- Measuring equipment, CR oscillator ... Elimination of level difference between ranges; reduced distortion factor (by one decimal position). (BG, BGN)
- Switching power sources ... Elimination of residual noise; elimination of need of noise filter. (BGVK)
- Strobe power sources ... 40% increase in peak discharge level

We are confident that the use of Black Gate capacitors will substantially improve the performance of the following types of equipment:

- Audio ... DAT
- TVs ... High definition TVs, Color TVs, cameras, digital TV receivers
- Communications equipment ... Super long-range radar and identifier, satellite receiver, receiver for use in very cold areas, landing guide system, broadcasting studio equipment
- Computers ... 32-bit CPU power source, very low-noise switching power supply, supercomputer power supply
- Measuring equipment ... Spectrum analyzer, FFT, low-distortion oscillator
- Medical electronics ... Cardiograph, electroencephalograph ultrasonic diagnostic equipment
- Lighting ... Inverter power sources for discharge tubes, strobo power sources, plasma discharge capacitors

Product differentiation is the need the requirements of the time. Electronic equipment is no exception. Information signals, whether analog or digital, flow through a power source and become contaminated there. What should be done first is improve your power source to minimize its influence on signals and ensure its ideal operation. Black Gate overcomes this problem. We earnestly recommend you to use Black Gate capacitors for more product differentiation.

Only Limited Life for Electrolytic Condensers!

Though Black Gate is used to revitalize professional audio appliances, it is surprising that even professional sound producers do not know that electrolytic condensers have only limited life. Though dependent on ambient temperature, the life is generally estimated as about five years. Energy is exhausted even when not in use. This is the fate of aluminium electrolysis. Life can be estimated from E.S.R. (Equivalent Series Resistance) and is ordinarily judged to cease at double value the initial E.S.R. For instance, in the case of 100 V/10000 μ F, when new, the value is about 5 m Ω /1000 kHz, but unexpectedly higher values of 20~30 m Ω can be found, where life is virtually non-existent. With decrease in life there is in particular a decrease in responsiveness, drastic decrease in information volume in the medium and low zone and power drop low zone (somewhat similar to human being) also occurs. The amplifier is then dead. The reproduction of music is out of question. We can never forget the astonished producer's face when the amplifier produced beautiful sounds after refreshing by "Black Gate". That is why a truly exciting sound is revived with a distortionless, coherent and strong power exceeding far the quality of the new state. All audio fans now agree with this. The effects of "Black Gate Refresh" is outstanding. This should be confirmed by all interested people.

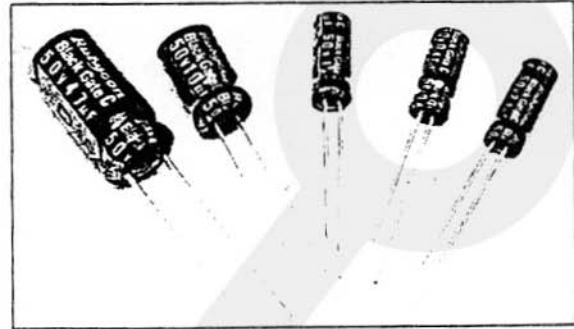
* Inner ions of "Black Gate" move actively, and thus some idling is necessary prior to use. Idling operation is carried out by an audio signal connected to the set when in use. The time for this depends on capacity, voltage and signal level. However, 10 to 30 hours should be sufficient.



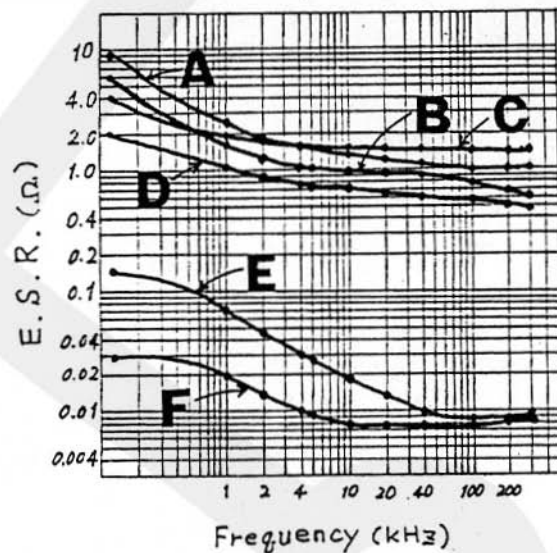
Black Gate C - The Best Coupling Capacitor

Just one single Black Gate C can greatly enhance your electronics circuit's performance.

As electronic equipment becomes more and more compact in size, the coupling capacitors mounted on the printed circuit boards need to be greatly miniaturized so as to fit within these boards' space limitations, in addition to providing high performance. Jelmax believes that the Black Gate C is the only capacitor capable of satisfying these very demanding requirements. As shown in the adjacent figure, the Black Gate C has outstanding E.S.R. characteristics compared with other capacitors. The size compared with the film condenser is less than 1/10. Also, as it does not fluctuate, it enables any sound system mounted with the Black Gate C capacitors to produce natural sound quality in all bands. Different from normal electrolytic capacitors, the Black Gate C never misses information due to ion distortion to pass through much more information than the other capacitors. These new innovational features are being widely acclaimed by many users. Black Gate C's extremely small leakage allows it to be used in any high-gain and high-impedance circuits designed for entire electrical equipment including head amplifiers, pre/main-amplifiers, tape recorders, tuners, video displays, CD, DAT, communication devices, and medical units. As an example, a high-end electronics manufacturer in U.S.A. reported that the Black Gate C is already being substituted for all tantalum capacitors used as a coupling capacitor in MC head amplifiers and pre-amplifiers and highly praised by end users. In addition, to prevent noise from being generating due to mechanical shocks, the Black Gate C is provided with high-noise resistance by molding the ends of lead wires with resin. Another very important advantage is its low price compared to its numerous other merits. Even manufacturers that have never experienced the Black Gates should first utilize the Black Gate C, for seeing is believing as the saying goes. Just one single Black Gate C can greatly improve the performance of your company's circuits. Trying it will remove any doubts you might have.



Black Gate C E.S.R. Frequency Characteristics 10 μ F



- A: 16V10 μ F commercial
- B: 35V10 μ F solid tantalum
- C: 50V10 μ F regular type
- D: 50V10 μ F Black Gate C
- E: 100V10 μ F mylar film commercial
- F: 63V10F polycarbonate imported

PERFECT NF (NEGATIVE FEEDBACK) FINALLY HAS BECOME A REALITY

BLACK GATE N (NON-POLAR) IS NOW ON THE MARKET

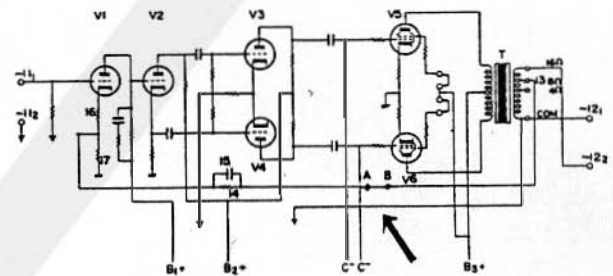
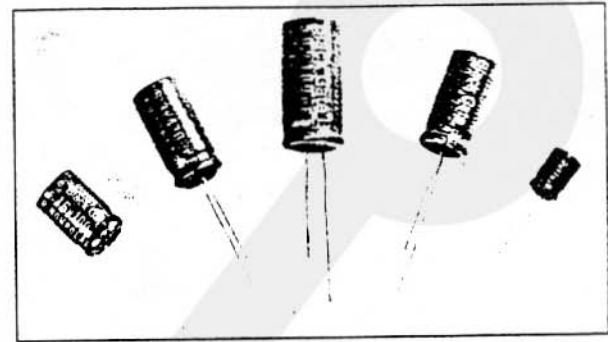
As you know well, the highest tone quality is obtained through the Black Gate Refresh of vacuum tube amplifiers. However, even for such an amplifier, unfortunately, it is not perfect due to the lack of one important capacitor. In fact, it is *an absolutely must for NF (negative feedback) circuits of vacuum tube amplifiers.* In the A-B points of the NF loop of the famous Williamson amplifier, it is *unable to perform its perfect function of NF, unless direct current is interrupted by a non-polar, non-distortion capacitor of a large capacity.* However, since a capacitor meeting such conditions has yet to be realized, that is why audio fans have been forced to put up with less-than-perfect amplifiers until now. Now, Jelmax has made the impossible possible. It did it with BG-N. For example, when A-B points are connected in the following way, method ⑤ will increase the grade of the amplifier to a position of an unbelievable height with a perfect tone. Its overwhelming tone quality may be an initial experience to everyone with an admiration to a powerful middle-low pitch tone and an amazing volume of information which never could be heard until now.

We recommend you to test it at once. A great improvement in the tone quality for

not only vacuum tube amplifiers but also all kinds of amplifiers will be assured at single stroke due to the appearance of Black Gate-N (PAT. PEND.) *Some people question whether the NF for amplifiers should be used lightly or should not be used at all. However, this is an immature, absurd way of thinking.*

The great invention by Black in the Bell Institute about one-half century ago is curiously limelighted again by the Black Gate-N.

Because BG-N has the same performance as a plastic film capacitor having an ultra-high capacity which is unable to realize, it does not reject to select any usage such as NF in all electronic circuits, bias circuits and coupling circuits. BG-N 16V 100 μ F, 16V 470 μ F, 50V 100 μ F are suitable for the circuit in the drawing, however, when the power level is small, BG-FK also has the same effect as these. (The above has been proven using a cutting amplifier.)



[Methods]	[Drawings]	[Tone quality]
① Direct- coupled	A ——— B	×
② Coupled with polarized-general electrolysis	A ———+——— B	×
③ Coupled with non-polarized general electrolysis	A ———⚡——— B	△
④ Coupled with polarized Black Gate	A ———+——— B	○
⑤ Coupled with non-polarized Black Gated	A ———⚡——— B	◎

New Audio Life with the Revolutionary Black Gate!

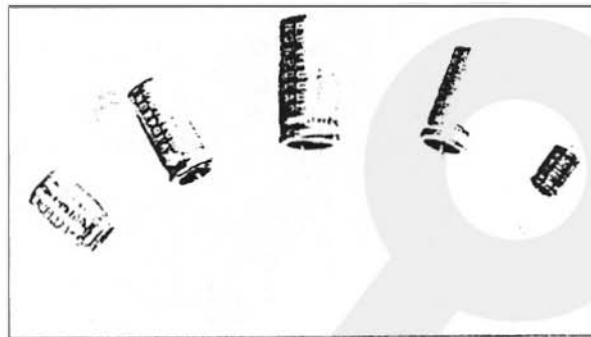
The reports related to No. 9 (NF) and No. 11 (Vita Drive) of the BG-N series have had a great impact in Japan as well as other countries throughout the world. If this was not enough, we have also caused another shock with our NF for amplifiers. We are sure you are well aware of Marantz #7. This preamplifier is not new, but it has had a great influence on many preamplifiers from that time. The three-stage negative feedback is perfect in this circuitry. However, the capacitors are not used reversely and existing ones would perhaps have a short life. Consequently, they can not exert even half their capability and their sound is completely unsatisfactory. Notwithstanding this, we are astonished to see them always appearing in the audio reviews. Important is C1 and R1 in the NF loop. C1 completely controls the performance. In this connection, we want to change C2 to C4. The power source and heater must be changed to BG as a matter of course. After remodelling and finishing remodelling, the feeling of S/N's normal, resolving power and tone quality are surprisingly excellent; therefore, there is no new preamplifier capable of competing with it. Also, here we can show you the perfect, powerful performance of NF using BG-N.

Next is the TR equalizer. This is used as a low cost pre-main amplifier main. It closely resembles normal preamplifiers. Changing A, B and C as shown in the drawings is required. Also, the most important is B, and here the key to success is the NF's perfect operating ability. After finishing the above

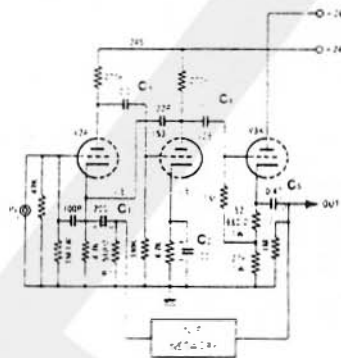
remodelling, its tone quality will exceed the general level of audio tones, with difficulty in discerning whether it is a Marantz or a newly remodelled one. It is capable of producing high quality genuine music.

As shown above, Black Gate is playing a leading role in this remodelling. We think that you can also participate easily in this kind of remodelling. Get away from the normal sounds which are low in quality and begin creating super sounds using Black Gate's new, innovational audio components.

These above two are only representative examples. We are ready to provide you with superior components for all types of audio systems.

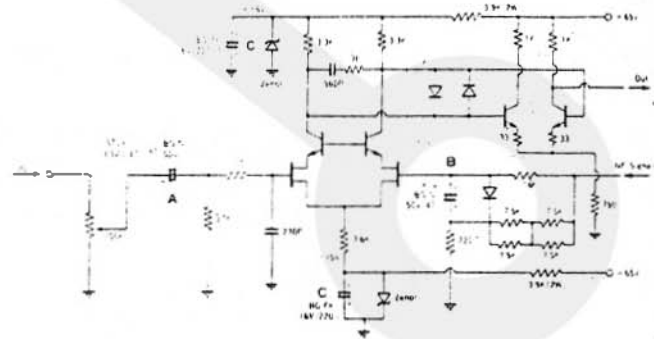


Marantz #7 Equalizer Circuit



- C1: BG-N6.3V470 μ F
- C2: BG-FK16V220 μ F
- R1: tantalum 510 Ω
1/2W
- C3: STLX200V 0.01
 μ F
- C4: STLX200V 0.1
 μ F
- C5: STLX63V 0.47
 μ F

Transistor Equalizer Circuit



One Unit Capable of Attaining to Ultimate Localization and Depth Sensitivity" Black Gate NX Vita Drive

Generally speaking, the sound of TR amplifiers is inferior to that of vacuum tube amplifiers as regards localization and depth. This is why there are still two unsolved points concerning the Black Gate series capacitorization. The first is that the NF circuit has unsatisfactory capacitors. This, however, has been completely overcome through the use of BG-N. The second is the phase difference in the input bias circuits, which has yet to be solved up until now. As shown in Figure 1, in all amplifiers, signals pass through the positive and negative bias circuits and drive a pair of complementary TR. However, since the upper and lower electrodes have always had an alternating phase difference for each bias circuit and are synthesized without correction in the output side, input and output waves are always different; therefore, the above described information from the signals is greatly missed. Furthermore, with the distortion added by switching, a great reduction takes place. Countermeasures up to now were to adopt A class amplifiers and to change bias circuits. However, all of these were temporary measures and nothing was achieved. Returning to the basic problems, with the utilization of BG techniques, and with the concentrated power for the development of a super low E.S.R., non-polar and non-distortion capacitors which allow the input bias circuit to be completely the same as alternating phase pouring, Jelmax, at last, became the first in the world to overcome this difficult problem. This is the Black Gate NX. As shown in Figure 2, the unrealizable super large capacity film capacitors, that is, E.S.R. having surprising a one-tenth value in general electrolysis, have been realized. As a result, the problems involved in TR amplifiers have been solved in a single step.

That is:

- (1) Black Gate series capacitorized amplifiers have a completely complementary action independent of the operating points and power, and S/N, information volume and power sensitivity are tremendously increased.
- (2) As a result of short-circuiting input at zero-impedance, switching distortion disappears.

An audio professional expert observing this experiment of this amplifier was astonished, saying "I had the illusion, with the focal point in all voice changes just adjusted, as if the announcer was right in front of me when listening to FM, as if I was the conductor, not just in the front seat of the stage when listening to an orchestra". We have finally grasped at last the essential quality of amplifiers and conquered it. This circuit was named 'Vita Drive' circuit (vivid drive circuit) (PAT. PEND)'. After using this circuit with Neuman Co.'s cutting amplifiers, a super analogue record which we have never seen before finally came into being. The long pending problem with analogue records was in the power amplifiers. With this new system, we can absolutely provide records greatly exceeding CDs for those desiring quality sounds. We welcome amateurs and professionals interested in true sounds. (It is necessary to operate idling for total 50H.)

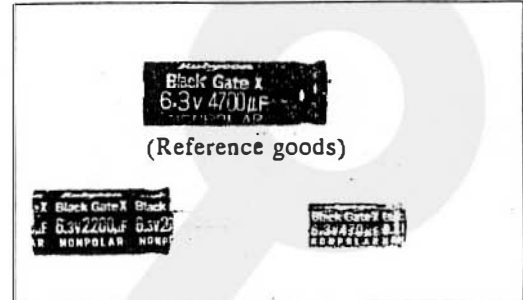
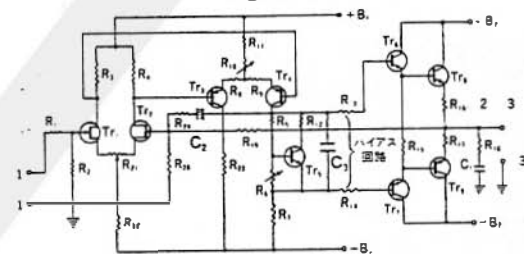
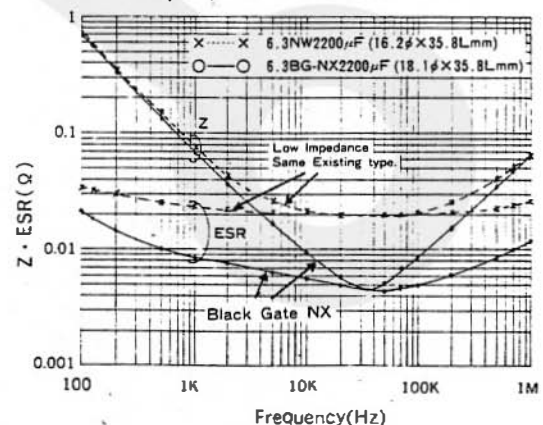


Figure 1.



- C₂ For NF: BGN 50V100F or 47µF.
- C₃ For bias shunt: BGNX 6.3V470µF or 6.3V2200µF.

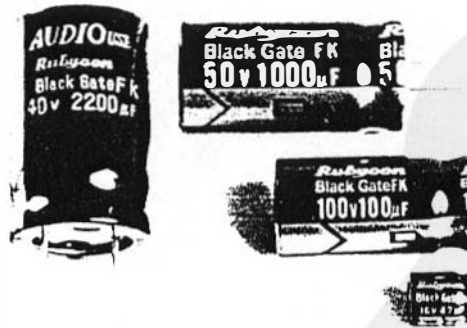
Figure 2. Impedance and E.S.R. characteristics BG-NX 2200µF (YHP-4192A, AT 25 °C)



WHY SHOULD YOU USE BLACK GATE NOW?

First you should know inner distortion noise of

electrolytic capacitors. Dry-type capacitors' have a large contact distortion noise of -80 to -100 dB. Wet-type capacitors' generate ion-caused distortion noise of about -120 dB due to an electrolytic solution. These values are roughly similar to that of semiconductors being active components. While resistors and other components generate distortion noise, they are far lower than the electrolytic distortion noise. As electrolytic distortion noise is



caused by the structure of the component, it has been considered that the improvement of the noise characteristic is extremely difficult. So, electrolytic capacitors have been produced with no suppression of the noise. While the S/N ratios of active components may be improved by appropriate circuit design technology, it is impossible to improve the S/N ratios of passive components including capacitors. This is one of the most important points to be taken

into account in the circuit design. Accordingly, the lower limits of the operations of electronic apparatus are almost determined by electrolytic capacitors. It is because signals always pass through wires to be contaminated and/or deteriorated by the distortion noise of electrolytic capacitors. To prevent signals from being affected by noise, it is necessary to make power noise lower than those with active components by at least -30 to -40 dB or more.

On the basis of this concept, Jelmax had started almost ten years ago to develop electrolytic capacitors aiming at an extremely low distortion noise as low as -160 dB. The patented idea is to provide oxide film with liquid contacts and also form electron transfer within separators (see the catalog for details). Jelmax believes that the approach is only the way to reach the target. Now, we have successfully developed Black Gate. In the audio field, our common

recognition have been conventionally as follows: the rejection of distortions in a circuit including active components enables clear and high-quality sound to be obtained. However, Jelmax substituted Black Gate capacitors for all electrolytic capacitors attached to amplifiers to greatly change the sound quality, so good that most people are surprised with the minimum change in the distortion rate. This clearly proved that the

recognition is incorrect and that the sound quality is determined by the level of power noise. Furthermore, we have received a number of reports in support of Black Gate from throughout the country. Some of them say that the use of Black Gate capacitors allows color monitors to have a fine color tone, even a pocket radio may receive broadcasts from nationwide FM stations, a normal CD player can be superior to that of the highest level in the sound quality, the

broadcast from an FM station in Tokyo can be received in Hokkaido, super analog records can be heard, and color cameras may take pictures of fine quality in dark places. Why take second best when Black Gate can give you the best in quality.

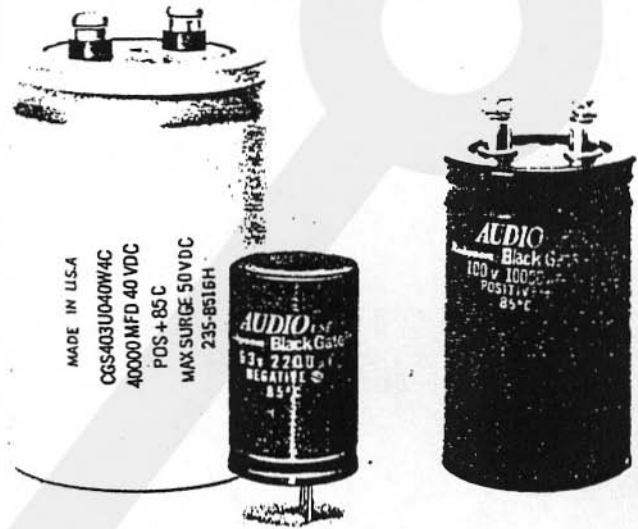
* Dry-type capacitors include tantalum, aluminum solid, and organic semiconductor types.

Wet-type capacitors are normal electrolytic capacitors.

Increase in Capacity of Power Supply Capacitor Cannot Always Decrease Sound Noise

The SOTA Co., a high-grade player manufacturer in the U.S.A., said that, when the 40,000 μ F capacitor (photo on left) for powersupply smoothing in DC drive of a turntable was changed to BG-FK2200 μ F, many characteristics of the replayed record sound, including the extraction of the high-frequency range, sound quality in the middle frequency range, sound rising in the low-frequency range, power, separation, and depth, were greatly improved as well as a decrease in the cost and every power supply would be a Black Gate in future. The motors require DC power with minimum noise. It is because residual noises cause jitters to occur and the jitters are amplified and replayed of tens thousands of times through the record causing a bad affect on sound quality. It is common sense to believe that noises should be decreased as smoothing capacity is

increased. However, this is not correct. With a normal electrolytic capacitor, if the capacity is increased, the ion noise by the electrolytic capacitor is also increased, and thus, the total noise cannot be decreased over a certain level. The level is about -100 to -120 dB. (Audio enthusiasts are not satisfied with this value, or the limit value of the measuring equipment). Because of no generation of such the ion-caused distortion noise in itself, the Black Gate can provide a limit value larger than -160 dB with a capacitor as small as only one-twentieth that of a normal capacitor. The player experiment described above gives us the following instruction. First, for very quiet rotation of the player shaft, a power supply with the minimum noise is required rather than mechanical precision. Next, only the high capacity of the power supply can not decrease the noise nor erase any contamination of sound information in the amplifiers. This clearly tells us that the high capacity of a power supply is useless for Hi-Fi amplifiers, while it has been assumed as being common sense. Surprisingly, the human ear has the capability to correctly extract any contamination in the unmeasurable level from sounds and evaluate sound quality. This fact promises us the appearance of new high-quality equipment in not only the audio field but also a variety of other industries by using the Black Gate that decreases the inner distortion noise in electronics equipment to an extremely low level which has not been realized by other types of capacitors.



Black Gate has better ability than the normal capacity of 50,000 μ F or larger, and thus, may be used for any power supply for Hi-Fi sounds.

Capacitors play a major role in producing high quality sound. However, capacitors of low quality give only low quality sound.

The quality of whisky is in the blend. When blending whisky, as it is different from other things, by blending good quality whisky with low quality whisky, the result is a whisky which is the same quality as the good quality whisky. This is one of the special characteristics of whisky. On the contrary, capacitors of low quality will give you sound of low quality, and even if you mix them with high quality ones, the outcome will still be low quality. Once sound is contaminated by inner distortion noise, no matter what you do, the sound will never come up to the desired quality. The sound is permanently damaged by the use of these low quality capacitors. So, it goes without saying that if you want high quality sound, you have to use high quality capacitors. With a conventional amplifier, each of the normal electrolytic capacitors in the circuit has its specific distortion noise depending on its internal structure, and fundamentally, the distortion noise cannot be ignored. Then, the distortion noise generated by another electrolytic capacitor is added to the circuit to produce composite distortion noise comfortable to one ears as a whole (this manipulation is called sound creation). In other words, distortion is balanced by another at a lower level. Therefore, it often happens that an electrolytic capacitor highly elevated for a certain circuit gives very bad results for another circuit. As a result, we are of the same opinion with that of the users, that the sound quality advertised never really comes up to the quality stated. The Black Gate when not used with other low quality capacitors provides sound of unquestionable quality. Even with a standard audio system, maximum sound quality can be obtained when a Black Gate capacitor is used. The following table lists several types of capacitors classified as to whether they may be used with the Black Gate or not.



www.partsconnexion.com

Can be used with Black Gate	Can not be used with Black Gate
Polypropylene capacitors Polystyrene capacitors Polycarbonate film capacitors Polyester films capacitors Lacquer film capacitors Metallized paper capacitors	Ordinary electrolytic capacitors (Wet-type) Dry-type electrolytic capacitors (tantalum, aluminum, semiconductor, and solid tantalum) Multi-layer ceramic capacitors Oil capacitors Ballium titanate capacitors Vinillfluoride capacitors

There are other not-desirable capacitors causing distortion, though they do not have such a detrimental influence on sound quality as the electrolytic capacitors. They will be listed on another occasion.

Small, terrific, and remarkably highly efficient!

Black Gate Super Small PK Series

When electrolytic capacitors become smaller, distortion characteristic and electrode efficiency are drastically reduced and efficiency of equipment also declines. However, Black Gate PK has high efficiency equals to the larger type. The adoption of BG-PK brings a significant difference compared with other small equipment. And at a quite low cost.

[Advantages]

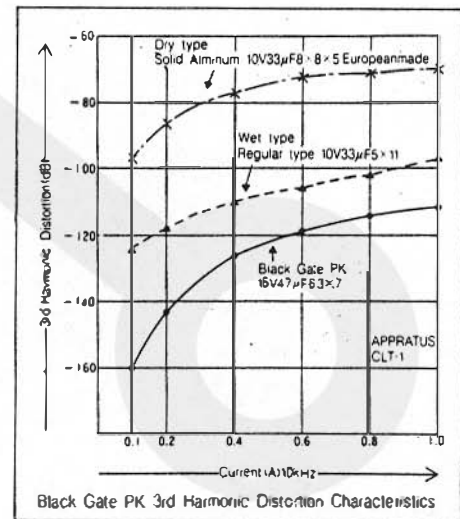
- Super low noise characteristic (-160dB), which is superior to existing electrolytic capacitors (wet type, dry type).
- Due to the electron transfer mechanism (PAT.), it is possible to communicate information without pollution, loss or deterioration.
- Excellent power transfer efficiency and long life.
- Applicable voltage range is wide and strong with pulse
- Wide temperature characteristics reach to -40°C.
- Lead wire is made of pure copper. Best material and mass production facilities produce high-level quality.

[Uses]

For all kinds of small electronics such as small video equipments, digital audio equipments, communication equipments, office automation equipments, medical equipments, portable measuring equipments.

3rd Harmonic Distortion of Black Gate PK

The 3rd harmonic distortion, which is the largest distortion generated inside when 10kHz signal current is passing through both electrodes of capacitor, figure shows the distortion characteristic which express the 3rd harmonic distortion against input by dB. The "electrolytic capacitors" are 30 to 40dB larger than other passive components. This is mainly because of ion-caused distortion noise due to internal electrolyte liquid and some non-linearity distortion noise. Ion-caused distortion noise covers from the audio band to VHF band and due to its special characteristics, the lower the frequency, the bigger the noise is. As indicated by the curve in the Figure, when Black Gate PK is at approximately 0.1A, which is the normal working range, this has an amazing low-noise characteristic of -160 dB which is lower than the 35dB of the wet type capacitors (ordinary) and the 63dB of the type capacitors (solid tantalum). There is no other example of either active components or passive components showing this great difference, therefore, if Black Gate PK is used in a power supply and circuit element, you will see that noise can be decreased remarkably, the S/N of equipment is increased and high efficiency is improved.



For dimensions and specifications, please refer to the catalog.

Electrolytic Capacitor Distortion Noise Reaches The VHF Band

People tend to think that ion distortion is a phenomenon limited to audio equipment. This is not true. The problem also extends to higher VHF bands and beyond. A signal is always passing through a power supply. Whenever there are electrolytic capacitors, distortion noise occurs. This noise will impair the receiver S/N ratio. Use of the Black Gate (BG) capacitor in the power supply and circuit components of communications equipments, televisions, tuners, tape recorders, medical telemetering transmitters and receivers, computers employing high-frequency clocks, and similar equipment makes it possible to eliminate unwanted noise and miraculously improve S/N ratios and overall performance.



To emphasize this point we would like to refer to a report by Mr. Yamagami of Asahikawa City, Hokkaido. Mr. Yamagami prepared the following reports citing concrete examples of post-BG-installation performance benefits in used electronic equipment. (The reports are unchanged but pseudonyms have been used for the companies' names.)

• ST5000 FM tuner from S company

I bought this particular tuner nearly twenty years ago. Approximately a year ago, the tuner lost the ability to separate stereo signals and I was on the verge of discarding it. Instead, I decided to give the BG a try. After installing the BG, I again had stereo separation. Additionally, overall sound quality was better than when I had originally purchased the tuner. Needless to say, it was a very pleasant surprise. When the local NHK station suspended broadcasting for the day, even residual noise from the modulator was audible. That gives you some idea of how much the S/N ratio improved after installation of the BG.

• 6010GSL tape deck from T company

From the time I purchased the tape deck, the sound imaging was poor and the bass sounds were suppressed. After a complete conversion of the tape deck to BGs, the Black Gate-rejuvenated tape deck performed beautifully. Not only was the sound quality dramatically superior to previous levels, but the separation and distinction of audio details was astounding.

These reports call attention to the tremendous improvement that can be expected with an complete BG conversion for new or used equipment. They also demonstrate the surprisingly adverse effect that electrolytic capacitor noise can have on any type of VHF equipment. This is also true for related equipment such as video cameras and VTRs. Excellent results have been realized here too. Powerful electronic equipment of this sort has never been available before. We hope that you will soon be able to experience the refreshing advantages of Black Gate by installing BG capacitors in your own equipment.

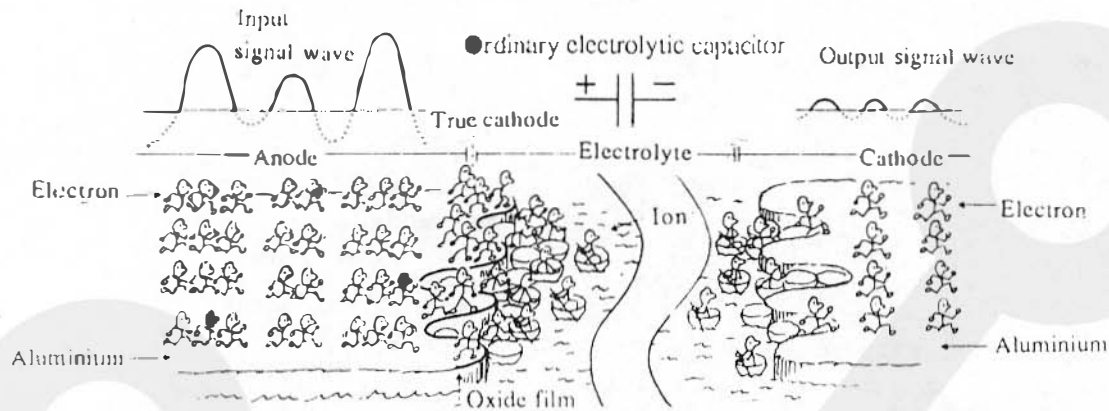
"Blind Sports in Electric Circuits" : The Electrolytic Capacitors

Electrolytic capacitors in operation usually allow a signal current to flow which ranges from several mA to several tens of amperes, depending on the places where they are used. It is unimaginable that the current amounts to hundreds of amperes even in small-sized stroboscopes. There are a lot of people who still believe that the capacitors will work with impedance values officially released, and without causing any electrical distortion. This is a serious misunderstanding. The so called impedance curves of ordinary electrolytic capacitors show the static characteristics gained on condition that any electric current does not flow, and then there will be little difference among the curves for different capacitors; therefore the curves are not related to the dynamic characteristics which will be obtained when electric current actually flows through the capacitors, are they? when

a certain electric current flows, the maximum distortion of electric current will occur in the capacitors due to ion transfer, and so the standard of E. S. R. (Equivalent Series Resistance) is also important which greatly affects the flow of electric current (The standard is in force in the U. S. A.) It is impractical and obsolete to use the current Japanese standards that do not include such a standard. There are a great many requests from university faculties for our catalogues. This indicates that textbooks do not explain ion transfer, causing engineering students to be taught wrong. We concluded this is a serious matter and it must not be left as it is; then we tried to explain the meaning of such an influential ion transfer and the problems of ion-caused distortion and decreased power by illustrating (Technical Report No.18-B) the physical phenomena in the electrolytic capacitors so that anyone could easily understand them We hope you will read them through by all means.



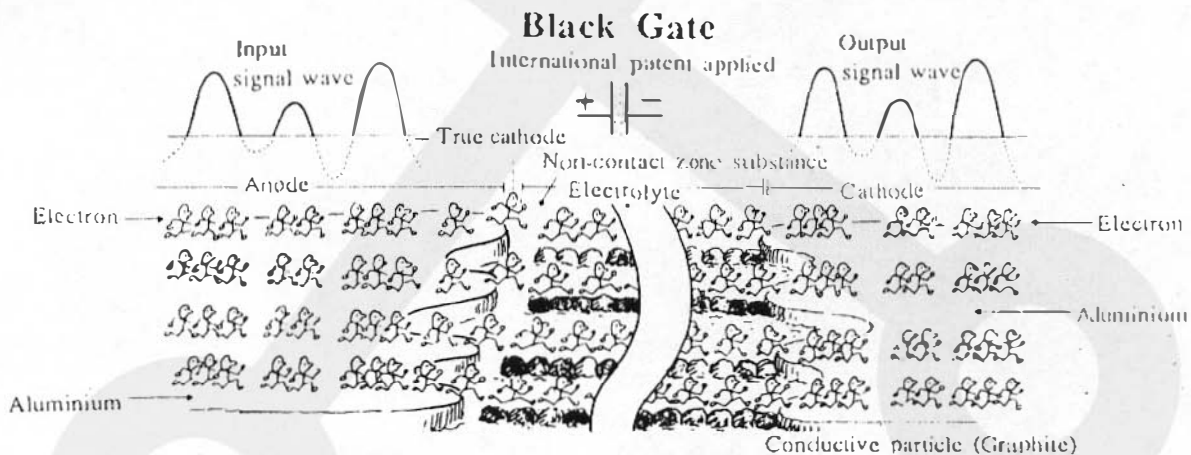
"Blind Sports in Electric Circuits" : The Electrolytic Capacitors



- Electrons reach an anode oxide film in accordance with an input signal wave.
- A true cathode is formed in contact with the oxide film in electrolyte, and becomes ionic conduction between the anode and true cathode.

- Many small bays are formed by etching around the wharf of the oxide film.
- Electrons ride on boats (ions) at the wharf and advance slowly toward the opposite wharf (cathode) (ion transfer). Ions advance much slower than electrons. The bays are crowded with too many boats, and a large number of electrons miss boats or are delayed (power-down and distortion occur).
- The signal is influenced by the characteristics of ions, and also ions are consumed.

- After reaching the opposite wharf, electrons start running again. However, due to large power-down and delay (ion-caused distortion), the output signal is different from the input signal. The larger the power, the larger the difference. Insulating materials contained in the electrolyte obstruct the movement of ions.



- Electrons reach an anode oxide film in accordance with an input signal wave.
- A true cathode is formed in a non-contact zone electrolyte which is formed in contact with the oxide film, and electron transfer occurs toward a cathode. This is the most significant characteristics of the Black Gate.

- Many small bays are formed by etching around the wharf of the oxide film, just as an ordinary electrolytic capacitor.
- Electrons jump over a short-distance non-contact zone (0.5 μm) at the wharf, and run on the adjacent graphite grains, toward the cathode (electron transfer) (below 40dB). No delay occurs at the wharf, since boats (ions) are not used. There is no influence of ions and no ion consumption.
- The non-contact zone serves as an important shelter, shutting out the oxide film (below 60dB), conductive grains and contact noise (ultra-low noise).

- After reaching the opposite wharf (cathode), electrons run with the same speed and power as before, and an output signal with the same waveform as the input signal is transferred. Therefore, the capacity of 1000μ of a Black Gate corresponds to 5000μ of an ordinary electrolytic capacitor.

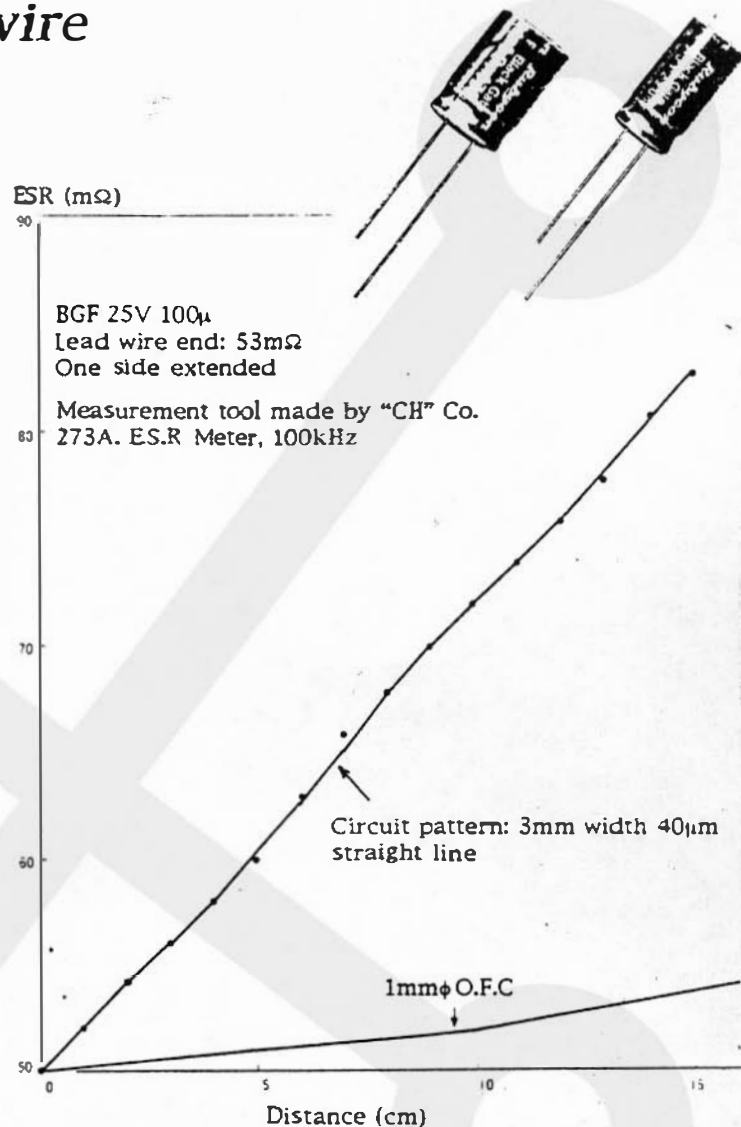
Capacitor performance drops incredibly on extension of lead wire

When a capacitor is mounted on a printed circuit board, how is its performance changed by the printed circuit pattern extending away from the capacitor leads? Until now, the answer was generally not known. This paper presents surprising data.

It is generally known that an electrolytic capacitor's life is over when its E.S.R. (equivalent series resistance) value reaches double of its initial value. With this increase of E.S.R., distortion of the electrical signal and lower dynamic range also occur. The figure on the right shows the straight path that provides optimum conditions for capacitor performance. It shows that a distance of 15 cm will be the limit of the effect. In the case of a narrower or a curved path, the E.S.R. value may double or triple. In recent digital equipment, in which clocks of 20 MHz to 30 MHz are often used in addition to direct current, the E.S.R. values jump dramatically at these frequencies and capacitors that are only a few cm away have their performance cut to null.

On the contrary, an example using a single 1 mm thick wire in the same circuit shows that there is almost no lowering of its performance. Twisted wires thicker than 0.18 x 30 will also give the same good results.

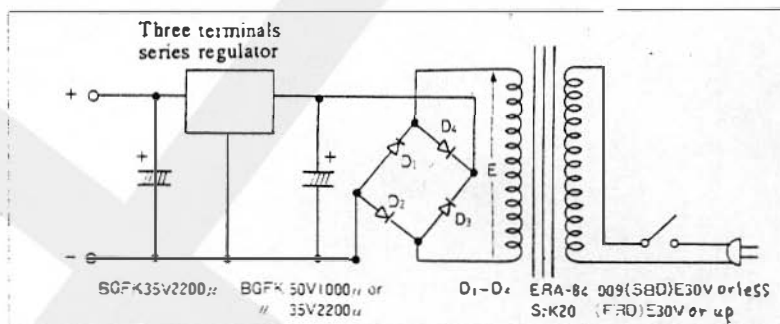
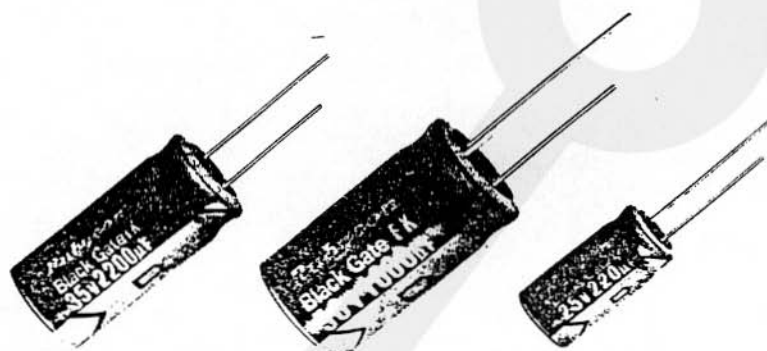
As a result, equipment running at speeds up to video band frequencies should use paths that are thicker, or they should be equipped with supplemental twisted wires alongside the paths. Otherwise the capacitors will not function fully at a sufficient level to be useful. In the case of equipment using frequencies higher than the video band, even these measures are not sufficient. Special feeding devices which do not decrease performance and cannot be interfered with by other circuits might be required for the wiring circuits themselves. Most of the problems in electronic equipment using highly-integrated circuits are caused by the large decrease in the performance of feeding devices and the internal noise of capacitors. The "Black Gate" capacitor series only requires sufficiently thick paths. Their performance provides incomparable super low noise, super low distortion, and they allow the best performance in all kinds of electronic apparatus.



Improve CD player performance

- Tune any CD player to produce the highest quality sound -

CD players have become widespread. Digital signals should be unchanged from the original when they are reproduced. Nowadays, everyone knows that this does not happen. However, the cause is not known and therefore many wrong steps are being taken to solve the problem. The largest cause of distortion of the digital signals is the electrolytic capacitors. Capacitors change the digital signal voltage and phase to a non-linear form, and they cause large distortions and phase differences. In addition, another problem is jitter disk. In the power supplies generally used (shown in the illustration) there is lots of residual noise and it is impossible to supply the clean power required for



Power supply of CD player

jitter-free rotation. Therefore, the disc cannot be read with great precision. Even a turntable weighing 4 kg will have jitter if the power supply is noisy. Feather weight CD discs are very badly affected by this power supply noise. The current countermeasures to support disks from outside, which add weight to the housing, miss the point as badly as taking a headache cure for a stomach ache. Finally, the previously reported measure of adjusting the S/N point in the D/A converter is insufficient to solve the problem. All of the causes of distortion in CD sound can be traced to the electrolytic capacitors that are used. We used our Black Gate capacitors to replace the original capacitors in a low price CD player. After fine tuning the adjustments, the low cost CD player turned out the highest quality sound, as expected. The points which were changed are as follows:

- (1) Installed a BG-FK (shown in the illustration) on the main power input/output lines.
- (2) Installed a well matched BG-FK 25 V100 μ F, 220 μ F etc. on the motor driving circuit bypass line.
- (3) The D/A converter requires special care. Optimized with a BG-N.
- (4) For other circuits, BG, BG-PK capacitors are usually good enough.
- (5) For power rectifiers consuming less than 30 VAC, schottky barrier diodes are OK. Power supplies bigger than 30 VAC should be equipped with fast recovery diodes. (D1 to D4).

The improvements listed above have already been tried in audiophile shops in Japan, Hong Kong, and Taiwan. The result was many satisfied and happy people who know good quality sound when they hear it.

Every capacitor that is connected to common power supplies will be a source of contamination

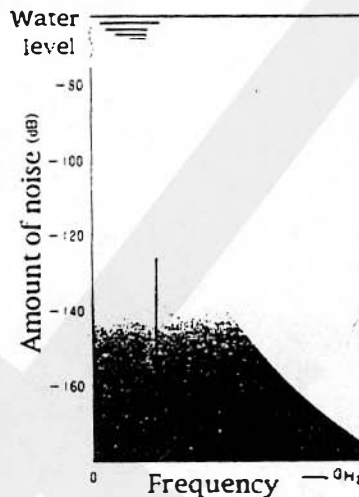
- It is a waste of effort to change only some of the capacitors in the circuits -

"Where we should use Black Gate capacitors to get the optimum effect?" We are frequently asked this question.

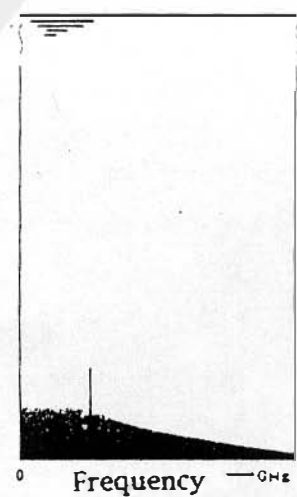
People seem to believe that to improve the high frequency S/N ratio, only the capacitors in the high frequency circuit will have an influence on the S/N ratio, and that low frequencies are only influenced by capacitors in the low frequency circuit. This is, however, not true. Imagine that a power source is a pond and that the figures on the right show the effects when a single electrolytic capacitor is used in a circuit. The pond begins to be contaminated and gradually loses its transparency. Other known causes of this contamination are various rectification components, zener diodes, choke coils, resistors, barium titanate capacitors etc.



Contamination of a pond: power supply, using conventional electrolytic capacitors



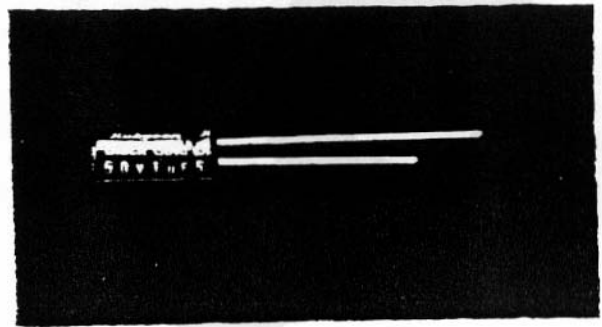
Contamination of a pond: power supply, using Black Gates



However, the largest and most critical cause of contamination is electrolytic capacitors. As the number of capacitors used increases, so does the contamination. Electrolytic capacitors generate -80 to -120 dB of noise and they add 20 to 30 dB more contamination than any other parts. Many people mistakenly believe that popular filters such as LC filters or CR de-coupling filters help to prevent circuit contamination. However, these filters actually have no effect on power supply contamination. By the way, circuit engineers often use electrolytic capacitors in each section, in order try to improve S/N ratio of their apparatus. On the contrary, this increases the contamination and they should take note of this fact. Therefore, it is more clever to minimize the use of electrolytic capacitors. Furthermore, another important fact is that this distortion noise, added by electrolytics, cannot be removed and it affects not only the level of noise, but it influences a wide band of frequencies from 0 to somewhere in the GHz range. When a signal is passed through a contaminated power source, the low level information is omitted and deformed so that it drastically lowers the apparatus' performance. This is the true cause of lower S/N ratios. Black Gate capacitors only add 1/1000 of the amount of contamination caused by conventional electrolytic capacitors and the use of 100 or even 200 Black Gate capacitors will not increase the contamination of the power source. Instead, any conventional capacitors which remain in the power supply after installing Black Gates will continue to be a critical source of contamination. Reporters involved in electrical appliance sales campaigns say "This TV set has an incredibly improved picture image quality. It is as if I could smell the savory odors from a cooking program." These observations backup our assertion. The wide range reduction of noise, down to -120 dB to -150 dB, as shown in the figures above, make it possible to achieve the rich information signals that are indispensable to our life style. These signals convey things such as position, depth of image, and atmosphere in audio equipment. They also provide clear, fine color, stereoscopic images in video equipment. Clean power supplies using Black Gates are the key to dramatic improvements in the performance of electronic appliances.

Unbiased coupling is a serious problem in circuits. (No. 1) - Black Gate capacitor applications: Our BG-N solves all the problems. -

Operational amplifiers (op-amps) are easy and convenient to use, and they are very often employed in analog and digital circuits. These amplifiers use bi-polar power sources and they have unbiased input and terminals. However, this requires the use of coupling capacitors to remove the polarization caused by normal, polarized electrolytic capacitors. Sometimes non-polarized capacitors are used and in other cases polarized capacitors are hooked up backwards, or in series, to try and deal with the problems. These methods of controlling op-amps inevitably create significant problems with the signals being processed.



Electrolytic capacitors are at their worst in unbiased operation under the following conditions:

- 1) Polarized electrolytic capacitors only function as a capacitor in one direction. They work like conductors in reverse polarity.
- 2) In an unbiased operation the electrolytic charge is not a reliable factor, and the capacitor exhibits very low conformance with the signal. This is an unavoidable and fatal defect of ordinary capacitors in these conditions. So, besides the contamination of the power supply, which has been described several times before, the signal itself is subject to large non-linear distortion and phase distortions.

BG-Ns (non-polarized Black Gate capacitors) do not contribute to these types of distortion. On the contrary, they offer the best performance among the Black Gate series. The internal construction of BG-Ns is absolutely and completely symmetrical and they function essentially the same as an electron transfer. They are almost ideal capacitor with the following advantages:

- 1) Distortion is infinitesimal (-160dB or better), 1/1000 or less that in ordinary capacitors.
- 2) The internal signal speed is 100 times or more higher than ordinary capacitors.
- 3) Their resonance point is even higher than equal-capacity film-type capacitors.
- 4) They exhibit minimum E.S.R. and very little scattering.

Therefore, when used for zero-bias coupling, they provide the very best results. The number of applications for BG-Ns is huge. In audio devices: preliminary amplifiers, main amplifiers, microphones, compact disk players, and professional mixing consoles can all benefit. In video devices: TV monitors, video tape recorders, and TV cameras will show improved pictures. In office automation equipment, modems are greatly enhanced. In medical equipment: EKGs, EEGs, and CGs provide cleaner, more accurate readings. Our brand-new BG-N50V1 μ and BG-N50V4.7 μ can be used to improve the input and output impedance of all kinds of electronic equipment. Why don't you try these new, non-polarized Black Gates in your application?

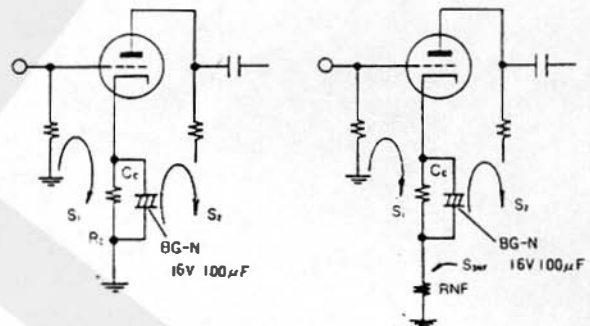
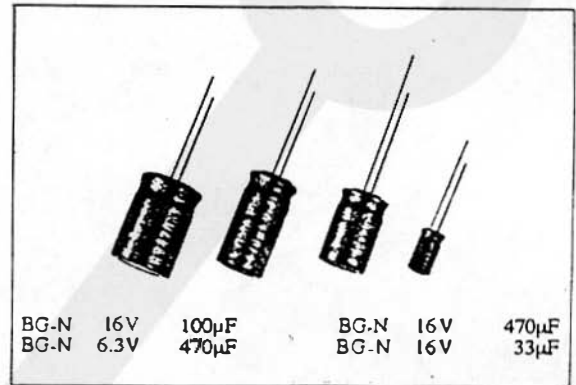
BG-N capacitors are very effective in grounded, negative voltage circuits

Optimum design for use in cathode and emitter bypass circuits

In the last issue, we discussed coupling circuits. This time we will talk about the more common use of bypass capacitors in negative voltage cathode and emitter circuits. In negative voltage amplifier circuits the at-rest potential of the amplifier is zero. When vacuum tubes are used, the following circuit is appropriate (when transistors are used, an emitter bypass is capacitor-used). **The original purpose of a bypass capacitor is to maintain a stable cathode to ground potential in an AC circuit.** In real-life amplifiers, this cannot be achieved. To check this out, remove the bypass capacitor, and you should see a decrease in gain. On the other hand, the signal quality will increase greatly. Theoretically, there should not be a difference in signal quality between circuits with and without a bypass capacitor. But actually there is. This is due to qualities in the electrolytic capacitors. Therefore, most ordinary capacitors cannot be used. This is because the bypass capacitor functions as a common path for the input signal S1 and the amplified signal S2, which have opposite phases. This is really the critical point. Then, when NF is added, the bypass capacitor also functions as a path for the feedback signal S3. Therefore, the bypass capacitor is required to perform perfectly. The bypass capacitor, which is understood to be a necessary part of circuits, is key in determining the performance level of an amplifier. Many people have made the mistake of discussing the good or bad aspects of circuits or the sound quality of units, while they are using imperfect bypass capacitors. **If you want to design a circuit which uses bypass capacitors as large as 100 micro farads, you can choose from four (4) types of Black Gates: BGPK, BG, BG-FK, BG-N. Black Gates are perfectly applicable under any circuit condition.** We cannot explain the differences of each type and tell you how to use these capacitors in this short column. However, we recommend that you simply try them and check the sound quality with your ears.

The designer of the Audible Illusions 2B, an amplifier made in the U.S, tried our suggestion. He changed the circuit to use four (4) Black Gate capacitors in place of the four of the seven (7) German capacitors previously used in the circuit. This simple, low priced, not very high quality pre-amp was soon producing sound equal to the highest quality amplifiers. IAR applause excitingly. "It is a very inexpensive pre-amp, you and your ears will be happy with its music for the rest of your life."

We regret to say that he kept the original specifications for the other three capacitors so as he was unable to get literally the best quality amplifier in the world. High priced amplifiers with gorgeous outside panels and poor components inside are still being sold. But, not for long time.



Television replaced with Black Gates is superior to any ordinary TVs.

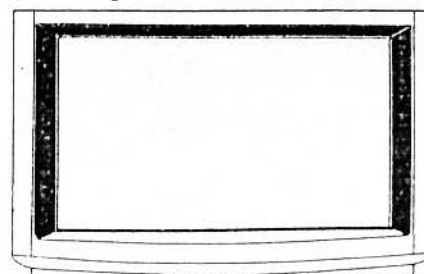
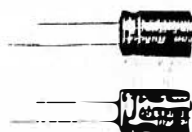
We chose several tens of people from many applicants who hoped to improve their televisions, and we offered them Black Gates to replace all electrolytic capacitors inside TVs. Then we asked to test them and sent us the reports about the results. For a while, We got a lot of reports one after another which were detailed and had rich in contents. We are not able to introduce all of them for lack of space, but there were so many kinds of improved television sets that cover almost all of TV manufactures in Japan and the types of them including old ones to new ones. We are going to summarize them as follows:

- (1) About the clearness and the beauty of color, especially red is outstanding in comparison with one in ordinary televisions.
- (2) The resolution is improved, and the amount of information is increasing, moreover, there are some pictures superior to the monitors in TV stations.
- (3) The linearity from highlight to darkness is upgraded, therefore the ability of resolving half tones is marvellous, every pictures on a lot kinds of TVs entirely become bright.
- (4) It becomes possible to receive the stations which was hard to receive before.
- (5) There is the sense of perspective appears on a picture for the first time, we can see depth and distance in pictures.
- (6) The interlace becomes complete, and we don't notice the existence of scanning lines at all even upon large-scale pictures.
- (7) Ghost, color gap and blur arc decreased remarkably.
- (8) We can distinguish between not only a live broadcast or a VTR of electric waves transmitted on pictures, but also whether the quality of switched cameras in stations are good or not.
- (9) With replacing inside capacitors with Black Gates, 12-year-old TV that is about to thrown out becomes better than new one. The reporters believe Black Gate is a key component that is given the highest priority over any other components.

Above are the results. There were about 40 to 240 pieces of ordinary electrolytic capacitors in each set, all of them were replaced with Black Gates. it took 30 to 90 hours for idling, The more the pieces are inside, the more the time takes. Finally, all sets became upgraded to the almost same level.

* The reason why, as I explained, capacitor noise generated from any band in audio frequency to GHz reaches 40 to 60db per each capacitor used in televisions, also the phase delay becomes $1/100$, therefore if you replace 40 electrolytic capacitors with Black Gates, the noise will be decreased by 1600 to 2400db, the phase delay will be better by $1/4000$, it is extraordinary difference. There will be no information dropout, it means signals are completely reproduced by Black Gate.

* A high-definition television is preferred recently, however, it doesn't make any sense from a transmission theoretical point of view to extend the amplification range or to increase the amount of information as the electrolytic capacitor noise left. First of all S/N ratio should be improved by Black Gate.



Black Gate is the best for improving S/N of MRI/CT/DSA/US
There is no rival in the world; super-low noise electrolytic capacitor.

Most of the specialists point out that it's important to improve S/N ratio for upgrading diagnostic imagings. All biosignals are amplified by an analog system, then they are digitized through A/D convertor and are processed in a computer, finally, the signals will be an imaging or a hard copy. We can think of improving S/N ratio at any part in that kind of electrical appliances.

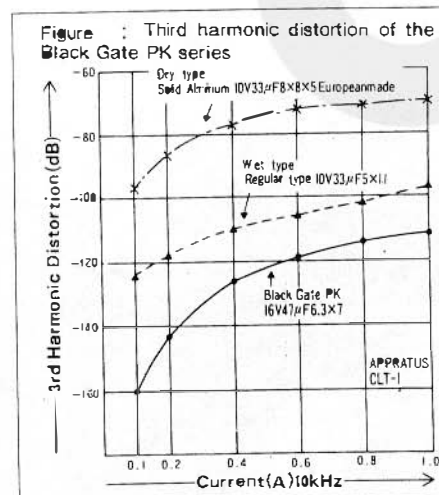
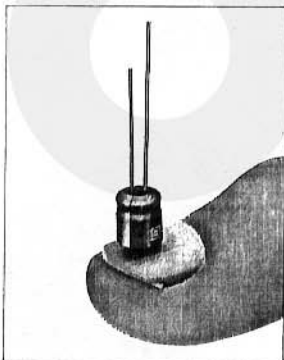
It will be most effective that making improvement on inside each electronic circuit constructing the appliance. The noise level of a semiconductor unit is ordinary about -120db, but in fact, there is a large blind spot in each circuit. That is, when the amplified signals passing through an electrolytic capacitor in circuits, they are influenced by large ion noise (-80 to -120db) of caps, therefore the low-level signals are dropped out or deteriorated.

The reason is, the signals are on ions when passing through a capacitor, therefore it is an ion transfer instead of an electron transfer. The weight of an ion is much heavier than an electron, so they are delayed when going through an electrolyte, and also generated distortion noise. Therefore, the S/N ratio of both analog and digital signals become much worse. Moreover, the sound range reaches from the audio band to 1 GHz.

On the otherhand, Black Gate is, (1) the distortion noise is 60db(1/1000) less (2) the internal signal speed becomes a hundred thousand times faster (3) the power transfer efficiency is several times better. We used Black Gates for a CD player of low priced, it surpassed the highest grade one about performance. Also, we succeeded in making the receiver on TV high-definition about color and clearness, we proved how terrible the influence of ion distortion is!

The "CLT-1", a distortion measuring instruments having a oscillator and an amplification inside, has the highest sensitivity of Denmark made. The limit of measuring level was -160db, however, our company replaced the each capacitors inside with Black Gates, we succeeded extending the measuring limit to -180db, it means the S/N is lowered by 20db! It shows Black Gate is necessary for ME systems that should be super low-noise. In 1992, Dr. Sasaki living in Fukuoka, Japan, he replaced the capacitors in his ultra sound system with Black Gates, after that the system became so sensitive that he got the result of finding an early cancer. Therefore, We are sure that using Black Gate is the best thing for great improvement on S/N ratio of ME systems.

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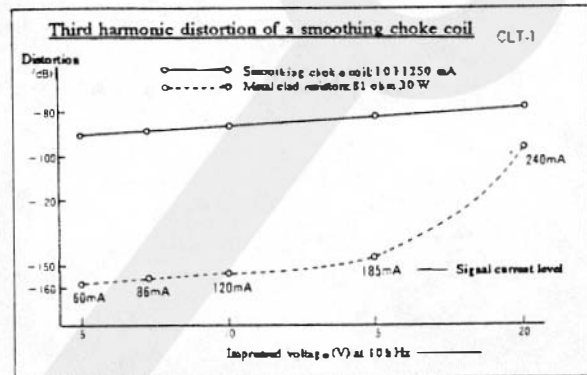
Smoothing choke coils reduce the performance of amplifiers when you use Black Gate capacitors

Good quality high fidelity sound cannot be achieved without removing the magnetic choke coils

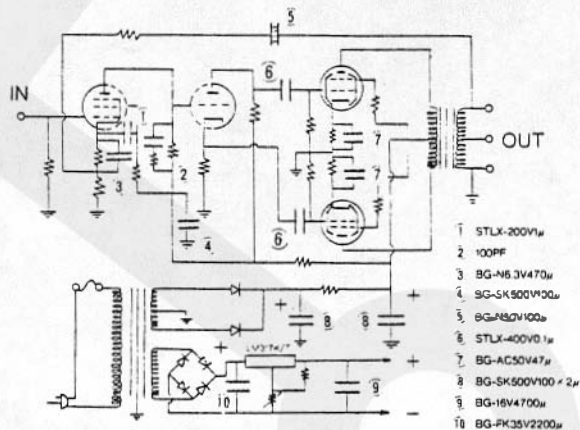
We have already reported that smoothing choke coils will affect the performance of high fidelity equipment in Technical Report No. 12. Since then, we have continued to received lots of questions from readers. Therefore, we would like to present the following critical information.

The curves right demonstrate the distortion by comparing the pass signal current level between the nearly equivalent resistance of a 200 mA choke coil and an 81 ohm metal clad resistor. Although the choke coil always generates a large distortion of about -90 dB, the metal clad resistor has a relatively low distortion of -150 dB on average. The difference in these two levels of distortion is 60 dB, and the choke coil often generates 1000 times the distortion of the metal clad resistor. In other words, the signal deteriorates or loses -90 dB to -140 dB of information after passing through the smoothing choke coil.

Moderate and soft sounds produced by special vacuum tube amplifiers lose information. The information in sound is present at -120 dB in CDs, and at -140 dB in analog equipment. Without reproducing these ranges, high fidelity sound cannot be said to exist. Use of BG-SKZ capacitors guarantees an accurate transfer of information at up to -160 dB. Therefore, the smoothing choke coil has only negative effects on the sound quality and does not provide any advantage. Furthermore, magnetic coils such as coupling choke coils, input transformers, and output transformers have the same problem. However, only the output transformer is indispensable, and this is a weak point in vacuum tube amplifiers. Only a complete adoption of negative feedback can solve this problem, thereby minimizing the differences between vacuum tubes and transformers. By providing negative feedback from the secondary line through the BG-N, as shown in the circuit above, you can solve this problem. Vacuum tube amplifiers are still in use in Europe and the USA. However, smoothing choke coils have already been eliminated.



An example of a super amplifier circuit



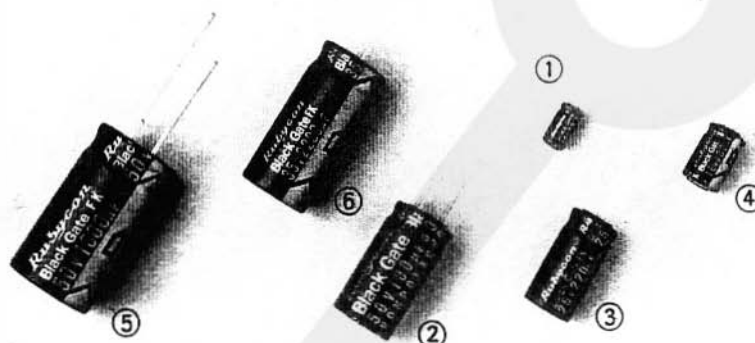
Creating the ultimate CD players

Successfully playing back the full depth of sounds by adopting Black Gate N capacitors in the heart of the amplifier

The report titled "Improve CD player performance" (Technical report No. 24) has had a large impact all around Japan causing CD player manufacturers to begin using Black Gates in their CD players. We have received lots of reports from customers who reported even better improvement than they had expected. Among them, some enthusiastic fans of Black Gates

have requested a further upgrade to the ultimate level. In response, we have immediately developed the super-low-noise BGN-16V33 μ and used it to replace the conventional PC board mounted capacitor on the moving mechanism of an experimental CD-95. We also tested it with CD players made by other manufacturers. This capacitor smoothes the power supply to motors, lasers, play head amplifiers, and is the key to the performance level of CD players. Two weeks later, some independent experimenters excitedly reported that they could hear a greater depth of sound (a widened range in both front and rear) than they had ever heard from a CD before.

After them, we and other fans of BGs confirmed the fact. One of the experimenters sold out his long-loved, separate type amplifier made by "A" company after finding as an absolute difference of sound quality. He found the comparison extremely striking. The birth of the ultimate CD player, equal to analog players, is very close indeed. The distortion generated by ordinary electrolytic capacitors is far too large to deal with various measures such as oversampling systems, separated structures, optical fiber cables, and heavy chassis. Capacitor distortion simply cannot be solved by circuit technology. It is clear that only the way to solve the variety of problems is to replace the capacitors with completely non-distorting capacitors: the Black Gates. This fact is very important and it means that the Black Gate can contribute greatly, not only to improving the performance of CD players, but also to the performance of digital signal processing devices that use disk shaped media, such as floppy disk and optical disk. The trend toward CD music software is growing, and the hardware to play this high quality software must respond to this trend and provide perfect performance. In order to meet the requests from fans, CD players and vacuum tube amplifiers employing Black Gate capacitors have recently been introduced in the commercial market. Advanced audio shops all over Japan are taking the initiative and expanding their lines to include the highest sound quality as soon as it becomes available. Black Gate capacitors are changing the conventional audio map!



- | | |
|-----------------------|-------------------------|
| ① BG-N16V33 μ F | ④ BG-FK16V100 μ F |
| ② BG-N50V 100 μ F | ⑤ BG-FK50V 1000 μ F |
| ③ BG-FK25V220 μ F | ⑥ BG-FK35V2200 μ F |

Evaluating Black Gate Capacitors

Evaluations should always be performed against a standard; that is, against components that have the lowest possible level of distortion

A check of capacitor performance can be attempted by replacing only the capacitor to be tested with one Black Gate capacitor, leaving all of the other components intact. Then you can compare the performance difference before and after replacement. This evaluation method is called "bad components evaluation method."* However, this method is completely unsuited for evaluating the true performance of Black Gate capacitors.

Suppose that a complex electronic instrument contains 100 capacitors, and that the difference between a Black Gate capacitor and an ordinary capacitor is 60 dB. Then, the overall performance difference that will be achieved by replacing just one capacitor is $60 \text{ dB} \times 100$ (the original configuration) compared to $60 \text{ dB} \times 99$ (with just one Black Gate). Clearly, we will not be able to see the superior performance of the Black Gate when it is buried in the distortion of all the other capacitors in the circuit.** In other words, you cannot pick out a colorless object while wearing colored glasses.

Once we asked a broadcasting research center to evaluate the performance of Black Gates. A technician simply replaced one ordinary capacitor with a Black Gate in a TV camera in which hundreds of capacitors were installed. Then he looked at the results (coming from the high distortion levels created by the other capacitors) and announced that no difference could be found. We're not sure that this fellow was ever able to conduct any meaningful research since he wasn't even able to see how completely inappropriate his testing method was.

So, what is an appropriate testing method for evaluating Black Gate? The answer is quite simple. First, install Black Gate capacitors in every location on a piece of electronic equipment and take your measurements. Then replace one Black Gate with a single ordinary electrolytic capacitor and measure again. Compare the difference in performance before and after. The resulting difference will be dramatic. This demonstration shows the real difference between Black Gates and ordinary electrolytic capacitors. And anyone will be able to see the difference because it is that obvious. Why so evident? Because, the distortion caused by 100 Black Gates is so small and the distortion difference between ordinary capacitors and Black Gates (60 dB) is so large, that it is impossible to miss the difference in actual use. This evaluation method is called the "low-level distortion component evaluation method." In other words, you can find object with even a faint color when looking with transparent glasses. This evaluation method is applicable to any passive component, such as wires, cables, resistors, capacitors, or rectifiers. Using it, it is possible to immediately verify the super-low noise distortion of -120 to -170 dB that even high-performance measuring tools cannot evaluate in a circuit full of distortion.

Therefore, everyone should always have components available (including capacitors) that create the lowest possible level of distortion when evaluating any type of component. Low-distortion components make it possible to evaluate poor parts with extremely high precision, over a wide range of frequencies (0 to 20 kHz for audio appliances, and of 0 to 1 GHz for TV equipment). Of all the methods for testing components, this one is the most cost-effective and accurate.

All of the film capacitors (Twist L, Super Twist L, and STLX), and system wires (speaker cords, JPC coaxial cables, and lead wires) we offer have been selected after being evaluated as the best available, using exactly this method.

* For a table classifying low and high level distortion components, see our Technical Report No. 15.

** For the report about contaminated sources, see Technical Report No. 25.



Black Gate is aiming for the performance of sapphires, king of dielectrics.

Diamonds are the king of jewels. But, when considering jewels for their dielectric properties, sapphires are number one. As shown in the table below, the physical characteristics of sapphires are outstanding and their best feature is their superb characteristics when used as dielectrics.

With most dielectrics the rate of dielectric loss only gets smaller as the dielectric ratio is reduced. However, sapphires are an exception. Although sapphires have the lowest dielectric loss of any substance on earth, their dielectric ration is approximately 10, which leaves them standing completely alone in the field. In other words, the static capacity per unit area is extremely high, and dielectric loss is super small, as low as 10 to 15 A/V . Together with outstanding voltage proof, sapphires make the very best capacitor material and can be said to be the king of dielectrics.

(Our company name "Jelmax" is derived from this idea of being the best among jewels.)

Historically, electrolytic capacitors have been made of the same dielectric material, oxide aluminum.

One billion capacitors are produced every month, and they are indispensable in all types of electronics equipment. However, the electrical characteristics of capacitors made with oxide aluminum as the dielectric are terrible when you examine their distortion, dielectric loss, signal transferring ability, and life span.

The cause of this inferiority in electrolytic capacitors comes from the ion transfer section composed of an electrolyte and a separator.

Jelmax was the first to determine that this was the problem and they have relentlessly pursued the improvement of the ion transfer section. Jelmax's idea of improvement in this section means they want to reach the level of performance of sapphires and dramatically improve the functions of all types of electronic equipment.

After a decade, Jelmax solved this difficult problem with a method no one had foreseen* and introduced the "Black Gate" capacitor.

The assumption that improving the ion transfer section would lead to dramatically improves functionality in electronic equipment was exactly correct. When Black Gates are used, ion distortion noise decreases tremendously. Analogue and digital audio appliances have been transformed into ultra Hi-Fi sound machines and TV sets are finally able to reproduce extremely fine colors on high density screens. Many people inside and outside the country have recognized this fact.

Now Jelmax is aiming to apply Black Gates to state-of-the-art Medical Imaging Equipment such as MRI/CT/DSA/US. We believe that using Black Gates in this equipment will contribute greatly to the detection of early-stage cancer.

"Black Gates" have come very close to sapphire-like performance, compared to what is offered by ordinary electrolytic capacitors. Even so, there is room for improvement.

Jelmax aims to come closer still to the performance of sapphires in collaboration with engineers in a variety of fields. You can look for more developments in the future from Black Gate capacitors.

* See catalog. International patents applied for.

• Comparison between sapphires electrolytic capacitors

		Monocrystal sapphire			Electrolytic capacitor
		Unit	Temperature	Value	
Physical characteristic	Density	gr/cm ³	Ordinary temp.	3.98	-
	Hardness	Mohs	Ordinary temp.	9	-
	Break strength	kg/cm ²	Ordinary temp.	4200 - 7000	-
	Speed of sound	km/sec	Ordinary temp.	10.6	-
Electrical characteristic	Resistance	Unit	Ordinary temp.	> 10 ¹⁴	-
	Dielectric ratio	1 MHz	Ordinary temp.	11.58	-
	tan δ	1 MHz	Ordinary temp.	0.001	0.26 - 0.08
	3rd-high-frequency distortion (db)	10 MHz	Ordinary temp.	- 170 or up	- 80 to - 120



Improvement on SP system

The relationship between the mass of vibrating component and network.

In our Technical Report No.34, we introduced the reference amplifier; it is an amplifier replaced inside all capacitors with Black Gates. When you complete your handmade reference amplifier with all efforts, next, it's time to improve a SP system. Because the tone quality of all sound systems depends on amplifiers mostly, therefore if you complete the reference amplifier, the tone quality should have been upgraded, so you don't have to be so careful what SP system you are going to make. If you would like to pursue a better tone quality, then it is the best timing to improve a SP system. The tone quality of SP system depends on a network, therefore it has a close relationship with each parts of L and C which constructing the network.

There is a clear principle for satisfying your ears between the mass of a speaker's moving element and the loss of corresponded each component. It's easy to understand if you think about the relationship between musical instruments and microphones: when the vibrating component is light like a flute, a capacitor microphone is suited for reproducing, such as recording, mixing, transmitting and announcing, because its vibrator is also light. Like this, a ribbon microphone is for human voice, and a dynamic microphone is for a low frequency instrument. As these ways, it's natural to change the kinds of using microphones to suit each vibrators. Now you are aware there's a clear relationship between the mass of an electroacoustic transducer part and the corresponded reproducing range.

The same as above theory, there is a correlation between the mass of a speaker and a network as in figure 1. You will understand how to think this way: there's a difference in the each vibrating mass between actual musical instruments and the using SP systems, therefore to narrow the gap as close as possible, we can choose which network we are going to use to get the real sound.

After that, you can adjust a SP system by using the reference amplifier, then the tone becomes very natural and desirable. If you use not the reference amplifier but whatever amplifier on hand, the SP system has to be adjusted to the peculiar tone color(ion distortion) of the amplifier, therefore the tone color will not suit to other amplifiers completely. Normally, a network is constructed by the combination of inductance L and capacitance C, so we can choose how large or small of the each loss, if you combine both of them properly to make a network, you can control the losses. Finally, you will achieve the sound that everybody will be satisfied with no matter how different the characteristic of speakers' vibrating component.

In conclusion, the reference amplifier with no distortion noise must be the fundamental for reproducing music.

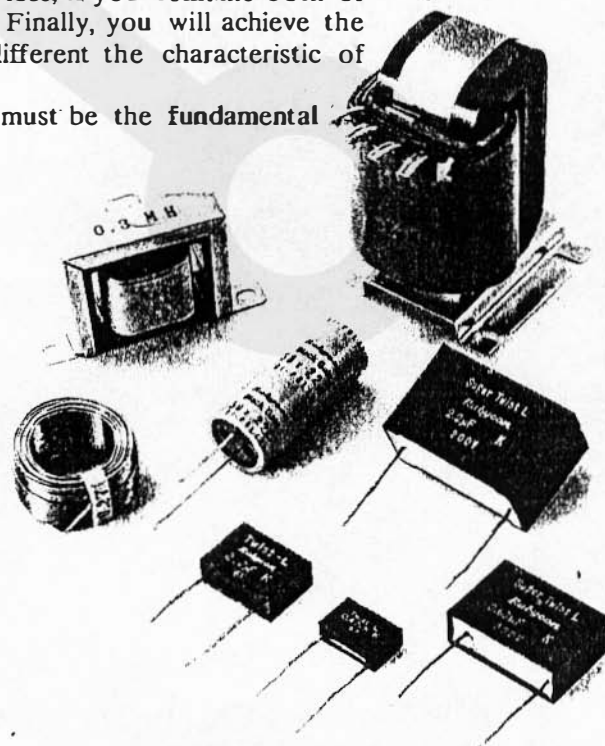
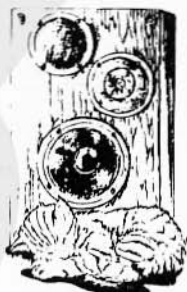


Table 1:

reproducing range	speaker	vibrating mass	network
high freq.	tweeter	small	loss small
middle freq.	squawker	middle	loss middle
low freq.	woofer	large	loss large

DISTORTION GENERATED BY A CAPACITOR

- Except Electrolytic Capacitors -

All the electric devices greatly affected

You may mutter to yourself, "Is distortion generated by a capacitor? I have never heard about that." That kind of story has neither taught in school nor prescribed in JIS standards. There is nothing more important than this fact in the field of modern electronics engineering. As shown in Fig. 1, a capacitor is made of a pair of electrodes P_1 , P_2 and a dielectric ϵ interposed between the electrodes. As shown in Fig. 2, when a signal is supplied to the capacitor, the dielectric expands and shrinks as all kinds of dielectrics do and exhibits a electric distortion curve. The curve is similar to a hysteresis curve of magnetic material. Dielectrics generate a loss and a lot of harmonics due to the non-linear curve. That is what a distortion of a capacitor really is. The distortion has relative relationship with a loss $\tan \delta$. The level of the non-linearity of PS, PP, PC, PET, paper, PVF, ceramics and laminated ceramics becomes larger in this order. Although an electrolytic capacitor is located at the position following the paper in the order of the non-linearity, a detail description is omitted in this report.

There is a big difference in the distortion of as high as more than 60 dB (1000 times) between titanium capacitors and styrene capacitors which are widely used in tuners or high frequency apparatuses. The figure of S/N can be improved by more than 10 dB by simply replacing all the titanium capacitors with styrene capacitors. You will recognize at last that the distortion generated by capacitors is greatly important by this fact.

CTL-1 is an only method for measuring the distortion in which the third harmonic distortion of an input signal is directly measured by supplying the pure input signal power having a frequency of 10 KHz to a capacitor and is capable of directly reading the dB value of distortion generated for a given input. Although there are some articles describing that the distortion is measured by using an ordinary distortion gauge, they are, however totally meaningless since it can not measure electric power.

As stated in the last report, the distortion (an ion distortion) gives a great influence to electronics circuits through which a signal passes irrespective of whether the distortion is analogue or digital.

Sound quality of audio amplifiers is almost decided by the distortion of the capacitors which give a decisive influence to digital circuits such as CD players. It brings about impurity in the colors reproduced by color signal circuits of television sets adversely affecting the reproduction of pure and beautiful color pictures. Finished capacitors must be selected carefully for use with respect to their structure, lead wires and other elements because these elements also have relatively great influence to the generation of the distortion.

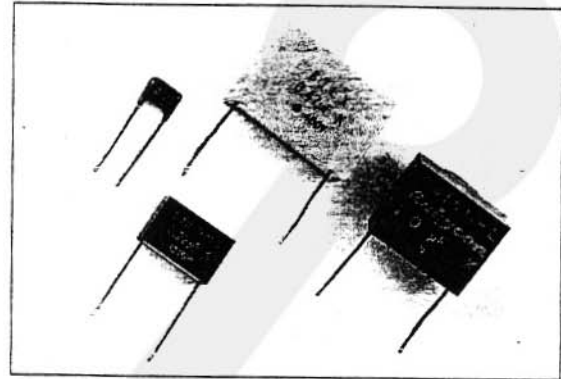
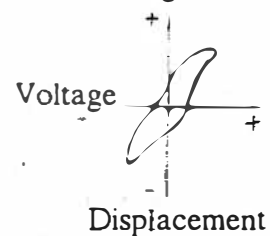


Fig. 1



Fig. 2



How will E.S.R. become?

When capacitor is connected in parallel

...It's a troublesome question.

Perhaps few people can give an immediate answer to the question above, because there's no standard about E.S.R., Equivalent Series of Resistance. Suppose each E.S.R. of these two capacitors C_1 and C_2 are r_1 and r_2 (see the figure),

(1) Combined capacity $C_T = C_1 + C_2$ — Anyone knows this.

But the question is combined E.S.R. r_T , that's not easy.

$$(2) r_T = \left[\frac{C_1}{C_1 + C_2} \right]^2 r_1 + \left[\frac{C_2}{C_1 + C_2} \right]^2 r_2 \dots \dots \dots (A)$$

On condition that two capacitors are equal,

$$r_T = \frac{r_1}{4} + \frac{r_2}{4} \dots \dots \dots (B)$$

Normally, there's few possibility that both a capacitor and E.S.R. are exactly equal in the expression (B), so E.S.R. will become worse than half from its original when a capacitor is connected in parallel.

(3) Next, when "n" pieces of equal capacitors are connected in parallel,

$$r_T = \left[\frac{1}{n} \right]^2 (r_1 + r_2 + \dots + r_n) \dots \dots \dots (C)$$

If capacitors are not equal, we will calculate this by using the expression (A), that makes us rather bothersome. In conclusion, it won't become $1/n$ of E.S.R. of one piece of capacitor, but will be pretty bad. Moreover, the condition of E.S.R. will be even worse because we have to consider about lead wires and wiring patterns.

E.S.R., Equivalent Series of Resistance, shows efficiency of capacitors.

$$E.S.R. = \tan \delta \times \text{impedance } Z = \frac{1}{Q}$$

Q is same as a coil's Q. Therefore, the smaller it is, the bigger the power of suppression to noise will be. To make E.S.R. as small as possible, many circuits are connected in parallel in power supplies for smoothing use, however, their ripples and noises are about 100 mV, it's not small at all. So we can hardly say they're direct current. There's a great mistake!

In the U.S., noise pollution has been occurred, and Japan is following that. Switching power supplies have spreaded over every field of electronic equipments, therefore, to solve this problem is of primary importance for high-technology.



Unconventional high-performance electrolytic capacitors "BLACK GATE"



What is the secret of Black Gate K series It's essential for pulse transfer of ultra-low noise

Recently, not a few amplifiers, CD players or videocassette recorders get improved drastically to be ultra high fidelity with Black Gate K series such as BG-FK and VK, etc., and this trend has been spreading rapidly all across the country. And there is a question we've been asked, what is the structure inside. On this occasion, we'll make public the structure which is difficult to understand for even professionals.

FIGURE 1, when applying AC voltage e to a rectifier D of a rectifying circuit, rectifying voltage of half-wave is generated at output side, and because of the absorb effect of an ordinary semi-conductor, transient voltage S about 1V is generated. Forward direction S_1 is smoothed by the capacitance of electrolytic capacitor T , however, backward direction S_2 passes by the electrolytic capacitor and flows into a circuit L . As you are aware, an electrolytic capacitor can block only one direction of the current, and it let the opposite direction passes through. The output voltage E seems as if it were a complete DC under waveform observation, in fact, it includes ripple noise of mixed S , therefore the circuit's S/N drops. Moreover, when the wave form of input signal is pulse, the noise becomes larger. That is how S/N deteriorates when pulse is transmitted.

The K series has shutting wall of oxide layer at negative electrode, and the wall blocks backward voltage up to 10V at its peak, it means it is sure to operate as non-polarized completely until AC 10V. Therefore, in the case of BG-FK 35V 2200 μ F, its blocking ability is equivalent to 12,000 μ F as smoothing capacitance, for example.

Thanks to such incomparably large capacities, reverse pulse is cancelled completely. Because of the patented structure which can smooth both of positive and negative pulses perfectly, Black Gate K-series keeps noise level under unbelievable -160db, it is generated from a power supply. This is the lowest level in the world!

Our company put on sale the epoch-making BG-K series since 11 years ago, but we had already invented its theory even 20 years before. We foresaw super low noise transfer in such old days. Needless to say, this is unique product on earth.

An electronic equipment which operates pulse is a main stream in the field of information equipments such as CDs, TVs, and digital signals deteriorate or fall off drastically while it's transmitted, this is the fact that nobody could imagine before.

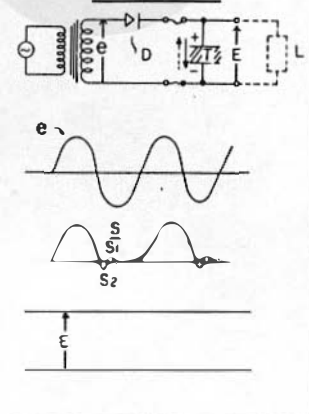
In conclusion, Black Gate K-series is indispensable to resolve the above problems.

We highly recommend trying this!

Black Gate



FIGURE 1



✽ The New Year's Topic ✽

The relationship between traditional craft and high technology “Ki-Hachijo”, the Japanese fabric led Black Gate to complete.

20 years ago, I, the inventor of Black Gate, was glued to the television of which program is about “Ki-Hachijo”, the traditional dyed fabric produced in Hachijo-island. This “Ki” means yellow, its chinese character is 黄. Ki-hachijo is woven by silk of two different colors which is dyed with yellow and black. It is so unique and modern that we can call it one of the traditional masterpieces. Especially, I was paying attention to the way of dyeing the BLACK color, which had the original method. First, soaking the silk in the peculiar mud of the island, then stamping on it again and again to make the equal-sized fine grain of the mud join into the silk for coloring. The mud stuck to its fiber, then once it was dyed it never faded, moreover it would be rather bright with washing.

I was very impressed, and I believed the success of Black Gate. Because I had wondered a bit whether the graphite fine particles were able to stick to the separator. Against my expectation, the certain grained fine particles stuck firmly to the fiber of the separator and it keeps steady like “Ki-Hachijo”, then Black Gate completed as the greatest electrolytic capacitor in the world.

The black carbon graphite particles are distributed equally in the separator between the electrodes, it becomes just like a gate electrode. Moreover, the graphite changes a ion transfer into the remarkable Transcendence Electron Transfer, it accelerates the internal signal speed to a hundred thousand times than before! Also it reduces the ion distortion noise to $1/1000(-60\text{db})$, and makes power transfer efficiency rising up to the several times than before. This is the real Black Gate, its effect is so overwhelming that anybody cannot expect. For instance, AV sets become super Hi-Fi, CD players perform marvelous sound, TV pictures will be so clear that we can obtain so much information which we were never able to get before. Every element is up-graded, and it proves the real performance of Black Gate. A most remarkable point is, we can never get such wonderful result even if we change circuits mechanism or replace other components. The all you need to do is replacing ordinary electrolytic capacitors with Black Gates, because the difference of the distortion between them is so enormous. From this point of view, we can say Black Gate is the ultimate weapon to win the high-technology competition nowadays.

Finally, I'd like to thank for the people in Hachijo-island. I'm proud of this invention is based on the Japanese traditional craft.



Is BATTERY ideal power supply ?

The weak point of ion transferring power supply

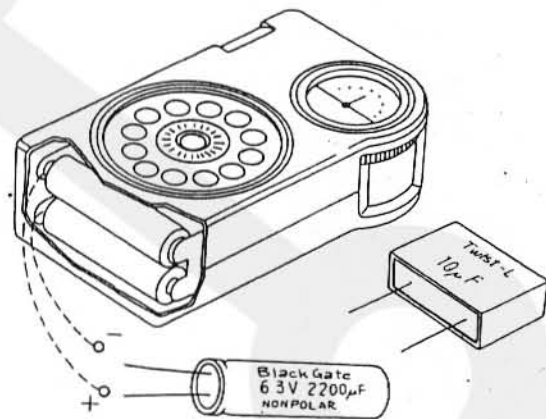
When there was a question as above before, I remember some people who know about electricity well answered "yes". I guess not a few people still believe so. However, the right answer is "NO" except it doesn't have a ripple. For confirming this fact, we'll introduce the easy test anyone can do. First, connect a **film** capacitor of $10\mu\text{F}$ to batteries of a portable radio in parallel (make sure you take away an ordinary polarized electrolytic capacitor beforehand when it's connected in parallel in the radio). Then you will notice the tone quality becomes better at squawker to tweeter, but you feel it's not enough. Next, connect an ordinary polarized electrolytic capacitor of $6.3\text{V } 2200\mu\text{F}$ instead of the film capacitor, but the result is almost the same as the film one. Finally, connect a non-polarized **Black Gate NX** $6.3\text{V } 2200\mu\text{F}$. After an idling of enough time, you will be surprised the tone quality becomes great and **Hi-Fi** at all frequency bands, you can hardly believe it. In short, the signals at **all** frequency bands flowing in a battery are **bypassed** and distortion noise is decreased remarkably. Non-polarized Black Gate is the only one capacitor that can transport AC signals to work perfectly even under DC potential.

On the other hand, if signals run in a battery directly without through a capacitor,

- (1) a battery is a power supply of ion transfer, therefore it radiates ion distortion noise.
- (2) a battery is also polarized, so it becomes non-reciprocal characteristic and it also radiates nonlinear distortion.
- (3) ion electricity has frequency nonlinear characteristic, therefore it also occurs its distortion.

Even in electric schools nobody teaches these facts, it's natural that many people tend to think a battery is an ideal power supply. In fact, it has a lot of distortion radiated more 60db(1000 times) than Black Gate or film capacitors, it is faraway from an ideal capacitor. Of course ordinary electrolytic capacitors are also ion transfer and generate distortion of which amount are just a little better than batteries.

In conclusion, **Black Gate** is the best capacitor in the world because of electron transfer.



Semi-Conductor Stabilized One is Ideal Power Supply?

Black Gate makes it perfect put at in & output sides

Continuing from Technical Report No.43, we're pursuing a higher graded power supply. People misunderstand some extent what is semi-conductor stabilized power supply used a lot in various kinds of electronic equipment. That is, a stabilized power supply doesn't need a bypass capacitor or it's enough the capacitance is small because of its low impedance. In the case of semi-conductor, the conditions (1) and (3) in the Report No.43 do not apply to since semi-conductor doesn't have ion, so its quality is better than batteries on these points. However, for the condition (2), since a semi-conductor is polarized, it becomes non-reciprocal characteristic toward AC, therefore it cannot help generating non-linear distortion. The noise level of the power supply with it becomes about -120db, this value is almost the same as an ordinary electrolytic capacitor, so we cannot tell the quality is particularly good.

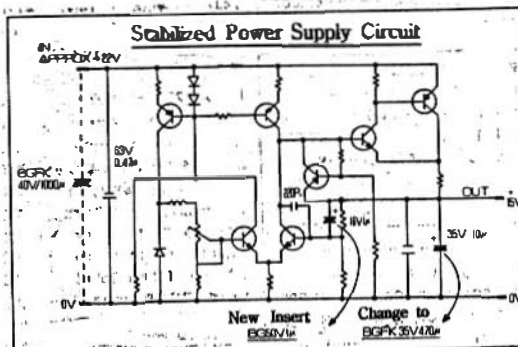
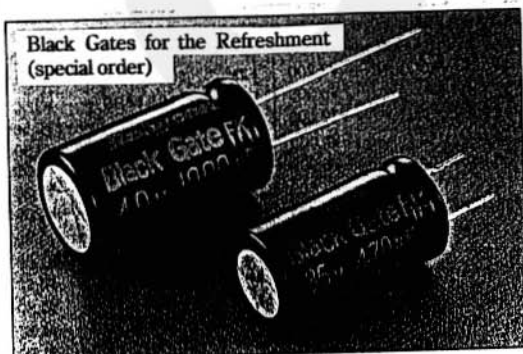
In 1984, we had the golden opportunity which making the above problem came to a conclusion. That was, replacing all electrolytic capacitors inside of a SX-74 which was a well-known cutting amplifier made by GEORG NEUMANN GMBH in German, with Black Gates. The figure below shows a power supply of the driving amplifier, and its output bypass capacitor was very small(10 μ F) at capacitance. With the manufacture's consent, we probed into the amplifier for the first time which had been standard and reference. Because of its space restriction, we used BG-FK 35V 470 μ F which was about 50 times as large as an ordinary cap which had been located there. We didn't change input side. In order to compare the difference, a record was cut each before and after the replacement respectively, and after that we had a listening test. "Tannhäuser" had been chosen as a master tape.

The result was dramatic. The record which was cut after the replacement, means the one made by the amplifier with BG-FK, was superior to the other one on every aspects, especially the sound staging were overwhelming. It was so great that could never get from a CD player. The fact impressed even professionals, and we heard someone muttered he wished if he had known BG 10 years before. The idea which bypass capacitors were unnecessary for a stabilized power supply proved incorrect at all by Black Gate.

A number of analog records have decreased sharply and CDs have become more and more widespread for more than 10 years. Our company has announced repeatedly in the Technical Reports*, a stabilized power supply using BG-FK, BG-N is overwhelmingly superior to the one with other electrolytic capacitors by wide margins, and as you are aware, even a cheap CD player will be excellent in quality with them.

In conclusion, stabilized power supply with Black Gate having enough capacity at both input and output sides is an ideal power supply at any of characteristics such as S/N, distortion or phase, no matter it is used for whether analog or digital. We highly recommend you to choose these Black Gates.

*=Please refer to Technical Report No.24



The Essence condensed in merely $50\mu\text{m}$ of Electrolytic Capacitor Caps must take off a heavy jacket that blocks the transferring information!

A dielectric on anode electrode in an electrolytic capacitor is an extremely thin aluminium dioxide foil of about 10\AA thick. Making cathode electrode on this side directly without noise is impossible because dioxide aluminium is insulating material, so it has to be created with capacitor paper of $50\mu\text{m}$ thick that is impregnated with electrolyte. You may think $50\mu\text{m}$ is very thin, but it is 30 thousands times thicker than dielectric.

Moreover, the pass road is ion transfer so signals go sluggishly: It is like scratching one's back over a thick jacket. Therefore information signals lose their majority while they transfer from anode to cathode electrodes, and the phase and power decline. People should have known such an important fact earlier!

For example, an audio signal as information source which decides tone quality of an amplifier has countless frequency spectrum and low level component that reaches as well as -140db . Both of them drop out and deteriorate again and again and become poor sound in separator between two electrodes whenever the signals go through a capacitor. However, no instruments can measure such transferring condition in real time except human ears. In the case of imaging information, human eyes are only ones to act this role.

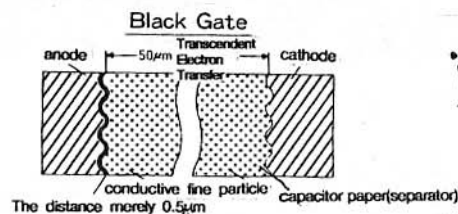
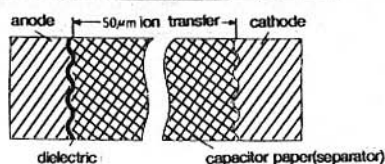
Black Gate has great ability that changes inside transferring system from ion transfer to the Transcendent Electron Transfer. Signals are released from ion and speed up so tremendously that the thickness of $50\mu\text{m}$ of capacitor paper(separator) becomes substantially zero, so the distance between dielectric and cathode is shortened by $1/100$: it becomes merely $0.5\mu\text{m}$ in BG.

Such complete change contributes significantly to the improvement not only on distortion value and phase characteristic, but on the amount of information: it betters more than 1000 times larger than that of an ordinary capacitor. A number of old amplifiers, televisions and low cost CD players all over the world have revived one after another by replacing Black Gates and they surpass brand new sets in tone and imaging quality because lost information comes back by Black Gate. Therefore we can say it is totally wrong to use a distortion meter or a cross modulation meter to judge tone quality.

Although the dielectric in Black Gate is located extremely close to cathode electrode, there was still a distance of 100 times wider than the thickness of dielectric. If this problem would be solved, the performance would improve unlimitedly.

Therefore, Jelmax made every effort and resolved the problem. This is how Black Gate N series, the first completely non-polarized capacitor in the world is born. At last, we have created the best capacitor ever.

Ordinary Electrolytic Capacitor



The Idling Process of Black Gate

It is completely different from Aging, NOT confuse them. –Important item–

About the idling, we have explained it in our catalog and reports in magazines, however, some BG users are still confusing it with aging. Now, we are introducing the “idling” once again.

What is the “Idling”?

It is a cathode activation process which only Black Gate can do. The capacitor paper so far is a mere separator of an electrode.

We decided to make use of the capacitor paper as a path of an electron transfer on a cathode side for the first time in the world. Everyone had thought it was untouchable. However, we achieved a remarkable result since this is the essence of Black Gate. In short, the idling is, making a patent structure separator to be completed as the path of an electron transfer. On the other hand, the “aging” is the process of repairing the several cracks on the oxide film coating over an anode foil when just before the capacitor is completed in factories. This repairing means to put DC voltage to an anode, therefore you don't have to re-aging at all for high quality products, such as the ones using Black Gates.

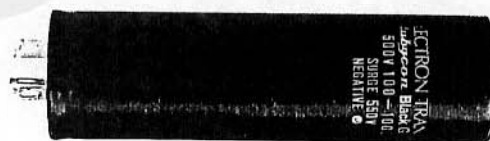
As described above, idling and aging are totally different in their technology and purpose. We'd like you to not confuse them.

How to Idling?

Black Gate is the only one that can activate inside of itself. How to do is, let it work in audio sets after fixing, then put the DC voltage and signal current which is occurred in the circuit at the same time (you'll put signals only if there's no DC in the circuit like SP network), the cathode of Black Gate starts to activate gradually from the high frequency band, then it spreads out the middle to the low band.

The idling operation grade varies according to the size of the signal level or frequencies, but it will be completed after 30 hours. This condition will last almost permanently unless you change the operation environment. It took 0.5 hour to complete this in case of large current such as a SP network, however, it took more than 1 month where the very weak signals running in a pre or head amplifier. Therefore, you can shorten much time if you do the Forcible Idling Process at first. How to do is, putting the more level of signals for two or three times than usual, then turning the level back to the regular one after 3 hours. This might be a good idea, but we recommend the normal idling process.

Come to think of it, whiskey takes 25 years, brandy and wine will take even 100 years to become mellow, so their lovers are waiting for it calmly, with the passage of time. If you are going to enjoy the masterpieces of music written one or two century ago as a real sound, you can wait for just a 1 month, aren't you? If not, you may not suited for an audiophile!



Question: when the Leakage Current (L.C.) is small, is the noise also small?

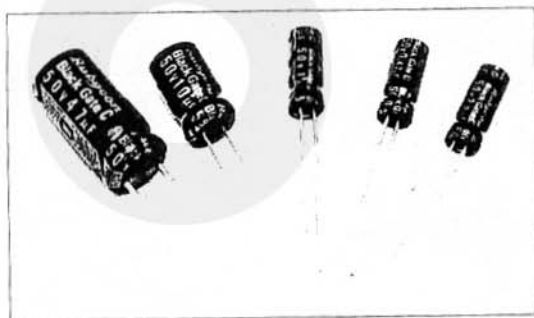
You can make superior sets if you understand the all functions of the capacitor very well.

If there's an question as above, 70% and 50% of engineers concerned each the set makers and the capacitor makers will answer "yes", however, the right answer is "NO". The capacitor which has the smallest L.C. value is a dry-type electrolytic capacitor, such as a tantalum, aluminium solid, organic semiconductor and conductive plastic. Moreover, they are also good at impedance and E.S.R. characteristics, therefore we tend to think their noise are probably small. However, the dry-type one of which conductor contacts a dielectric directly as an electrode always cannot help radiating a contact noise. For example, a tantalum generates about -80db of distortion noise which is the worst level in the all kinds of capacitors, therefore it isn't suitable for high-quality audio sets. Thus, such large noise level is sometimes larger than the level of the signals. Many people will say, "I didn't know that, so why such bad caps have been produced still?" The reason is, there is no any official reference for noise level of capacitors at present. This is the result of neglect and indifference of the capacitor industry.

Recently, one maker announced the above type of capacitor as a dream wonderful capacitor, or one major company started using aluminium solid capacitors for CD players entirely which dealing with the low level -120db of signals. The result was miserable, we guess their designers didn't notice why the tone quality was so bad. The present level of knowledge about capacitors is mere like that.

In comparison with the dry-type, an ordinary electrolytic capacitor(wet-type) is certain to have larger Leakage Current. This current is generated when the anode oxide film is refreshed in the electrolyte, it's unrelated to the signals. However, pure direct current and noise are never happened. Therefore, the total noise level is 1/100 less than the dry one even though wet one radiates ion distortion noise about -120db when the signals run inside.

However, the large leakage current is not good because it effects an input circuit of high-impedance, therefore we designed the L.C. of Black Gate C, for coupling capacitor, make smaller than one of Tantalum. On top of that, even the distortion noise is smaller, 1/1000(-160db), and there is no shock noise. The cost is reasonable, it's the best coupling capacitor in the world.



The birth of Black Gate–Nonpolarized 100V/330 μ F, high voltage and high quality

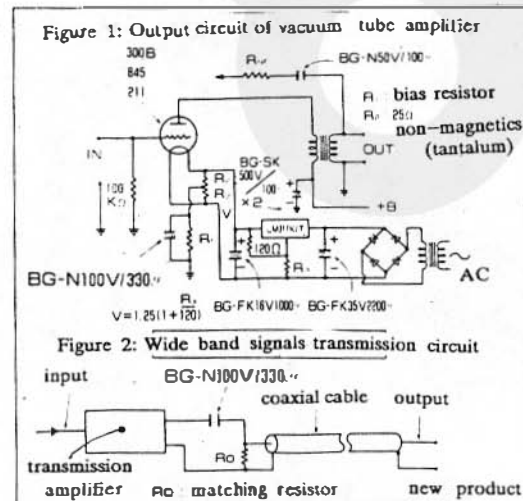
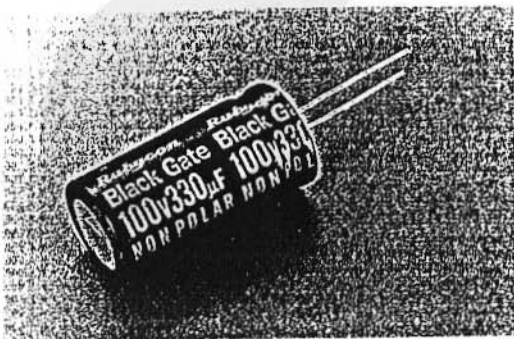
A wonderful news for vacuum tube audio fans and for the transmission of A.V. & data signals

We got a question from an audiophile who use a 300B vacuum tube amplifier as his favorite. He said he was satisfied with this which capacitors had been replaced with Black Gates, because he got a real quality. Even so, he wondered if he could find any room for improvement. Its circuit was a conventional fixed bias system, therefore we advised him to remove a power source choke coil in order to change to a self-bias system. Then recommended using BG–FK 100V 100 μ F because the bias voltage was high. The result was good. Suddenly, I remembered the trial manufacture version of BG–N 100V 330 μ F, so I asked him to test this. A few days later, he gave me a reply in an excited voice that he was amazed because he never heard such wonderful sound. Why the tone quality was so improved?

BG–N is the best bypass capacitor, it's like a film capacitor of such large voltage and capacity that is impossible to manufacture. Now, you'll understand. This is the super technology that only Black Gate can realize, there's no other bypass capacitor makes such a high bias tube can operate perfectly at present. We put on sale the BG–N at our customers' strong requests. The self-bias system of a vacuum tube is far superior to the fixed bias one about important factors, the tone quality and S/N ratio. We'd like to recommend the BG–N for everyone who are looking for the best tone quality.

Would you please look at the figure 1. The circuit is a DC flashing, and you don't need a hum balancer, but you have to use a fixed-resistance in order to protect its filament. You need to make each tubes connect to the different BG–Ns' when you make a push-pull circuit. BG–N 100V 330 μ F has many uses. For example, it's possible to transfer in Hi-Fi about 0 to 10 MHz signals of an audio, a video and a digital data to a coaxial cable directly, by non-loaded. You'll get the best results for the characteristics of frequency, distortion and transmission phase. We are sure that it'll contribute greatly to the transmission for the inside and the outside of studios, and the high-speed data communication.

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We can call CAPACITOR “ The Fundamental Components”

While semiconductor is a leading part of electronics.

The quality of every electrical equipments ruled by these fundamentals: C,R,L

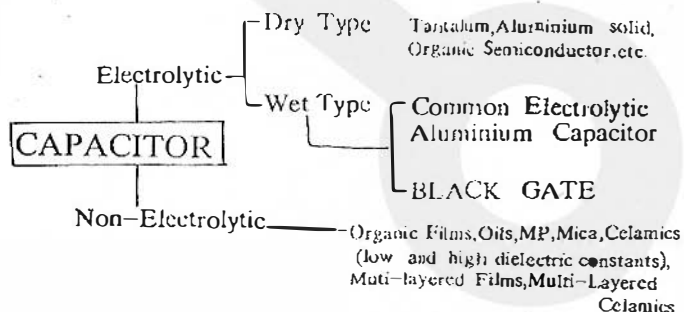
[Non-linear distortion]

In fact, some types of capacitors and resistors generate terrible non-linear distortion. The picture is “ CLT-1” ,a distortion measuring instrument of Denmark made:it's unique in the world. Originally,the purpose of it is controlling quality of components. In 1977,it was gotten much attention because of the monograph by Mr.Kiyoshi Nishi, audio components scholar. Therefore, audio-makers introduced it first, then capacitor and resistor makers followed that, and it is continuing today. It shows how excellent the monograph is. The point of it is,“ Tone quality is decided not by active components or the situations of the movements of vacuum tubes or transistors, but by the non-linear distortion generated by capacitors, resistors, and coils such are called passive components.” And he corroborated the first time in the world there was a extremely close correlation between distortion of various capacitors or resistors and the tone quality of audio components by using CLT-1. As well,this monograph is a trigger for invention of Black Gate. 80% of all output of CLT-1 are exported to Japan: an advanced nation of distortion analysis. But the U.S.and Europe are in the cradle years yet. Then, what is the CLT-1? It has a 10KHz oscillator of an ultra low distortion and a measuring part. Applies an electric current or voltage to measured instruments,then measures occurred third harmonic distortion(non-linear distortion)for input. It can supply maximum 1W for output (see figure 1). The reason of 10KHz measuring frequency is, (1)the oscillatory coil with ultra low distortion is coreless,so if its frequency is lower,the coil has to be so huge that difficult to realize, so the highest frequency in audio band is selected. (2)It's impossible to measure the level -160db exactly because it has to be influenced by electromagnetic induction from power supplies in a room. So it's quite nonsense to measure components by distortion meter for audio amplifier. The resistor trade has established the method of measuring distortion by CLT-1 eight years ago,so users can specify the level of distortion and order resistors for uses. It proves that the monograph of Mr.Nishi is right, however, capacitor trade hasn't put it into operation yet. Capacitor makers must have fear if it's enforced, they couldn't have manage their company because their products are too bad to qualify the standard. Moreover,there are many mistaken articles in magazines recently written by fellows who are stupid,ignorant about distortion and they are damaging readers. So we are going to report the fact about the non-linear distortion of capacitors and coils.

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“ Capacitor” has a lot kinds of variety(see the figure 2).First,there's a great difference of distortion according to their constructions of kinds. Next,even if the kinds are the same, distortions are much different with the materials of capacitors or manufacturing technologies. However, distortion is unrelated to impedance inside. Figure 3 shows almost the middle level of the distortions of each kinds.

Figure:2 Kinds of Capacitors



[The standard of distortion]

The lower the distortion is, the better the capacitor becomes. Moreover, you should choose at least under -120db for the standard. The distortion noise has to be under 30 to 40db than the lowest level of working signals so S/N will be preserved that machinery sets will work satisfactory. If possible, we recommend you to choose -140 to -180db (it's easy to get such distortion level in all kinds of resistors). If you assemble the sets with components of only such distortion level, it's obvious that not only audio sets and videos, but also all analog and digital machinery instruments will become extremely high grade. We are introducing them on each Jelmax technical report. The most important thing is the quality of sets are ruled by a dictator, therefore they get damaged actually if there's only one components that generate distortion badly.

[The characteristics of each kinds of capacitors]

Dry type of electrolytic capacitor: It has a large contact distortion noise over standard, and it's difficult to be improved. Wet type of electrolytic capacitor: most popular and common aluminum cap. and it is effected from ionic distortion. Ionic distortion, the troublesome, is ranged from low frequency to GHz, and produces non-linear distortion on both frequencies and phases besides the third harmonic distortion. The cause is the gas produced inside following an ionic current that cannot be eliminated yet. Therefore a wet type is still incomplete that has a lot of difficult problems. Black Gate is hardly influenced by it because of an electron transfer inside. Non-electrolytic capacitor: the most part of the distortion of organic films and oils are the difference of the characteristic of dielectric itself. Ceramic capacitors of high dielectric constant has a great distortion by electrostrictive characteristics and it's difficult to be improved. A multi-layered type even produces the distortion of electrodes oscillation. It's the same as multi-layered film cap. Coil: There are great differences of distortion from magnetostrictive characteristics of magnetic cores.

[The coming of components revolution that regarding distortion as important]

Just one piece of capacitor or resistor has a enormous difference of distortion about 60 to 80db(1,000 to 10,000 times), so if you mischoose components for use, the total difference of the distortion in a circuit will be exactly astronomical figures. Therefore the performance of the sets won't be improved just changing active components or technics of circuits for countermeasures. after all, the distortion of components rules performance of the set. For the era of high electronics broken in soon, the components revolution regarding distortion as important will spread to all over the world from Japan. Universities, laboratories and manufactures have to think better of "the fundamentals" passive components. By the way, the cost of CLT-1 is fairly cheaper than Mercedes-Benz! There's one more big gate for capacitors, but we will introduce it some time.

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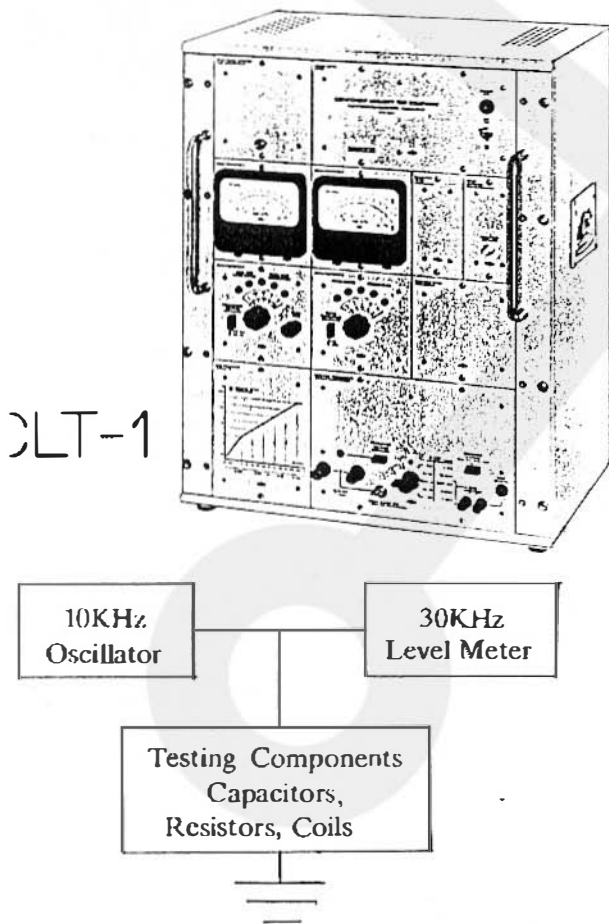
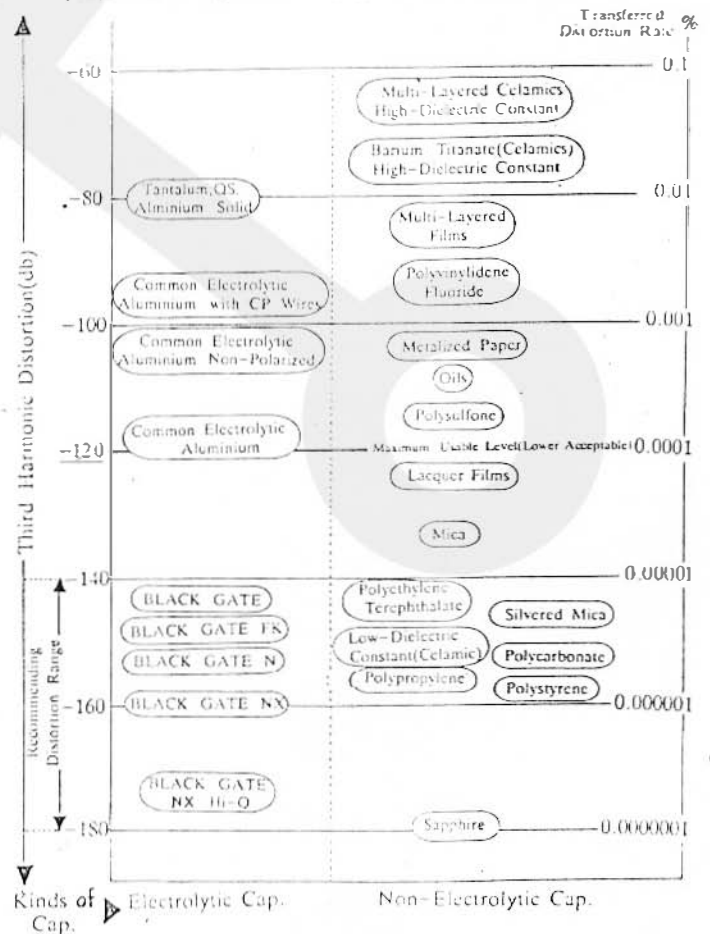


Figure 1: The Structure of CLT-1

Figure:3

Harmonic Distortion of Each Kinds of Capacitors



What is E.S.R. (Equivalent Series Resistance) of capacitors ?

[Impedance and E.S.R. characteristics]

Figure 1 shows an impedance curve which is a kind of resonance curve. The reason why this is a V-curve is the L-component of the capacitor. The resonance frequency f_0 is a center of this curve. Zone Z_L is a true work of the capacitor and zone Z_R is a false work of the capacitor. When the frequency of the signal is within Z_L , the operation of the circuit is stable. However, it is unstable within Z_R . Therefore, the operating frequency is closely related with the capacity of by-passed capacitor. The area surrounded by dotted lines is loss. The more Z_0 is close to f_0 , the more loss is decreased. If Z_0 is equivalent to f_0 , that is an ideal capacitor. As shown in figure 2, the value including the impedance, $X_C + R_s$ (E.S.R.), is the impedance including loss. Every capacitor works with R_s .

$$E.S.R.: R_s = \text{Impedance} \times \tan \delta = 1/Q \cdot \cdot \cdot (1)$$

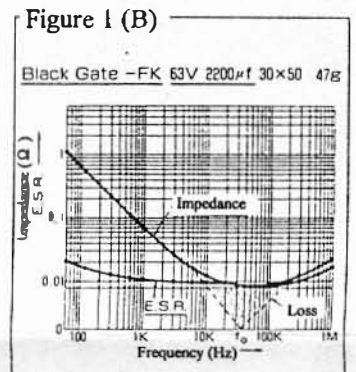
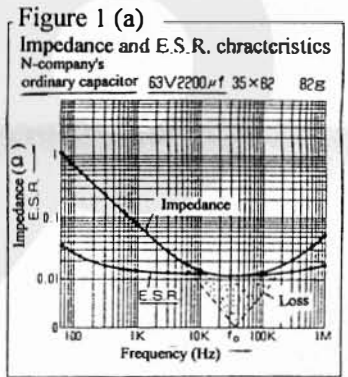
As you can find from this formula, the contents of E.S.R. are not only pure resistance component but also many kinds of loss factors. This is very troublesome as described later.

[What affects E.S.R. ?]

(a) Electrode (material, shape, structure), (b) dielectric (material, structure), (c) lead wire (material, shape, connection structure) and (d) manufacturing technology (process, treatment, enclosing method) are basically related to E.S.R., further, in the case of wet type, (e) electrolyte (material) and (f) separator (material, structure) are added. If you do not select them correctly, E.S.R. becomes worse. Therefore, E.S.R. is a measure to indicate how good the function of capacitors is.

[Function of E.S.R. in the circuit]

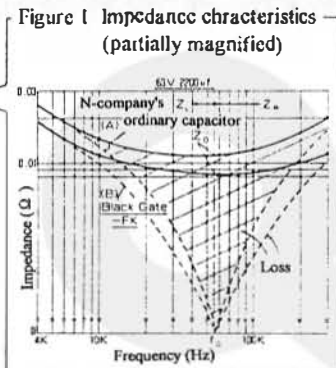
The performance of the tank circuit shown in figure 3 depends on Q which is determined by L and C. In the case of capacitor, smaller E.S.R. is better by the formula (1). This is an ability to select one signal from proximate two signals at tuning, resolution of signals in transmission circuits, an ability to dominate the volume of the signal information in audio and video systems, a capability to supplement weak signals in communication equipment. Smoothing ability of power filters which are inevitably used in the electronic devices and equipment, that is, ripple and noise rejection ability, depends on the value of E.S.R.. These abilities do not depend on the amplification element. Although Black Gate capacitors are wet type, electron transfer is used to handle the signal. As the figure 1 shows clearly, E.S.R. value is 1/2 to 1/10 the levels of ordinary capacitors. This is the reason why the high resolution is realized when Black Gate capacitors are used in audio and video systems.



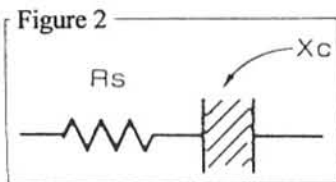
Once the distortion is completely overcome, the value of capacitors is determined by E.S.R..

[E.S.R. standard value]

E.S.R. shows the minimum value at the resonance point of capacitors. This value increases at other points. It is very difficult to

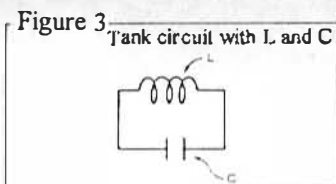


reduce this value under $3m\ \Omega$ even if that is a film capacitor which loss is small. We completed three kinds of capacitors, STLX, STL and TL, by improving the connection between lead wires and electrode foils. E.S.R. was improved by more than 30% compared with ordinary capacitors. E.S.R. of some our products are less than $1m\ \Omega$. E.S.R. of ordinary film capacitors, that of large electrolytic capacitors and that of small ones are usually $10\sim 50m\ \Omega$, $20\sim 100m\ \Omega$ and $50\sim 1000m\ \Omega$ respectively. The limit of E.S.R. value is $5m\ \Omega$ in the case of electrolytic capacitor. In U.S.A., a single function E.S.R. meter shown in the below picture is adopted as a standard measurement tool. E.S.R. value at $100kHz$ can be read directly and the contact resistance of electric conductors and switches can be measured.

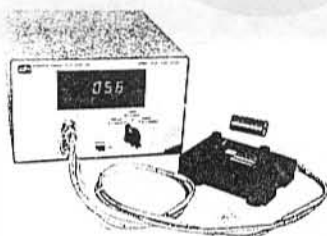


[Changeable impedance, changeable E.S.R. characteristics]

The above words are not popular. However, these are inevitable subjects to discuss the wet type electrolytic capacitor. There is a phenomenon which always occurs in the wet type electrolytic capacitor because of the ionic transfer. When current runs in a capacitor as well as a battery, gas is caused by ionization. Volume of gas is proportionate to the current and temperature. The gas is diffused as a fine mist and attached to the electrode and separator, and then it prevents the current flow and deteriorates the impedance and E.S.R. value. Impedance and E.S.R. characteristics which are officially published are usually initial static characteristics. These



values will be changed after capacitors are used. This issue in batteries was resolved by Leclanche in 1868, and the battery became commercially practical. However, this issue in electrolytic capacitors has not been resolved for more than 100 years. Gas is collected in a container and emitted through a seal little by little. At the same time, electrolyte is exhausted and the function (distortion, E.S.R.) is deteriorated little by little. When E.S.R. value becomes $1/2$ of the initial value, it is the end of life, short life. Engineers have to understand that the function of all sets is decreased largely with electrolyte. Black Gate capacitors are not an exception in this point. However, the influence of electrolyte is small and any deterioration in performance are not observed because of the electron transfer. We challenged this difficult issue for a long time and finally succeeded by distributing fine-grained graphite particles to a separator. This innovation was the idea behind Black Gates unprecedented in the world.



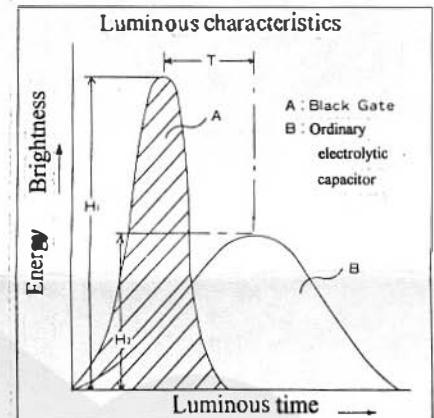
Speed/Phase and Power Transfer Efficiency of Signals

Which Pass inside Black Gate

Capacitors which could overcome two difficulties, the distortion (technical report No.50) and E.S.R.(technical report No.51a and b) are the Black Gate of all capacities and the film capacitors, that is, STLX, STL, TL, polystyrene, polypropylene, polycarbonate, polyethyleneterephthalate in the case that capacity is less than $15 \mu F$. All film capacitors can pass the third difficulty at this time. Therefore the issue is how slow the internal signal speed is in the case of the ion transfer. The figure shows the strobo luminous curve when Black Gate and an ordinary electrolytic capacitor, which capacities are the same, are discharged. Since discharge energies are the same, the area A and the area B are equal. However, the discharge curve is different. The difference (H_1-H_2) which is caused by the difference in the transfer efficiency appears and the time difference T is the difference in speed/phase. In a word, the charge and discharge time of Black Gate is very short and a peak voltage of that is very high. In music, there are many large impulse sounds from a piano, a drum, a cymbal and so on. Ordinary electrolytic capacitors can not respond to these short strong pulse signals. It can be understood that it is impossible to isolate fast continuous pulse signals without any cross talk. In color television, this delay T causes the phase distortion of synchronous detection circuit and deteriorates the visibility of colors. CD and devices and equipment for office automation use digital signals with pulses. However discussing the method without proper process of fast pulse signals puts the cart before the horse. As you see from the figure, Black Gate is the best suited for the pulse transfer.

Therefore, an ordinary CD player can be freshened to the best sound one with Black Gate. With electric components including capacitors which passed these three gates, resistors and coils, the best electronic devices and equipment can be developed.

We challenged difficult issues for a long time and finally succeeded by distributing fine-grained graphite particles to a separator. This innovation was the idea behind Black Gates unprecedented in the world.



Every Amplifier First Reproduces Perfect Sound with Black Gate

Distortion noise generated from passive components such as C.R.L. and wiring material severely affects all electronic equipment

Several years ago, we received news from an amateur audio fan built his **handmade** tube amplifier to exhibit in Japanese Audio Fair, won the first prize in a blind test of sound quality by **defeating** the **other famous amplifiers** such as M.R. Co., C.P. Co. and A.P. Co. created. This is not because the circuits technology of these well known amplifiers were inferior to that of the amateur made, but they chose wrong components for a capacitor: The performance differed whether to use Black Gate or not.

We quite naturally understand this result because we know many progressive audiophiles all over Japan, who had been dissatisfied with the sound of their amplifiers, have started to use Black Gate and are amazed how wonderful the sound quality of their amplifiers become. Now they completely stop buying other luxury amplifiers or components.

We are not sure if the amateur had known this fact and used Black Gate, but every customer who took a check service by Jelmax for their amplifiers and replaced all of their ordinary capacitors with Black Gates has achieved super sound regardless of their kinds.

Why? This is because the performance of all analog and digital electronic equipment is **damaged** by **distortion noise** generated from passive components in a circuit. Resistor and coil manufacturers noticed this **important** basic fact and have improved their products. Capacitor manufacturers besides Jelmax, however, have not yet able to deal with it because of its difficulty, so ordinary electrolytic capacitors produce incomparably much noise than other passive components. Amplifiers with such capacitors have poor sound quality, and at last they **tremendously improves** by replacing with Black Gate!

For more detailed scientific basis, please read The Jelmax Technical Report No. 50, 51 and 52. They will resolve problems of your amplifier.



UNCONVENTIONAL HIGH-PERFORMANCE
ELECTROLYTIC CAPACITOR

Black Gate



Why the great difference between BG-N, BG-AC(Non-polarized) and Ordinary Electrolytic caps(Non-polarized)?

The equal performance as film capacitors of $15\mu\text{F}$ or more is realized for the first time in the world. —structural issue—



Originally, capacitors should be **non-polarized**. However, the performance of an ordinary non-polarized electrolytic capacitors is worst, therefore some **necessary caps** are omitted or polarized electrolytic caps are substituted for non-polarized ones in sets. There are so many audio professionals and amateurs don't study hard so don't notice such basic mistake. It's sad!

As the Technical Report No.50, the distortion value of non-polarized electrolytic caps estimates about -80db , which is the worst level in electrolytic caps. On the other hand, **Black Gate N** is the best about distortion that is -160db or below, the difference is 80db (10 thousands times!) between them, and the total difference inside of a set estimates astronomical figures. We'd like to explain the essential difference of structure between these two capacitors for the sake of a lot of users' requests.

Figure 1 is an ordinary non-polarized electrolytic capacitor. The structure is making two aluminium foils having oxide films each as normally being anode face to face with each other.

When alternating current S runs between the electrodes X_1 and X_2 , X_1 becomes anode and X_2 becomes cathode temporarily between a solid line a-b in Figure 4, and current runs from X_1 to X_2 , ions flow as dotted line i_1 . When signals reaches b, current direction becomes reverse, then X_2 becomes anode and X_1 becomes cathode at this time, then i_2 moves to opposite direction, cathode is always changed from one side to another between $50\mu\text{m}$ so it is unstable, moreover the moving speed is far slower than signals, it cannot follow high frequency or pulse signals, it lose the function as a capacitor. Moreover, distortion added makes it worst. (Also this type cannot be used under DC operated.)

Therefore, a countermeasure as Figure 2 was thought, connect two polarized electrolytic capacitors in reverse series. Thus the potential of cathode is fixed in central and the above action is decreased, therefore some of set makers use this way. However, a path of ion transfer becomes double in length and also distortion generates double in quantity, E.S.R.value becomes double by seeing from the both ends, these performance is awfully bad as a capacitor.

On the other hand, the structure of BG-N is making two anodes face to face as Figure 3. It looks like Figure 1, however, the inside is completely different. The whole part of a separator inside is the Transcendence Electron Transfer, that is, electrons leaving from ions, so they aren't influenced by DC potential and respond to AC signals only. Then they move at super high speed, frequency characteristics is improved by a hundred thousand times. It's special merit! The distortion is decreased enormously and there is no phase delay at all, we can say it's epoch-making. Moreover, it's symmetrical structure, so there's no distortion in cathode side, although even polarized Black Gate has a little distortion. In conclusion, the quality of BG-N is superior to high class film capacitors, it means BG-N has the highest performance in all the capacitors of $15\mu\text{F}$ and more. If you use the performance on suitable circuits, you will be realized unimaginable and overwhelming new effects that doesn't exist before.

We will introduce you the examples of circuits using BG-Ns without rivals. Wait for it!

Figure 1

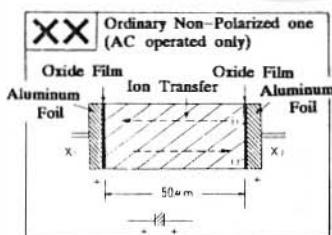


Figure 2

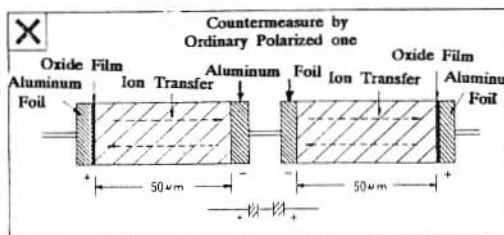


Figure 3

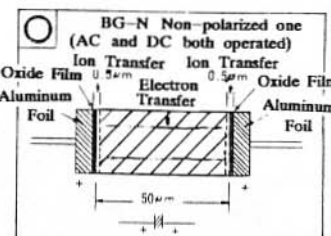
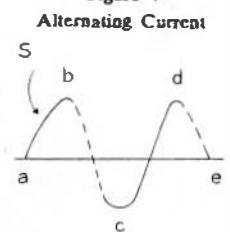


Figure 4



BG-N will promise large improvement on irregular circuit technology.

If you have a problem, DO THIS as soon as possible!

You will get a wonderful and unbelievable effect! ---practical issue---

In the last our Technical Report No.54, we introduced the structure of BG-N. As the Report, there was a large distortion difference 80db*1 between BG-N and ordinary electrolytic caps, the value is unknown and sticking for anyone. It's so great that an irregular circuit gets back to regular one, the effect is dramatic. Now, we will introduce some important examples including ones we've already reported before.

1.NF Circuit [Figure 1] In case of an amplifier doesn't amplify DC, it means an ordinary amplifier, you must not put DC for NF loop from output to input*2, or large distortion will be generated in low range. However, many people don't know such important thing, and most of existing amplifiers are failed.

At last, it will be born again as a perfect Hi-Fi amplifier for the first time when the Black Gate N is replaced in it. Now, It's time to change the old-fashioned way, audio makers!

2.A-D, D-A Converter [Figure 2] The information of 16bit A-D converter drops to just 10bit in low level because of the S/N ratio of power supply. But ignorance writers introduce wrong cases even in a A-D special issue in magazines. We can't imagine how these articles influence badly on readers. If the writers know the fact, the distortion difference between ordinary electrolytic capacitors and BG-N or styrene capacitors, they can't introduce such articles. It's also the same thing for a D-A converter*3, so we'd like to request CD makers to practice our improvements as Figure 2 immediately.

3.OP-Amplifier input and output*4 [Figure 3/1]-This is an equalizer amplifier made by audio specialty manufacture S Co. There are three mistakes even in the small circuit and there are more in whole the amplifier. We can't say it's Hi-Fi at all, this is like cheating technology!

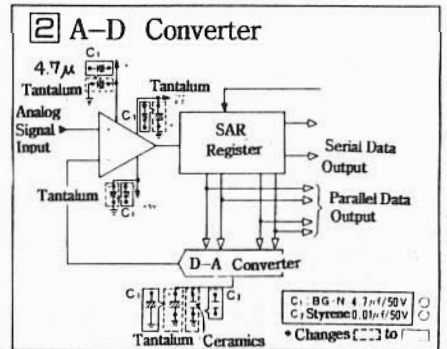
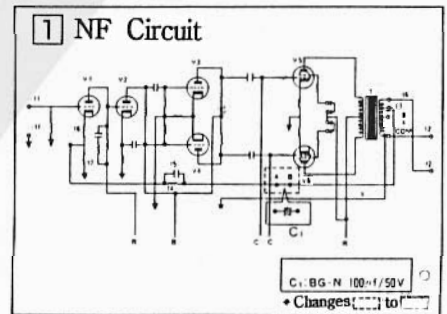
[Figure 3/2]-It's a CD output circuit made by a large manufacture. The tone quality becomes much worse, and some dishonest makers take advantage of it and sell special output transformer to users. It's surprising!

4.Bias Shunt Circuit There are several problems such as bias circuit, switching distortion, phase distortion and power(S/N), all of them concentrated on a transistor amplifier, so it cannot work enough even as A-class operation.

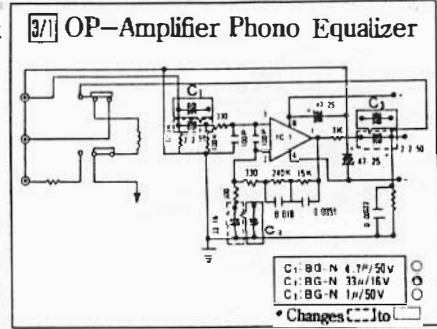
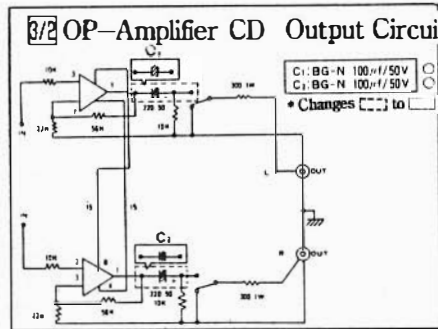
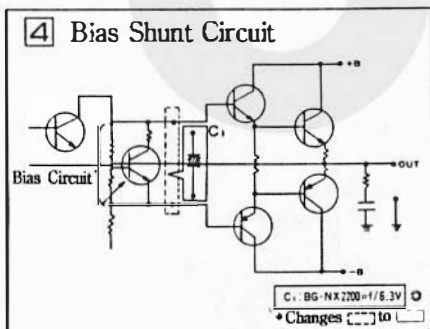
There was no countermeasures on this before, however, now, there's the only way to solve the problem—the bias shunt by BG-NX. The performance of BG-NX*5 2200μF, having super-low E.S.R., makes any transistor amplifier best.

There are uncountable ways to practice circuits by Black Gate NX besides above, and we will introduce new ones on another occasion.

	Switching Distortion	Phase Distortion	Power(S/N)
Ordinary AB Class	×	×	△
A Class	○	×	×
AB Class with BG-NX	⊙	⊙	○



- *1-Refer our Jelmax Technical Report No.50
- *2-No.9, *3-No.33,
- *4-No.26, *5-No.11



The Black Gate Series Capacitor - Easy Installation using the "Capacitor Graft

Even a beginner can easily install the Black Gate series capacitor quickly without making a mistake.

After reading the monthly "Jalmax Technical Report", even you might attempt putting the Black Gate series capacitor in your audio set. However, after opening your audioset and peeking inside, you might hesitate or shrink from the thought for fear of destroying your set. However, there is nothing particularly difficult about installing it when using the "Capacitor Graft Method." A very safe and easy method for installation. This method has been actually used as a prototype, displaying great reliability.

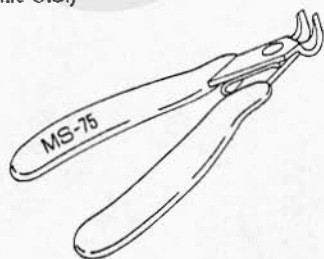
- **Tools needed:** A pair of nippers, soldering iron, scissors used for "Bonsai" plants, and ordinary tweezers. The scissors need to have a sharp point and be able to cut wire. These can be found at your local gardening shop.
- **Capacity and voltage standards to be exchanged:** A capacity smaller than 100 μF is used as is. A capacity greater than 100 mf can be reduced, for example, from 470 \rightarrow 220 μf or 4700 μf \rightarrow 1000 μf . Voltages can be selected as is or to a slightly larger one, for example, 35V \rightarrow 50V or 63 \rightarrow 100V.
- **Method of carrying out the exchange:** Turn off the powersupply. Cut the body, leaving its lead wires with a sufficient length extending from your from your PC card in a very small size. Then the Black Gate can be installed using the Capacitor Graft Method. The body fixed to PC card is exchanged in the way shown in the drawing. The work is carried out after confirming each step has been successfully completed, and after exchanging 10 elements and checking them, the power can turned on and only after this has been finished can the next step be started.

An electrolytic capacitor having a larger diameter will have to be gradually cut down to size using the nippers and scissors. After some experience, this work can be finished for a CD player within about 30 minutes. One very excited young office lady tried and succeeded in installing it. If you are not satisfied with the present audio performance you can get super high quality sounds by installing the Black Gate series capacitor. It provides supreme quality sounds.



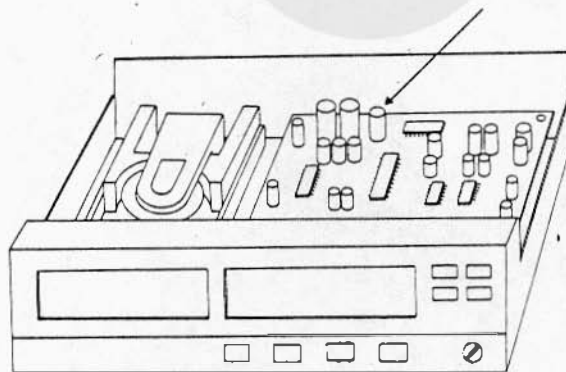
Nippers most convenient for installation

The tips should be at a right angle to the grip. This type is the most convenient for cutting the electrolytic capacitor in a hard-to-get at space. (Made in the U.S.)

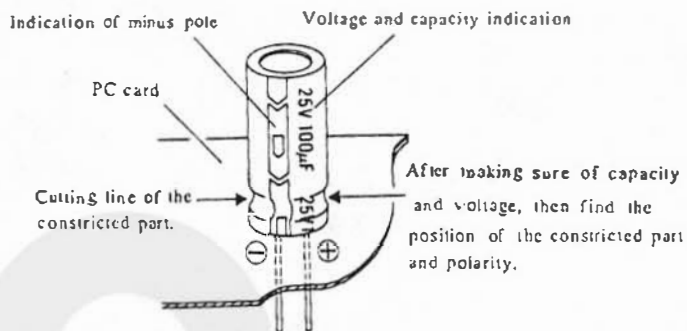


(1) Exchanging direction

This is the "Capacitor Graft Method" in which electrolytic capacitor (the arrow) can be exchanged directly from the top with only the upper cover needing to be removed.

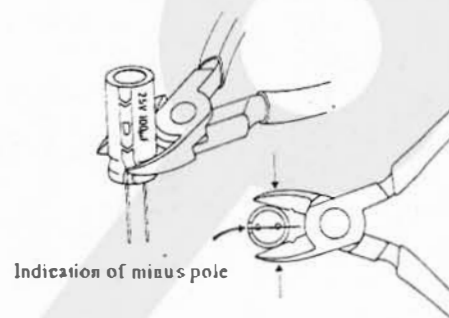


(2) Things to Note

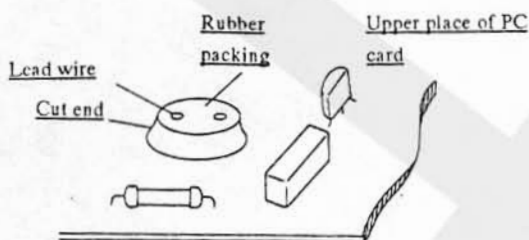


(3) Cutting work

Indication of minus pole
The tips of the nippers (Cutting type pliers) need to be held in the direction of the arrows so that the lead wires can be held properly, with the body being cut in the position of the constricted part.

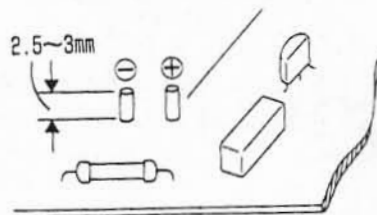


(4) Base of the body after being cut



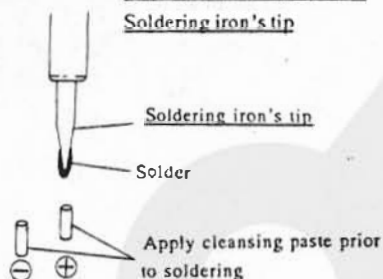
(5) Exposure of lead wires

All things shall be removed except the lead wires.



(6) Soldering the base of the lead wires

With a hot soldering iron and solder, solder the lead wires. Soldering iron's tip

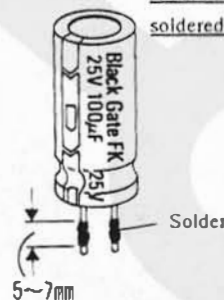


(7) Points of soldering When soldering quickly move the soldering iron around the lead wire holding the center of lead wire, and solder the surface.



(8) Treatment of Black Gate lead wires

The Black Gate lead wires to be exchanged should be cut to a length of 5 to 7 mm and soldered to the points.



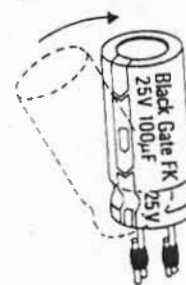
(9) Grafting
(Cap Graft)

With the Black Gate lead wire bent to some degree after confirming the proper polarity, quickly solder both the lead wires with the soldering iron along the lead wires embedded on the PC card.



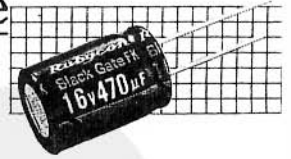
(10) Correcting and finishing work

After finishing the soldering, the Black Gate should be bent back to its original position. This concludes the installation to Black Gates.



How to bring out the full ability of Black Gate

Capacitor lead wires connected to a power supply and an earth line has to be as thick as possible.



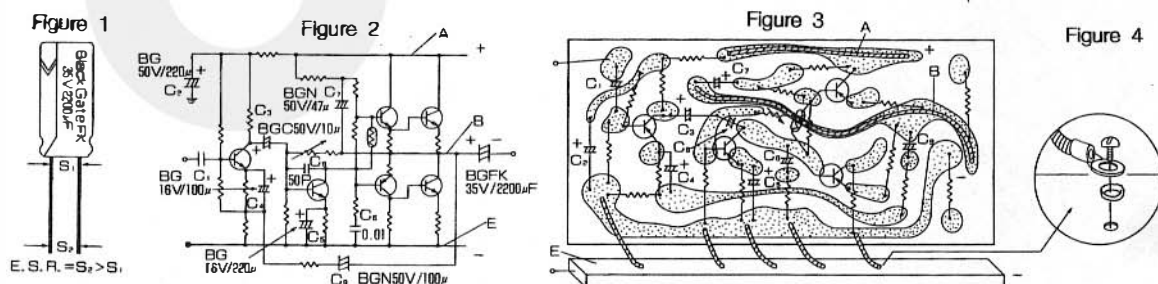
Information signals go thorough Black Gate are incomparably faster than these of ordinary electrolytic capacitors because of the inside Transcendent Electron Transfer system. Its peak value becomes very bigger*¹, and the sound quality is close to that of live performance. We are going to explain how to completely bring out the great performance of Black Gate through improving on a circuit.

A lead wire of a capacitor shows the best performance at its root(S₁), but the further from the root, the worse the E.S.R. becomes. (S₂——See Figure 1). When a capacitor is mounted on a copper foil pattern, therefore, its performance more and more declines as being apart from a mounting point of the capacitor leads.*²

For significant improvement, reinforcing each A and B part on a power supply and output lines with activated litz wires*³ along the pattern (See figure 2 and 3). The thickness of an earth wire is also very important because that decides the basical electric potential. As making an earth wire thicker such as 1.0, 1.5 to 2.0mmφ, the performance more and more drastically improves beyond expectation. Then replacing it by a copper square stick of the thickness of 3mm×10mm as maximum, Black Gate finally performs to the full, and you will first experience the ultimate sound filled with an absolute dynamic range, sound staging and three-dimensional reality.

This result shows that Black Gate will never demonstrate the full ability with a very thin copper foil pattern which is regularly used in an ordinary amplifier, and the wiring has to be improved first and foremost to reproduce real sound.

Black Gate have changed the concept of a wiring pattern from merely a part of safety current to a system needs unimaginable thick wire in order to deal with a large peak range. For using a copper square stick, place it besides a basic board, and screw down several near earth points on the pattern of the board to the stick with thicker lead wires (See figure 4). You will obtain the same result as using thicker earth wires without changing an existing wiring patten. Please try Black Gate to complete an ultimate amplifier.



*1: Refer to Jelmax Technical Report No.52

*2:

*3: Jelmax former inventive product: kind of twisted wires

Vibrating Influence on Capacitors

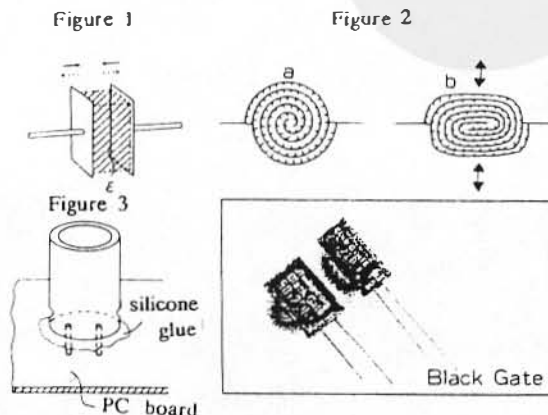
Influence changes according to kinds of capacitors –self vibration issue–

When AC current running in two electrodes face to face, electrostatic force occurs then the electrodes vibrate in response to signals, also capacitance is changed therefore harmonics generate. When the ratio of inside dielectric ϵ at the time is high, the dielectric itself stretch and shrink more, and a lot of harmonics generate.

Generally, capacitors having flat electrodes such as ceramic, multi-layered ceramic capacitors and mica generate more of distortion than capacitors of winding type electrodes. We can understand it by a distortion measuring instrument CLT-1. In case of the winding type, when the electrode is wound into the same distance from the center as a cylindrical type such as the diagram (a) in figure 2, electrostatic force should be cancelled each other, as a matter of fact, it slightly vibrates and generates distortion in spite of the ideal theory. The flat type (b) has a lot of flat portion parts, so it is influenced more. However, the flat type (b) is widely used because it's easy to handle. there are a lot of types of containers ranging from merely dipping structure type to high class type which is in a case and pour resin between the space to become hard.

In case of STLX, a film capacitor produced by our company, first we put the whole unit into the first container for preventing vibration, E.S.R. and ununiformed charging, moreover, we cover it with a polycarbonate case, it is a double structure. It shows the highest performance. On the other hand, most of electrolytic capacitors are the structure (a). Essentially it is an cylindrical type, there is a separator between two electrodes. Inside of it there filled with an electrolyte which has large viscosity, so vibration is dumped, therefore you don't have to concern about the self vibration of small-signals. However, the vibration value is not exact "zero", so more the signal level becomes larger, electrodes vibrate, and they effect badly to others. Therefore it is desirable to hold it on fixed thing (PC board, chassis, etc.) which is as quiet as possible, with dumping materials.

The "fixed thing" has an very important meaning in the next Technical Report about an outside vibration, please remember the word.



www.partsconnexion.com

Outside Vibration must be Forbidden for Electrolytic Caps.

It makes Basic Performance Worse altogether. -outside vibration issue-

We explained the influence due to the electric force of a capacitor itself in the last Technical Report No.61. To tell the truth, capacitors are influenced more by the outside vibration.

This vibration is different from the actions of pull or repulsion of electrodes each other, it vibrates in the same direction as the electrodes. The vibrating influence is fairly small on film capacitors, on the other hand, it is influenced largely on electrolytic capacitors. We think the reason why is the mechanism of generating gas due to ion transfer of electrolyte are excited by the vibration.

Therefore the basic characteristics such as distortion, E.S.R. and power transfer efficiency etc. become worse very much. The vibration is generated from electromagnetic coils such as power transformer, choke coils or output transformer etc. as well as the sets due to the sound wave generated from speakers, these are the cause.

A power transformer vibrates a whole set through a chassis, it also effects electrolytic capacitors of either large-type or small-type on a PC board. In other words, the "anti-vibrating fixed thing" we explained the last time, is impossible to exist inside of the set because it is connected to a transformer mechanically and directly, so it's sure to vibrate. This is a difficult question. In this case, it's more rational to dump a power transformer as the source of vibration, than capacitors. The best way is separating a transformer outside with lead wires extend.

This way is used to be done for avoiding a leakage of a transformer before, however, for preventing vibration becomes more serious problem nowadays.

The figure 1 is the example of the worst structure, however, this type is widely used in vacuum tube amplifiers. The figure 2 is a chassis structure that can be seen in transistor amplifiers, it's very effective if you dump it directly by setting vibration rubber pads just below the transformer. Moreover, it's the best way to lift the transformer off the main chassis with buffer materials, then fix it by solid pads. At the same time, you should set the rubber pads under other parts of the chassis.

Our company did above countermeasure for vibration on an amplifier of which capacitors replaced with Black Gates, and succeeded improving the amount of information for sound staging and the depth. The performance became very good. Now, please pay attention to CD players. Usually, they are put weights too much under ceiling or on a board inside the players, as cheap tricks. However, no manufacture does any countermeasures on a transformer as the source of vibration. We separated the power transformer of a CD player of which capacitors replaced with Black Gates to outside, it became up graded surprisingly. From the result, we can recognize vibration is especially bad for electrolytic capacitors which digital signals passing through in it.

www.partsconnexion.com

* Positions of Capacitor *



Figure 1
bad example

Power transformer vibrates a capacitor strongly.

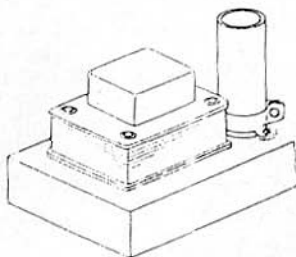
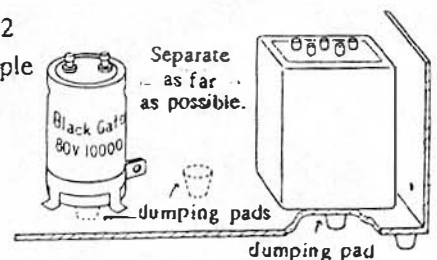


Figure 2
good example



—Important item—

The life of TV will end when ELECTROLYTE in caps dries up.

If you replace the caps in your TV with Black Gates, its life will be 3–5 times longer, and the picture becomes very clear.

“The Braun tube has gone bad, so the TV is broken.” This is the phrase you heard or say when your television gets not to work. However, this is not true. Because the cause of broken is not for a Braun tube, but for **ELECTROLYTIC CAPACITORS** inside. In case of the electrical appliances used very frequently in everyday like television, the electrolyte of an inside capacitor dries up in just 3 to 5 years; then the life becomes over.

95% of a TV set is still alright, but it is dumped because of the consumed electrolytic capacitors inside which are making up just 5% of the total cost for a TV. This is the main cause of increasing large-sized refuse from houses. What a waste of resources! On the other hand, some people say the short life of TV makes the manufactures rich because they can sell more of their products. However, consumers, stores and manufactures will have to pay their own expenses for their waste disposal in the near future because of the urgent environmental problem.

You may say, we can use so-called “long-life electrolytic capacitor”, however, such type of capacitor sacrifices its original efficiency to make the life of electrolyte long. Therefore it isn't suitable for the high quality television. Is there perfect capacitor which is not only high performance, but also has long-life? Yes! it is the **BLACK GATE!**

Our company spent much enough time to research and prove this fact by a lot of audiophiles all over Japan cooperated with us even before 9 years.

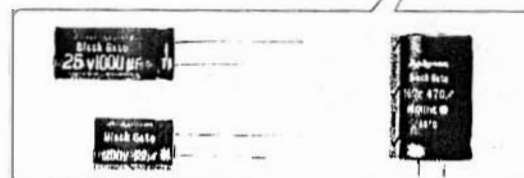
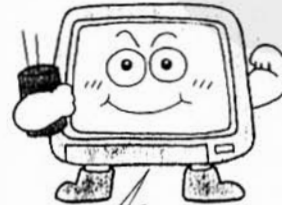
And then, these improved TV sets is working more and more fine, it doesn't seem to come to the end of the life soon. Besides, our company is testing several TVs such as “T1” of color (made in '77) for 13 years, “S” (made in '84) for 7 years, “N” (made in '81) for 4 years, “T2” of black-and-white (made in '67) for 14 years—all the testing periods are at the time of 1992— etc, all of them replaced their capacitors with Black Gates. These TVs maintain their pictures so clear that they are superior to the brand new TVs, it shows how wonderful the quality of TVs with Black Gate is!

The reason for the long life of Black Gate is, as you are aware, the outstanding inside structure. The 99% of inside is based on the electron transfer, the rest only 1% is the ion transfer, therefore, the consumption of electrolyte is reduced to 1/100 than the ordinary one. So you might say the life span becomes 100 times longer than before, however it's not. Because it is controlled by the long life (foil consumption) characteristic, therefore it will be 3 to 5 times, means 10 to 20 years, longer.

If the capacitors in all the television in the world is replaced with Black Gate, there will be the tremendous benefit not only for consumers and manufactures, but also for an environmental point of view on the global scale. We'd like to appeal how important to use Black Gate with TVs to all over the world. On top of that, you can achieve the high-performance and long life for the imaging equipment or the set itself of OA apparatuses, such as work stations, with our product!

※ See the Technical Report No.51

DURABLE and KEEP WELL!



High-Voltage, Large Capacity "Super E-Caps" BG-N 100V/2200 μ F completed for the first time in the world!

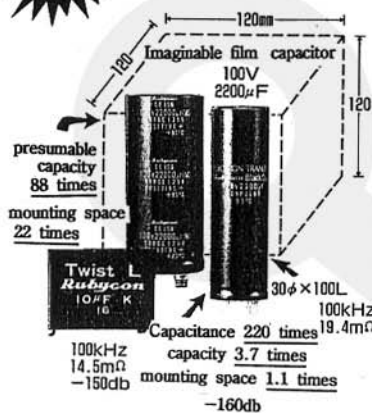
No distortion, Ultra high-speed, Lossless, and No frequency threshold, the Ultimate Electrolytic Capacitor is born!

Super coupling for signal/driving mechanism comes true:

AV equipment, switching power supply, hi-definition TV has achieved Super low noise!



Picture and Figure for Comparison



Above—If you make a film capacitor of 2200 μ F, its size would be the one drawn by the dotted lines. Compared to a film one of 10 μ F, Super E-Caps system is 3.7 times larger at capacity, the bottom space is almost the same, moreover, the performance is superior. We can say the dream capacitor of 2200 μ F is realized as super small sized and high-performance!

The "Super E-Caps" system, consisting of a pair of non-polarized Black Gates, which resolves all the defects of conventional electrolytic capacitors has finally completed. Among various kinds of electric parts, it is difficult to minimize the size of a capacitor, so people have made efforts to use capacitors as less as possible in amplifiers. However, an electrolytic capacitor of large capacitance is necessary for a coupling and a power supply of the final driving portion.

Conventional polarized electrolytic capacitors have inherent defects which nobody has able to resolve, so the final resolution or fidelity of equipment becomes much worse than the targeted value. We are not sure whether the technicians of set manufactures know this fact, but it is true that they have been spending so much time and money to take measures against this.

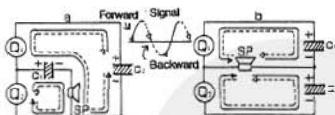
Now, we are going to explain the mechanism of the problem as an example of an audio amplifier. The sketches a and b in Figure 1 are the typical output circuits. AC signals flow from Q₁, Q₂ in forward direction (actual line) as well as in backward direction (dotted line), and they drive speakers. Polarized electrolytic capacitors C₁ and C₂ become signal passages, and when you look at them carefully, the stream from the -pole to the +pole (backward direction) is ion transferring conductor that should not be the function of a capacitor, and it is also a loss component which generates distortion while the other one from the +pole to the -pole (forward direction) is the regular function. In short, only a half of output signals contribute to the regular drive, and the other half means loss component having distortion that makes signals deteriorate.

The loss damages speakers then the essential performances such as distortion, driving efficiency, the amount of information and damping effect become very bad. It is far from Hi-Fi operation aimed at first. To prevent from this, people needs a non-polarized capacitor of perfect operation, which means no distortion, no loss and never generate harmful component in the both forward and backward directions. However, such capacitor has never been realized so far among any kinds of capacitors of 15 μ F and above. There has been a huge blank zone.

Jelmax challenged this blank zone by combining the technology and characteristics of the Black Gate. At last we have completed non-polarized electrolytic capacitor for the first time in the world; BG-NX 100V/2200 μ F (See Picture).

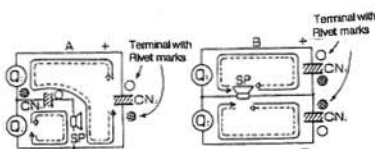
We also discovered that connecting a pair of non-polarized Black Gates each other, they become "Super E-Caps", the dream system having an excellent performance. Compared to conventional ones, the non-polarized Black Gate capacitors such as CN₁, CN₂ which creating the "Super E-Caps" at output sides of A, B in Figure 2 become twice at the capacitance to the load, the E.S.R. become 1/2, all of the harmful loss will be cancelled in the operation range and they never generate distortion, which means perfect no loss operation! These high-performances contribute to the complete driving for speakers. At last the ultimate audio system has finally comes true. We are going to explain the characteristics of this system in more details.

Figure 1 Output circuits of ordinary amplifier AC signals and current directions



Q₁, Q₂: Transistor
C₁, C₂: Polarized electrolytic capacitor
SP: Speaker

Figure 2 Output circuits with Black Gate-N AC signals and current directions



CN: Black Gate N

Figure 3 Frequency vs. Impedance, E.S.R. characteristics

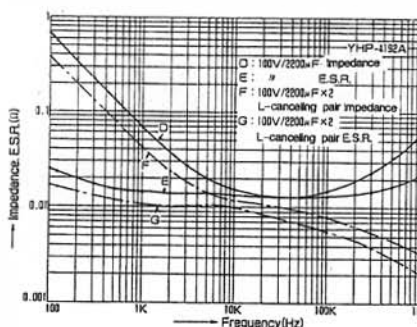
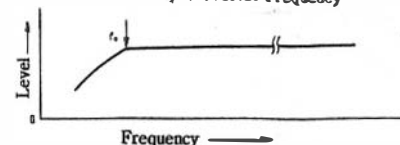


Figure 4 Capacitance of CN and lowest frequency zone of impedance at driven side

BG-N	Capacitance CN	f _c at 900 Ω	f _c at 100 Ω	f _c at 16 Ω	f _c at 8 Ω
50V	10 μ F	26Hz	159Hz	1000Hz	2000Hz
"	47 μ F	5.9Hz	33.8Hz	210Hz	423Hz
"	109 μ F	2.6Hz	16Hz	100Hz	200Hz
100V	330 μ F		4.9Hz	30Hz	60Hz
"	2200 μ F			4.5Hz	9Hz

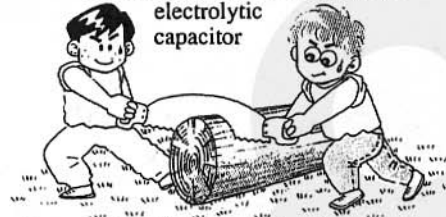
Figure 5 Output level vs. Frequency



A : Ordinary polarized electrolytic capacitor
Power can be applied only in one direction. The other direction just means a loss.



B : Black Gate-N non-polarized electrolytic capacitor



Power can be applied in both directions through well cooperation of the pair.

—**Distortion characteristics**— As in the Technical Report No.54*1, BG-N has incredibly small distortion value; -160db in the both forward and backward directions, it has been improved drastically than conventional capacitors.

—**Transferring efficiency**— In the case of Super E-Caps, the factor which makes the efficiency go down is only E.S.R. of just about 10mΩ, therefore its value reaches as much as 99.9%, and the coupling condition of an amplifier and the load becomes almost 100%. (See Figure 2)

—**Loss**— It is the opposite of the transferring efficiency. When the power of 1KW flows through in an ordinary capacitor, its loss will reach as much as 500W, and the inside electrolyte heats up because of ion transfer. However, in the case of BG-N, the loss will be merely about 1W because of the Transcendence Electron Transfer. You do not have to worry about it.

—**Impedance, E.S.R. characteristics**— You will understand the great performance of "Super E-Caps" as seeing Figure 3. The curves D and E*2 show impedance and E.S.R. when using one single BG-N. However, making two pieces of them pair by connecting each rivet marks of their lug terminals at the time of using ±2 power supply system such as in Figure 2 B, the inductance L component inside of the electrode is canceled completely.

Also the frequency resonance is canceled as shown in the curves E and G. As the frequency goes up, the value goes down boundlessly: these are the ideal curves which have been impossible to realize before. The phase change disappears, and its electrical characteristics such as distortion, velocity, and the power have become the great ones that nobody has ever experienced. Moreover, as we explained above, the life span will incredibly be longer because its inside loss is just a little bit and the temperature hardly rises.

These characteristics break common knowledge. BG-N can supply the maximum power to the load of 8Ω when the capacitance is 2200μF, as you see in Figure 4 and 5. In short, just 1/10 of the capacitance is enough compared to a conventional one. That is an amazing effect.

Jelmax produces the Super E-Caps from 6.3V to 100V as operation voltages, and from 0.1μF to 10,000μF as capacitance. There are wide selections for various purposes.

—**Uses**— The performances of Super E-Caps are so outstanding that any kind of electric appliances such as an audio set, VCR, OA, ME, or NC machine, etc. using this system will be ultra low noise. And also we expect these appliances make drive mechatronics as high definition. There is another ideal and epoch-making characteristic: as the operation frequency goes up, the impedance and the E.S.R. values go down endlessly. Therefore, this system is able to make a switching power supply noiseless completely, which has not been realized before. And it also contributes to the amplifying for a hi-definition TV system in wide ranges to keep S/N.

In conclusion, the Super E-Caps made by a pair of non-polarized Black Gates is the indispensable weapon in the bright future for electronics.

A Variety of Power Supply with "Super E-Caps"

Figure 1 A Pair of "Super E-Caps",
BG-Ns, Theory

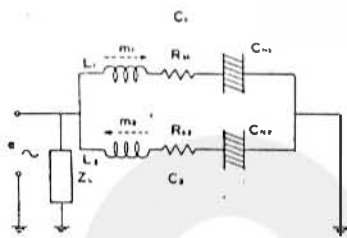


Figure 2 ± 2 Power Supply with Super
E-Caps L-canceling Pair Circuit

T_1, T_3 : Stabilizing Circuit
 C_1, C_3 : BG-N35V4700 μF
 C_2, C_4 : BG-N16V470 μF
 T_2, T_4 : Stabilizing Circuit
 C_5, C_6 : BG-N6.3V470 μF
 or BG-NX6.3V470 μF
 N_1 : NF-1 Noise Filter

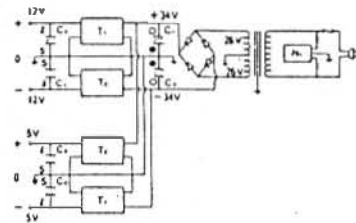


Figure 3 Terminals, marks of lead wires

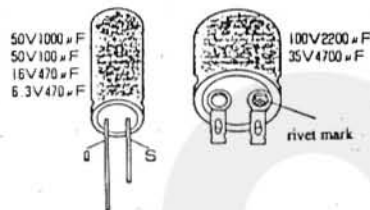
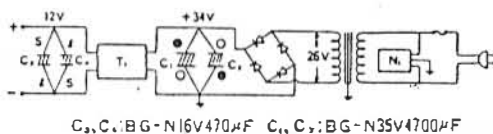


Figure 4 Super E-Caps Parallel L-canceling Pair Circuit



C_3, C_4 : BG-N16V470 μF C_1, C_2 : BG-N35V4700 μF

Power supplies with "Super E-Caps" were announced partially in the previous technical report No.66. This report introduces the super electrolyte system which can be applied into a variety of power supplies of electronic devices and equipment because the types of BG-N have been increased and improved.

"Super E-Caps" is described in the previous technical report. That is a system which enhances the function of the high performance BG-N, eliminates an internal inductance and upgrades it to the limit of its ability. That is, this is a system which works as an ideal capacitor of "Super E-Caps" by connecting two BG-Ns in order to cancel the internal inductance L each other. Then the false domain which is the weakest point of a capacitor completely disappears.

Figure 1 shows the theory of "Super E-Caps". A pair of non-polarized capacitors, BG-Ns (C_1 and C_2) include C_{N1} and C_{N2} of capacity, R_{S1} and R_{S2} of equivalent series resistance (E.S.R.), L_1 and L_2 of the inductance which are caused by the winding of an internal electrode foil as well as the resonance frequencies which are determined by each capacitor, C_1 or C_2 . The magnetic flux m_1 and m_2 are caused by the inductance L_1 and L_2 . However, in the case of BG-Ns which capacity and voltage rate are the same, the structure and the dimension of electrodes of each capacitor are exactly equivalent and symmetric, and the start of winding points and the end of them are the same, too. Therefore, when these two capacitors are connected in parallel to cancel the flux m_1 and m_2 each other as shown in figure 1, the total resonance frequency is eliminated, and the impedance and the E.S.R. are decreased to absolute zero as the frequency is increased. This is the characteristic of an ideal capacitor.

This excellent effect can be achieved by a pair of BG-Ns only. A term of "Super E-Caps" comes from this. Power supplies with this show almost no noise at any frequency. Also, when complex fast digital signals pass through the power supplies, they show the great electrical characteristic that they can transfer signals according to the change of the load and without any phase change. There is no such example other than this.

Figure 2 is the example of the power supply which is a lot of demand. This circuit generates $\pm 5V$ and $\pm 12V$ and meets the requirement of very low noise and very high speed. Marks, \circ , \otimes , I and S indicate BG-N terminals and rivet marks in figure 3. This is the example of L-canceling pair of ± 2 power supply circuit.

Figure 4 is a parallel L-canceling power supply which uses the theory shown in figure 1. This power supply is used for various purposes. Main usage is for switching power supplies which are produced ten million units per month in Japan, including four million of DC-DC converters. We have achieved the complete noiseless circuit first in the world.

No Distortion, Super High Speed, High Efficiency and No Frequency Limitation

This theory can be utilized in other power supplies and circuits. Therefore, this is used in all of electronic devices and equipment. This portion will be described in details in another report. Please expect it much.

Although only power supplies for low voltage are explained in the above, low noise power supplies are required at 100V or higher voltage. In this case, serial L-canceling pair is used and the even number of pair of capacitors are connected in serial to cancel L component. Since an internal resonance frequency is canceled as we can do in a parallel system, high voltage and high performance can be obtained. Figure 5 shows the application of this circuit to the full-wave double-voltage rectifier type of power supplies and DC 200V is generated in this circuit. In the case of a power supply for higher voltage, for example, a power supply for a vacuum tube amplifier, four of BG-Ns (100V 2200 μ F) are connected in serial. In this case, the total capacity is 550 μ F which is one fourth of the original one and the E.S.R. is 80m Ω which is four times of the original one. However, this is an excellent hi-fi power supply which is better than any traditional power supply for high voltage. Of course, a choke coil is not necessary. A resistor must be connected to each capacitor in parallel. Capacitors must be connected each other according to the rivet marks of lug terminals shown in figure 6.

[Superior Effect from Audio Frequency to Giga Hertz]

A DC power supply provides an active element with driving DC power. However, it is important to note that the DC power supply is also a function as a signal channel, and therefore it determines the performance of an amplifier.

Electrolyte capacitors which are the pathes of signals cause distortions and phase changes. These problems can be resolved by the ideal capacitor of super electrolysis capacitors "Super E-Caps".

The power supply that is equipped with our super-electrolyte capacitor can bring the utmost stability to an audio amplifier, making it the ultimate amplifier with the deepest sound. Also the color and the resolution of a video system are improved. Moreover, in Hi-vision system in which super low noise is required and five times of information than the ordinary system is used, this power supply which is no frequency limitation is expected much. The superior performance of this power supply is confirmed in an antenna circuit of BS bands as well as in the middle range of frequency and it is better than an ordinary power supply. It is important to note that the complete noiseless in a switching power supply has been achieved first in industrial electronics fields. We are proud that we are in the leading edge of technology of the electrolyte capacitor that has a long history.



Figure 5 Double-voltage Serial L-canceling Pair Circuit

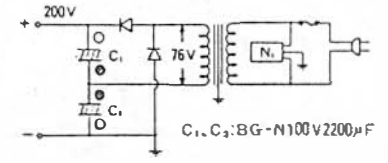
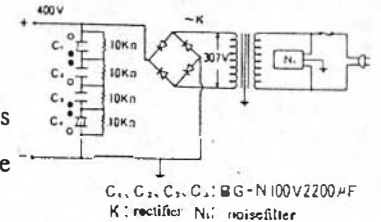


Figure 6 Serial L-canceling Pair Circuit for High Voltage



BG-N, BG-NX for Super E-Caps

BG-N AC/DC super low noise and low distortion capacitor

Voltage (V)	Capacity (μ F)	Size(mm)	Main Usage
6.3	410	12.8x24	AV, IC power supply
16	33	6.3x11	Audio, NF circuit, CD
16	100	12.8x20	Video, CD, Power supply
16	470	16x26	DC/DC converter
35	1100	50x90	Large video analog and digital power supply
50	1	5x11	S/D, D/D by-pass coupling
50	4.7	5x11	NF by-pass coupling
60	10	6.3x13	Video by-pass, C microphone
60	97	12.8x24	Audio, video, general
60	100	16.2x	Audio, video, general
60	1000	22x38	Large video analog and digital power supply
100	250	18x36	Audio, by-pass
100	2200	26x110	Audio power supply

BG-NX AC and DC super low E.S.R., super low noise

Voltage (V)	Capacity (μ F)	Size(mm)	Main Usage
6.3	100	6.3x11	AV, DC/DC converter
6.3	220	8x11	Audio
6.3	470	12.8x24	Audio
6.3	2200	18x36	Audio power, Bias adjust
10	1500	18x25.6	AV, switching regulator
25	1000	18x25.6	12V, 10V switching regulator
35	680	18x25.6	24V, switching regulator

Jelmax's "Non-Polarized Black Gate Capacitor" overcomes the problems of switching power supplies. It creates low ripple noise (3.75 mV), has high effectiveness (82%), eliminates the need for EMI measures, and it has a long lifetime.

"Super E-Cap" will meet any requirement of high performance equipment in the 21st century.

Jelmax introduced a new Non-Polarized Black Gate Capacitor on page 46 of the July 1992 issue of ELECTRONIC COMPONENTS. In the magazine, it was explained that Jelmax was the first company in the world to apply an L-canceling smoothing circuit to minimize the ripple noise of switching power supplies. This circuit is shown in Fig.9 in this catalog. These technical notes explain the details of this development.

Conventional switching power supplies' smoothing circuits, which employ polarized capacitors, have never successfully eliminated the ripple noise for the reasons given below:

(1A) Polarized capacitors have semi-capacitor action and they generate heat,

Rectified output waves have continuous high frequency positive and negative pulses up to 100 MHz and the smoothing capacitors must handle very high loads.

Polarized capacitors create a semi-capacitor action because they function as a capacitor on the positive cycle and a resistance on the negative cycle. This action consumes almost half of the energy inside the capacitor, and it generates heat. Therefore, polarized capacitors must be designed for thermal-proof characteristics as their priority target instead of optimizing them for performance.

(2A) Polarized capacitors do not function when the resonance point is exceeded.

Generally, a capacitor of 1000 μ F has an internal resonance point of approximately 70 KHz. When the frequency exceeds this resonance point, the function enters an imaginary region. In this zone, the impedance and E.S.R. values increase tremendously with increases in frequency and the performance decreases dramatically. It is, therefore, essentially impossible for these capacitors to cut the noise as they are always operated beyond their resonance points.

(3A) Only an adequate E.S.R. value can prevent noise.

Competition in heat prevention measures began for the reasons described in item (1A) above. The E.S.R. characteristics for handling high capacitor temperatures work against noise prevention performance.

Jelmax solved these problems by eliminating these faults in capacitor design and by using a parallel L-canceling pair of our "Super E-Cap", Non Polarized Black Gate (BG-N) capacitor. We describe the major points of their superior functions below.

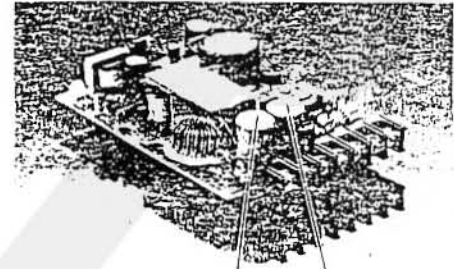
(1B) Why heat is not generated by our BG-N capacitor

The BG-N capacitor is a non polarized system and uses the principle of internal electron transfer. Therefore, its performance is the best of electrolytic capacitors. Just like good quality film capacitors, it has almost no reactance loss and it does not contain any heat generating elements.

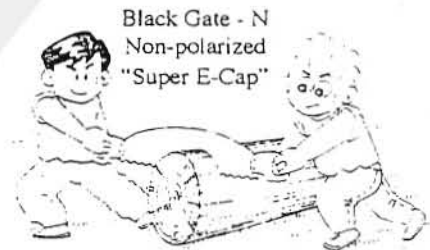
(2B) How we eliminate the resonance point

This is the most important aspect. A pair of BG-Ns, with identical voltages and capacity, are made with completely symmetrical rolled electrode. Together they cancel the inner resonance in parallel, in such a manner cancel their internal inductance "L element". The result is that the "Super E-Cap" merely functions as a capacitor. We have succeeded, for the first time in the world, in applying this function to super high range characteristics without limiting the operating frequency.

100 V input, 5V5A output switching power supply



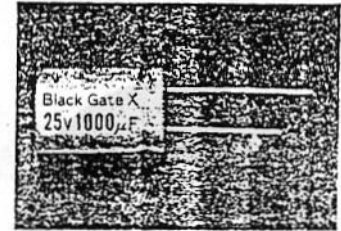
BG-NX10V1500µF



Well-matched pair demonstrating the performance in bilateral directions. The strongest in the world

(3B) How about the E.S.R. characteristics for preventing noise?

Due to the effect of item (2B) above, using the capacitor's impedance, the E.S.R. value continue to decrease, even after the operating frequency exceeds the resonance point. In addition to its internal electron transfer characteristics, its E.S.R. value decreases by 1/3 to 1/20 at frequencies over 100 KHz, when compared with ordinary capacitors. Thus, it has extremely good noise prevention characteristics. Pure copper lead wires also contribute to this effect.



(4B) What are the temperature characteristics?

As described in item (1B), this design does not generate heat itself. When installed in conditions similar to those for film capacitors (70°C), there is no heat generated by the BG-N and it has better heat resistance than film capacitors. In addition, contrary to other materials, the electron transfer path of fine grain graphite decreases distortion noise and energy loss when there is any increase in ambient temperature. This self limiting function is another important feature of the BG-N series.

(5B) How about its lifetime?

The lifetime of capacitor has a close relation to the operating temperature. At normal temperatures, at which there is no heat generation, the life of these capacitors will be 10 times or more longer than conventional capacitors which generate heat internally. In other words, the lifespan is nearly infinite.

(6B) No need for EMI preventive measures.

A large percentage of the high frequency harmonic energy generated at a rectifier's output is converted by the "Super E-Cap." It has an almost 100% wide range smoothing characteristic which converts the energy to direct current. Therefore, essentially all noise will be canceled. Furthermore, noise that might be scattered outside is also absorbed, and no EMI preventive measures are required. This can be proved by applying high frequency transmission theory.

(7B) What are the merits?

Needless to say, a single pair of BG-Ns get substantial points in solving all of the current problems of switching power supplies. Exceeding the performance of series regulators, which cost 10 times as much, they provide innumerable advantages in performance, cost, and lifespan and they do not need special noise filters, or EMI preventive measures. The same can be said for DC/DC converters. The market requires downsizing, as well as super high speed, high density electronic equipment. Only the BG-N meets these seemingly incompatible requirements. The table below shows the test results from substituting our "Super E-Caps" in normal switching supplies currently available on the market.

Performance comparison test between "Super E-Caps" and the ordinary capacitor: use 1 in switching power supplies.

Tested condition: 100 KHz waveform, 100 V input, 25 W output, 5V5A Size: 36 x 93 x 139 mm, made by "V" company and operated at 20°C

Test method: The original power supply circuit configurations were used. Only the smoothing capacitors were replaced and compared at 5V5A for each load.

	Original made by "V" company	Test (1) (See below)	Test (2) (See below)
Smoothing capacity	Polarized type made by "N" company 10 V 2200 µF x 2 16 x 26	Black Gate - NX (Non-polarized) 10 V 1500 µF x 2 16 x 24	Black gate - NX (Non-polarized) 10 V 1500 µF x 2 16 x 24
E.S.R. value (each) (* 1) 100 KHz	66 mΩ	28.6 mΩ	28.6 mΩ
Connection method	Simple parallel connection	Simple parallel connection	L-canceling pair of Super Caps connected (* 4)
Residual ripple noise (*2)	80 mV	18 mV	3.75 mV (* 5)
Effectiveness (*3)	75 % (catalog value)	-	82 %
Capacitor temperature rise after 10 hours constant operation	Yes	None (room temperature)	(*6) None (room temperature)
EMI noise	Yes	Very little	Almost none
Temperature rise of enclosure (common use of TR radiation)	Large	Medium	Small

* 1. 100 KHz E.S.R. meter made by "CH" company.

* 2. 100 MHz 2-channel oscilloscope made by "K" Co.

* 3. Multi-meter made by "F" company.

* 4. Patent pending.

* 5. Most of them are frequency ripple.

* 6. Heat generation is less than 3 % of conventional types

The merits and demerits of the electrolytic capacitor which has the axial type of lead wires.
If you don't know a real thing, you won't get the best result.

If you judge something by appearance only, you may misunderstand it because you don't know the inside of it. In audio sets, there's one example. It's an electrolytic capacitor which has the axial type of lead wires. Please look at figure 1. This connecting way to a circuit is seen in a lot of vacuum tube amplifiers of amateurs made or garage makers'. The way of wiring was also used in an old telephone. It looks smart, therefore people tend to think its quality must be good. However, it's wrong as below.

Figure 2 is the inside picture of the development of the electrolytic capacitor above mentioned. Inside capacitor element is the same as an ordinary electrolytic cap which has the radial type of lead wires. The lead wire of the negative side is welded spot to the one side of a flat ribbon wire that has more than 2 ℓ length, made of aluminum foil. Then the other side of the ribbon is also welded to the opposite side of an inside bottom. Its lead wire is made of iron because of the structural reason, therefore the element is connected by aluminum and iron to a circuit. However, these metals lower the quality for 30db about the distortion value, and 30% about E.S.R. value. Especially the L-component of the earth side increases terribly, it reaches the worst level. Moreover, the connecting way is so unstable that is weak at vibration. In short, this style is out of date, but many people still believe it today. We guess people are influenced by the appearance that looks easy-connection or by its sales copy.

We've asked many times if there will be a schedule of producing such type of electrolytic capacitor. However, we won't make it anytime in the future because of the above reasons.

Now, we're gonna introduce how to connect the radial type of a capacitor firmly to your handmade set. See figure 3. First, drill two holes in a PC board at an interval of the lead wires of the capacitor. Next, put eyelets into each of the hole. Then, glue the eyelets and the board with rubber adhesive. Finally, solder the root of the lead wires and the eyelets. It will be better that to connect wirings and the lead wires as figure 3. The lead wires become the shortest ones, moreover the glue is effective enough for suppressing the vibration of the electrodes.

We recommend you to connect BGs to a circuit with the way which we mentioned above. The tone quality will grade up fantastically that beyond your imagination.

Figure 1: the example of the connecting way of the axial type

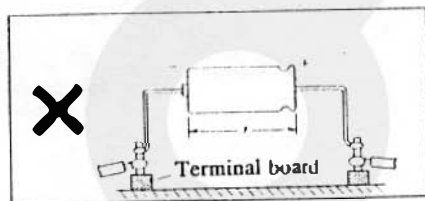


Figure 3: our recommending way of the connecting for Black Gate

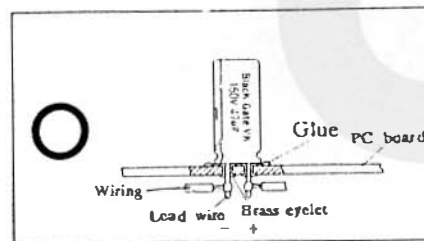
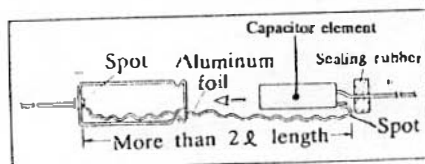
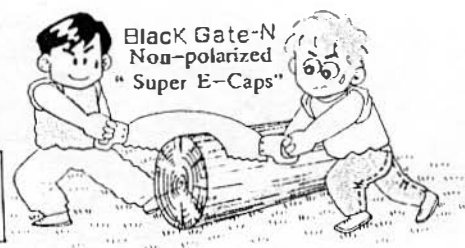


Figure 2: the inside picture of the axial type



*Super E-Caps series start from Our Technical Report No.71. Please take a look.

Power can be applied in both directions through cooperation of the pair.



Why tone quality of ion transfer is poor?

You may be taking wrong measures without knowing the real cause

We explained the goodness of tone quality of electron transfer in the Technical Report No.70. This time we are going to talk about why that of ion transfer becomes poor.

Ion transfer is the system that signals flow directly in electrolyte. The electrolyte ionizes into +ions and --ions, then an electron rides on an each ion and moves toward either + and --electrodes. The mass of an ion is much larger than that of an electron, therefore an ion moves slowly and is hard to follow the high speed of a signal movement. A lot of signal information drops whenever ions move between the two electrodes, and an ion distortion is generated.

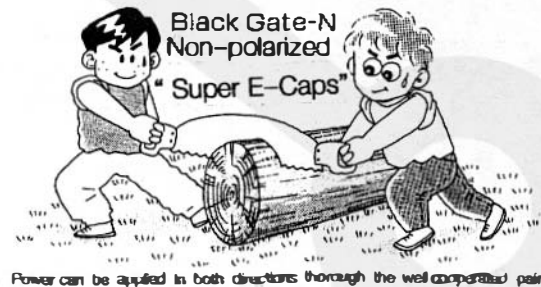
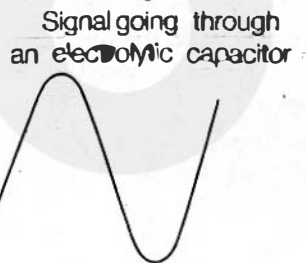
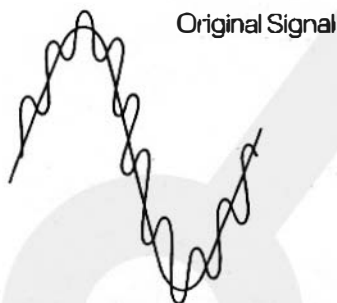
Perhaps you thought it reversely, but the more information drops as the frequency becomes lower, the driving voltage is smaller and the power is larger. As the frequency becomes higher, the less information drops.

Moreover, non-linear distortion that generates sharp, hard and unpleasant sound and offends one's ears becomes larger. This is caused by the loss of dielectric itself and the structure of electrodes.

Although the non-linear distortion can be improved much, the previous explained ion distortion is hardly bettered. When listening to a contrabass or cello closely, we can recognize the sensitiveness of the strings' vibration on basic note, but once listening to them through an amplifier, the sound becomes flat and signal information drops sharply.

As well as 80% of audio fans are dissatisfied at tone quality of an audio system because of the above reason. If you try to improve on an amplifying system or other parts without knowing the fact, it will be meaningless because all existing amplifiers have this fault. No matter how faithful an amplifying system works, the lost information will not get back!

The only correct measurement is replacing capacitors with faultless Black Gates. The inside transfer system changes from ion transfer to the Transcendent Electron Transfer then the amount of information increases by 100 times! This super capacitor will satisfy your ears completely!



Super E-Caps series 1:

The Great Power of a Bias shunt, "SUPER VITA DRIVE"[®] by SUPER E-CAPS

The achievement of ultimate sound
it's impossible to be obtained from amplifiers on the market

The biggest weak point of transistor amplifiers is a bias circuit. Input signals is amplified always with the difference of AC phases for only biases, and synthesized in output side. Therefore signal information becomes vague, S/N is lowered and even a switching distortion occurs. These are the principal cause of deterioration in the quality of Hi-Fi.

The switching countermeasures by A class operation is meaningless because it just makes biases deeper. For the fundamental countermeasure we need a capacitor for a shunt that always keeps input points A and B a very high speed and the same phase. Black Gate-NX is the only one can do that.

Its effect is so great that satisfy professionals and many audiophiles and it is even used in cutting amplifiers for making analog phono records. This time, we are introducing epoch-making "Super Vita Drive", that will make the quality of audio sets the best all at once.

How to do this is very easy. It only makes points A and B shunt by BG-NX pairs. To twist two capacitors' each longer lead wires L and shorter ones S together. The phase difference of input electrodes of up and down complementaries Tr1, Tr2 is completely disappeared over all bands. In "Super E-Caps", there is no resonance point in impedance and E.S.R. characteristics, then they continue going down endlessly according to the frequency is going up. this is the characteristic of the ideal capacitor. Therefore, the amplifier will become perfect complementary operation over all frequencies for the first time. In short, the resolution for all bands becomes terribly going up like being in sharp focus suddenly.

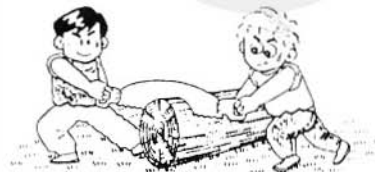
It is most effective for sharp and impulsive playbacking sound overwhelmingly like a cymbal, a harpsichord, a piano and a drum, moreover, the amount of information of sound increases and the amplifier becomes powerful remarkably even in the middle and low range, therefore the people who have experienced the sound has the same opinion that plentiful music is full of the room so they forgot the existence of speakers.

Finally, we have achieved to realize ultimate sound hoped for a long time. By the way, the best type of Black Gate for a power supply is BG-N 100V/2200 μ F \times 2. Try it!

www.partsconnexion.com



Non-Polarized " Super E-Caps "



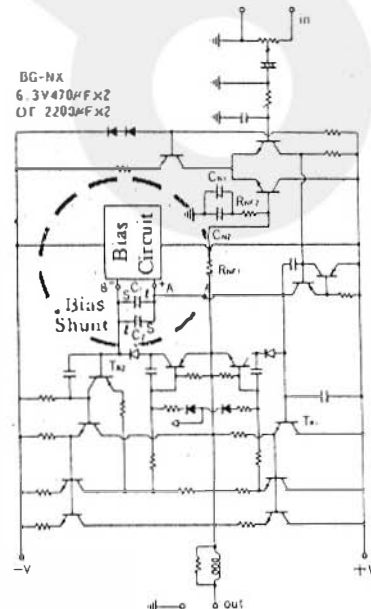
Power can be applied in both directions through cooperation of the pair.

Super E-Caps for Bias Shunt



To twist and solder two capacitors' each longer lead wires L and shorter ones S together.
You should use the wires as thick as possible for shunt with A and B.

TR Power Amplifier



Negative Feedback(NF) Amplifier will be Perfect with Super E-Caps

☆ Super E-Caps series vol.2 ☆

Capacitor is most important component in whole transfer circuit

This issue is one of the most valuable example in the uses of "Super E-Caps". As we reported in Technical Report No.55, when you practice negative feedback(NF) on an AC amplifier, it's an iron rule that using DC blocking high quality capacitors like BG-N in feedback loops for preventing low range distortion.*1

NF system is an important technology on signals transfer engineering, however, not a few manufactures believe NON-NF amplifiers are better than NF ones because they don't know the above fact and they cannot get practical effects.

Since capacitors are made by winding foils, resonance occurs by the foil inductance at specific frequency f_0 , and current phase in capacitors changes from minus to zero at the point f_0 , and it becomes plus after that. As you see the line M in Figure 1, the impedance curve of single BG-N 50V 100 μ F changes from down to up like V-curve as frequency increases, and we can call "false zone"*2 after f_0 . In short, it's no longer a capacitor function after f_0 , but it's like inductor characteristics. Negative feedback, following as the name, is natural to feed back by negative phase until f_0 , so when it becomes positive, the condition will be oscillating.

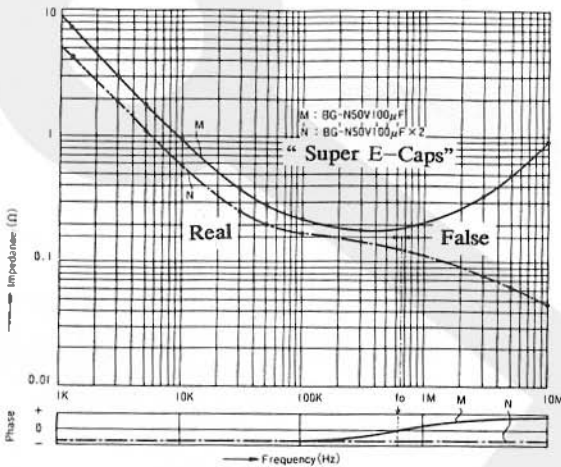
It's correct that using capacitors inside NF loop, but when there's NF gain of an amplifier in even higher frequency range than f_0 , a part of high range becomes an oscillating condition, or an amplifier becomes semi-oscillating. It's stable when no signals input, but it becomes unstable when input signals, then S/N becomes worse and distortion increases rapidly. The perfect countermeasure for this is very difficult, but there are some ways to improve a bit by making a gain in only high frequency range down or correcting phase, but these are not enough. Therefore some audio makers give up to use NF systems.

Finally, we developed the epoch-making technology that resolve the above problem; that is "Super E-Caps" NF systems. When making two BG-N 50V 100 μ Fx2 capacitors Super E-Caps structure, the impedance becomes like N curve in Figure 1, the resonance point f_0 is cancelled and impedance(same as E.S.R.) value continues to decrease, and a phase change is also cancelled. Then amplifiers become ultra-stable and negative feedback will be complete in all operation ranges for the first time. Therefore the quality of amplifiers using this system also becomes great ever since it will get high-level negative feedback effect which no one ever experienced.

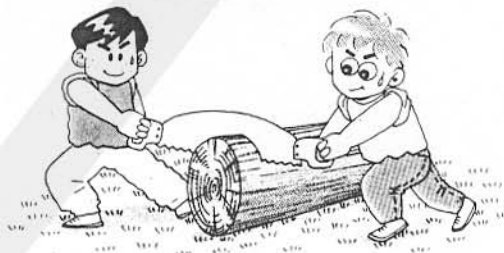
For example, if you practice this on a professional monitor amplifier which we introduced in our Technical Report No.74, its performance becomes highest grade easily even just 20db of the negative feedback because of the ratio between R_{NF1} and R_{NF2} in Figure 2. Moreover, the Super E-Caps "Bias Shunt" which we also presented in Report No.75, is also practiced in a bias circuit of the amplifier, therefore its tone quality becomes excellent which cannot get from ordinary amplifiers on the market. In addition, the amplifier can be used not only for audio system, but also for industrial use having broad frequency range, the effect is so great that we have never imagined.

*1 Refer our Jelmax Technical Report No.9 and No.55
 *2 Refer No.51

Figure 1: Frequency vs. Impedance and Phase Characteristics

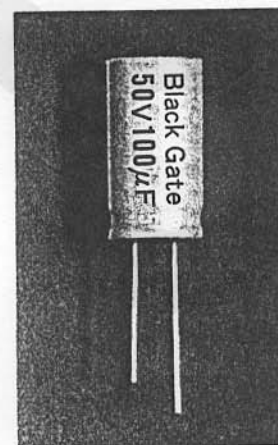
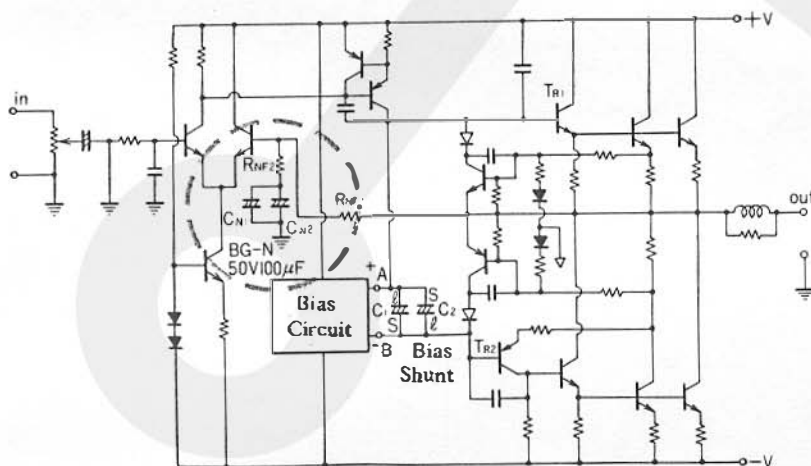


Black Gate-N
 Non-Polarized "Super E-Caps"



Power can be applied in both directions through cooperation of the pair. They're strongest on earth!

Figure 2: Tr Power Amplifier Circuit



“ Super E-Caps” support audio sets completely over all frequency bands for the first time in the world

The Switching Revolution which is the greatest one in the century breaks out!

There are always smoothing capacitors for even a use of a signal passage in a power supply. The quality of the capacitor is especially important because it affects the sets with distortion or some electrical influences when the signals are passing in the capacitor.

By the way, the characteristic of impedance that everyone knows is,

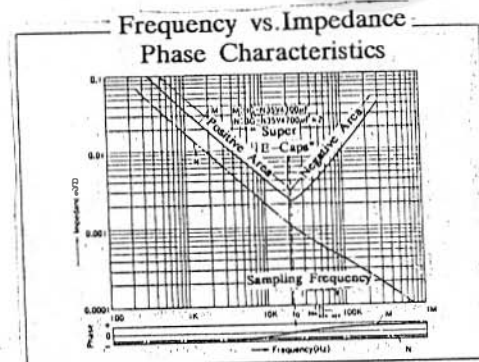
$$Z_c = \frac{1}{2\pi fc} \dots\dots(1)$$

Zc: impedance (ohm)
f: frequency (Hz)
c: capacity (farad)

The answer in the formula(1) has to be the one shows a straight line. However, reality is V-curve like the line M in the figure. The reason for it is common capacitors could work properly only in a positive area because of the resonance generated by L-component of the capacitor's inside. The value of the impedance springs up with the frequency in the negative area after the point f, therefore the capacitor lose its function. The signals are reflected from the power supply to inside the circuit and, if the frequency is high, the signals are radiated even in the air.

The worst example is a switching power supply. A lot of noise remains in it, and a part of it is radiated in the air then becomes EMI noise. There is no useful countermeasure at this time. We'll let you know the shocking fact that the all capacitors now in use could work only half the frequency band and the rest half is a harmful operation. The frequency of audio amplifiers is until 20 kHz, therefore it could work only in the positive area somehow, but all of the sampling frequency of all the digital equipment, such as a personal computer, CD, DAC, DAT, etc., is working in the negative area, it's beyond the limit of the proper operation. The reason why nobody would mention and made an effort to solve the big, basic problem is that there was no capacitor that could work over all frequency bands and it was impossible to produce such kind of capacitor. There was a flood of capacitors that were far from the perfect.

However, Jelmax has obtained the best result that breaks down old products. This is, “ Super E-Caps”, a complete operation over all frequency bands.(sec Jelmax Super E-Caps catalog) This surprising characteristic as the figure turns into reality. That's why we call it the Switching Revolution. Let's join it! And you'll know how amazing a real thing which suits its theory. We are hearing a lot of surprising voice about it all over the country. There are too many mancrism articles of audio assembling like a child's play lately. We would like them all to vanish.



CAUTION: IMPERFECT OPERATION THAT MOST OF DIGITAL EQUIPMENTS FALL INTO CD PLAYER GOES BEYOND ANALOG BY MEANS OF BLACK GATE "SUPER E-CAPS"

When we replaced conventional capacitor with Black Gate SUPER E-CAPS in CD Player, the player surpassed high grade CD player. Its sound quality from middle to high range levelled up and increased sense of sound depth which exceeded analog player. Especially brilliant expansion of sound won many critics' high praises. Why did replacement of capacitors in power supply make such a difference? The answer is that power supply of the digital equipment which was not perfect for operation was changed to ideal one.

Power supply for pulse signal needs characteristics which can pass through the frequency band twenty times as high as the signal and phase characteristics which don't change. However, there are no such digital equipment. For example, impedance curve of BG-N35V/4700 F has resonance point at 20KHz and then going up as is shown in curve M in fig.1.

Consequently, phase also changes very much accordingly. The impedance of capacitor should go down together with frequency in general, what will happen if it goes up. The capacitor behaving like coil? Since sampling frequency of signal of today's CD player, DC, BS and so on are all in negative zone higher than f_0 point, pulse reflects in the circuit and radiate into the air instead of passing through it in stable way.

Other digital equipments are also affected by such imperfect power supply. The error happened frequently in CD players and uncomfortable sound quality of high tones prove this fact. No digital equipment change its signal form in transmission process. On the other hand, curve N in fig. 1 shows how "Super E-Caps" works. It has no resonance over all band and its impedance goes straight down to the limit. There is no phase change either. Therefore, this is a real power supply.

Since the twenty-first century is the age of digital equipment, the only perfect power supply which will survive next age will be armed with "Super E-Caps".



Fig.1. Frequency vs Impedance, Phase Characteristics

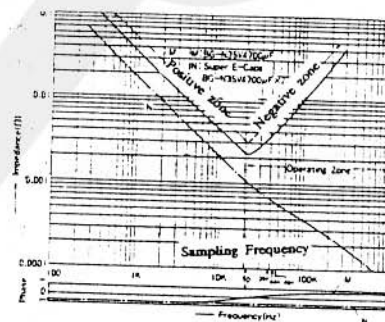
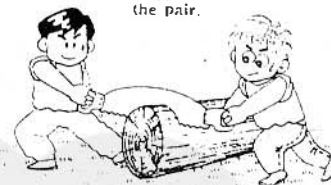


Fig. 2. The Black Gate non-polarized capacitor.

Power can be applied in both directions through cooperation of the pair.



What is the Power Transmission Efficiency?

Black Gate has the best characteristic for this: the value is extraordinary larger than any existing capacitors.

Power transmission efficiency indicates how much an electrolytic capacitor transfer power. You may think, the larger the capacitance, the more efficiency will be gained. However, the correct answer is, the more the number of ion in electrolyte, the better efficiency will be obtained because electrons usually move on ions.

(Refer to the Technical Report No.73)

However, the amount of electrolyte is hard to increase since it is impregnated in extremely thin paper which is sandwiched between electrodes, so the quantity is generally very little. To gain the amount, it is required to add both paper and foils more. This measure makes the capacity be huge.

But when large capacity foil is wound more than is necessary, it becomes a delayed circuit: signals go through the foil sluggishly. Such circuits never reproduce complete clear sound.

Besides, for increasing capacity, creating chemical etchings on the surface of the foils and making it rough. Such capacitors seem to become too large in capacity for small size, but in reality, they do not gain power because the amount of electrolyte which contains ion does not increase at all but just E.S.R. goes up instead. Therefore a small sized electrolytic capacitor never be powerful.

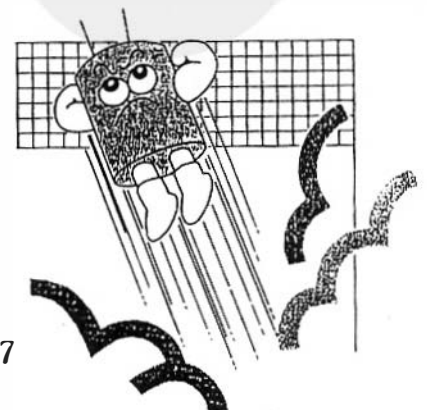
And there are capacitors which is said to be all right for high ripple, or ones that is lowered the etching rate. The capacitors of such characteristics transfer power a little larger than an ordinary one, but the improvement is just within the ability of ion transfer so it does not have much effect.

Then, at last, a great product that breaks through such limitations completely has been born, that is "Black Gate". The power of BG(standard) is 5 times and BG-N(Non-polarized) is 10 times* larger than an ordinary one at the same etching rate. The reason of such incomparable difference comes from the inside of Black Gate: the Transcendent Electron Transfer.(Refer to the Jelmax catalogs for details) It is never affected by the amount of ion at all because an electron in BG is transferred by itself, not by ion.

Therefore BG-FK 80V 10,000 μ F is more powerful than 50,000 μ F of an ordinary capacitor. This fact has amazed a lot of professionals in the world.



* Refer to the Jelmax Technical Report No.66,67



“Super E-Caps” :improving S/N of imaging equipment revolutionary!

High frequency digital signals of diagnostic imaging device transfer perfectly for the first time with Super E-Caps power supply!

Diagnostic imaging equipment such as MRI/CT/DSA/US are all processed by digital signals. These sampling signals are high frequency pulse, but they do not transfer completely in a circuit on the devices.

For perfect transferring, the power supply inside has to have these two characteristics: a frequency band of 20 times wider than its sampling pulse signal frequency, and unchangeable phase. But such power supply did not exist at all.

The chart shows an impedance curve of BG-N 35V/4700 μ F that used for a power supply of large capacitance. As a curve M, resonance point f_0 is sure to appear at around 20KHz due to L-component of an electrode foil. After this point, impedance and E.S.R. values jump up and phase changes drastically. Diagnostic imaging equipment always works above f_0 at signal frequency, so whenever the signals go through a power supply, they are reflected in a circuit or are radiated outside because of the unstableness.

Thus, for better S/N of a device, you have to improve such a defective power supply first.

Jelmax has completed epoch making “Super E-Caps” *1 system that cancel such internal resonance completely for the first time in the world.

The almost straight line N shows the phenomenon: there is no resonance over all bands, impedance goes down straight till the limit, and phase never change. Therefore digital signals transfer perfectly in a power supply, and marvelous S/N gained.

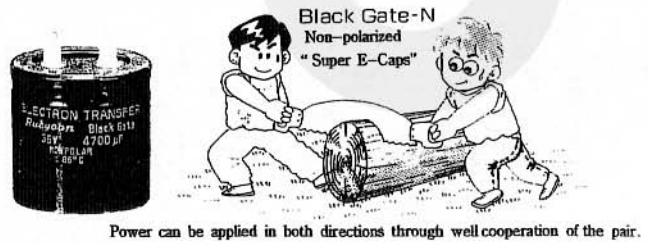
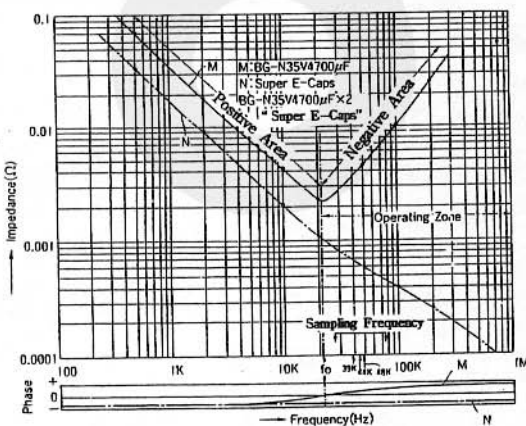
We have already completed a noiseless switching power supply *2 by applying the “Super E-Caps” system. The ripple noise ranged from several hundreds KHz to several hundreds MHz goes down to only 3.75 mV, and E.M.I.noise drops to almost zero. These success are amazing the world.

As well as on the new one, you will expect the same result by replacing with the “Super E-Caps” on a switching power supply which has already been used.

We highly recommend this system to people who pursue ultra sharpness in an imaging equipment.

www.partsconnexion.com

Frequency vs. Impedance,Phase Characteristics



*1: Jelmax Technical Report No.66, No.68
*2: No.71

“ Super E-Caps” Perfect Anti-Vibrating System is Completed

Ultra-Quiet Amplifier, a long time dream has come true at last!

◇ Super E-Caps series vol.4 ◇

When AC signals run into electrolytic capacitors, the inside electrodes vibrate a bit depending on an electric force. The electrodes are wound as cylindrical so the force are cancelled each other, and they are in electrolyte having a large coefficient of viscosity, therefore most of vibration are dumped, but it is still left and it generates distortion noise.

Black Gates can operate completely until -160db which is extremely low level, so they are affected by such an above weak vibration. Moreover, the “ Super E-Caps” system can operate as the lowest noise level, nearly -180db, in all kinds of capacitors, therefore it's important to set up a perfect anti-vibrating system under ultimate operation when using it. Here is the epoch-making system for this as completed. Would you please try!

As you see from FIGURE 1 or FIGURE 2, first put each lead wires twisted together, then glueing them in parallel with silicone dumping material, and lastly combining them firmly each other by cylindrical metal holder. Then, as FIGURE 3, active signals vibrate electrodes as the direction of real arrows when a waveform is a real line in FIGURE 4, and also they vibrates as the direction of dotted arrows when a waveform is dotted line. However, the significant point is a junction part because capacitors CN₁ and CN₂ vibrate in the same direction completely at this point. Therefore, it shows the vibrating energy is unrelated to other supporting structures and it is all absorbed and dumped inside the silicone elastomer. Above cylindrical holder should be fixed on chassis, it'll be more effective.

The reason comes from the basic mechanism of the “ Super E-Caps”, which is made by a pair of non-polarized Black Gates having completely the same structure and both electrodes are applied to the opposite polarities each other. It's so state-of-the-art invention! We practice the above system on each “ Super E-Caps” circuits and see the result, the effect is beyond our expectations, especially it's remarkably on coupling circuits. With this system, stereo sets become three-dimensional which has sound staging of on even right and left, up and down, and front and back.

www.partsconnexion.com

FIGURE 1 “ Super E-Caps”
Anti-Vibrating Structure
✧ Preparation ✧

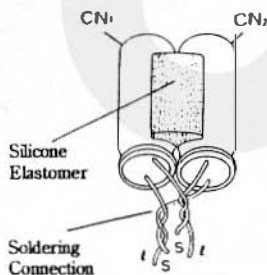


FIGURE 2 “ Super E-Caps”
Anti-Vibrating Structure
✧ Completion ✧

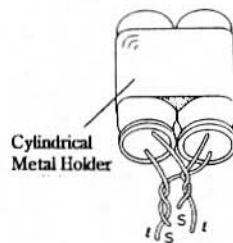


FIGURE 3 Anti-Vibration
✧ Explanation ✧

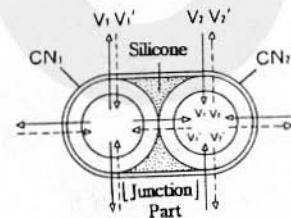
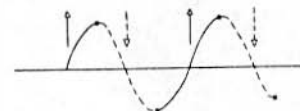


FIGURE 4 Drive Signals



Super E-Caps is the ideal coupling capacitor

* Super E-Caps series vol.5 *

Wonderful technology of Super E-Caps is spreading out in each industrial field. This issue is about what's the result when the Super E-Caps system is operated as coupling between circuits. It's interested in it, isn't it? At this time, we choose ordinary electrolytic capacitors and film capacitors for comparison, and except dry electrolytic capacitors*¹ such as ceramics*², tantalums and Organic Semiconductors because they have a large contact distortion noise which is hard to be accepted as capacitors. Also, it's not include high tension ones over 500V since they are only for vacuum tube amplifiers.

www.partsconnexion.com

	Super E-Caps BG-N x 2	Ordinary Polarized Electrolytic Capacitor	Film Capacitor	Application
Distortion Rate	◎	△	◎	High quality film capacitors are almost equal to Super E-Caps.
E. S. R. Value	◎	△	○	After resonance point, Super E-Caps is 1/3 to 1/20 compared to others.
Impedance	◎	△	△	Super E-Caps is the only ideal characteristic
Inner Resonance	◎	×	×	Super E-Caps is the only one to cancel inner resonance (Patented)
Signal Phase Change	◎	×	×	Super E-Caps is the only one to cancel phase changes (Patented).
Down Sizing	○	○	×	Film capacitors have to be large-scale.
Operation ability	◎	×	△	Super E-Caps has no frequency limit because inner resonance is cancelled.
Non-Reciprocal Characteristics	○	×	○	Super E-Caps and Film capacitor can be used for zero bias coupling ones.
Capacitance	○	○	△	The limit of Film capacitor is just 15 μ F.

For details, please refer to Jelmax "Super E-Caps" catalog. ◎ and ○ are good, △ means being managed to use, and × shows poor. You are aware that the items for Super E-Caps are almost all ◎! Most of them are the results of patented L-cancelling pair technology*³ which comes from only Black Gate Non-polarized caps, therefore any other ordinary capacitor never gets these wonderful quality.

Of course there has been no precedence of such above experiments for Super E-Caps couplings anywhere in the world, it is very unique. In short, Its performance is superior to any other kind of capacitors without exaggeration. First and utmost, the signals have to run without any information lack and unnecessary addition. In the case of an audio set, the sound of musical instruments is reproduced with various harmonic waves besides fundamental wave, and the waves reach until 100KHz as the highest limit, moreover all signal ranges include the sound staging information.

However, the resonance inside a capacitor and phase changes, both of them erase such above most important information completely. Therefore when reproducing analog records of which information is likely to remain, by Super E-Caps system circuits as FIGURE 1 or 2, anyone will be amazed that a sound staging appears perfectly! Then, we're going to introduce the low noise amplifier in FIGURE 1 for you to experience above effect easily.

the dream of three dimensional stereo comes true by perfect transfer of information signals!

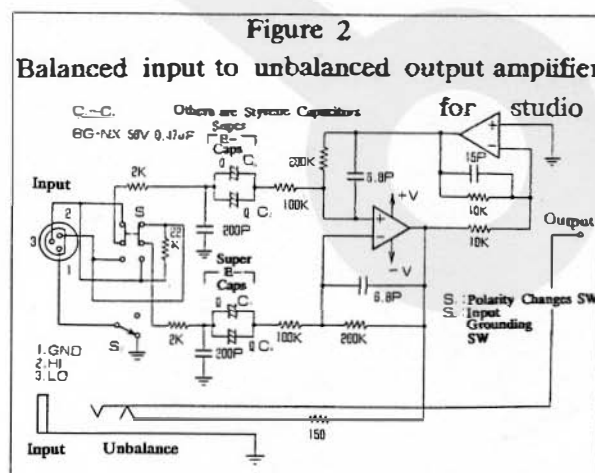
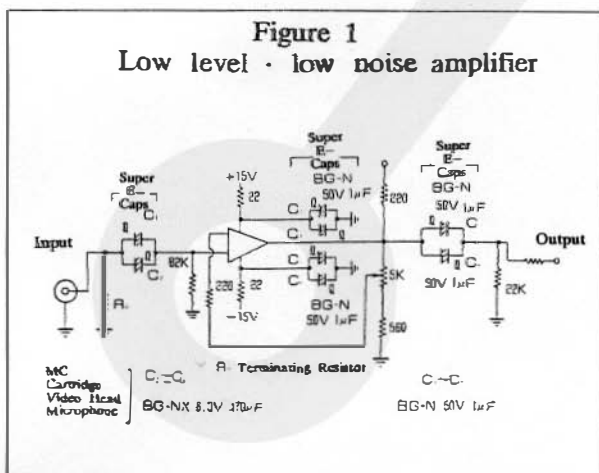


We tested Super E-Caps to a microphone or an analog record which have sound live information in its source, then the quality will be great about dynamic range, sound staging and sound volume, etc. compared to an ordinary amplifier which having input transformers at its input side. There is a enormous difference between them!

In **FIGURE 2** is the example of a higher graded amplifier for professionals used for studio live, it realizes balanced input used in studios without an input transformer, and it suites for a live recording and a broadcasting of extremely high quality. FM stations should practice this at once, they'll know example is better than precept. We'd like them to satisfy many music lovers through FM by using the attractive three dimensional stereo sets which produce sound staging of musical instruments, sound volume, and sound delicacy.

If you practice "Super E-Caps" on your circuits, we strongly recommend referring **Technical Report No.83**, the article about anti-vibrating system. And would you do the idling process enough!!(for detail, see Jelmax catalog).

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- *1... Refer to Jelmax Technical Report No.50
- *2... Refer to Jelmax Technical Report No.37
- *3... Refer to Jelmax Technical Report No.68



The Super E-Caps “BG-NX Hi-Q” is debut beyond Giga-Hertz

Ceramics distortion that must affect audio sets in high frequency range are cancelled for the first time!

The quality of capacitors depends on dielectrics. We expected if it was possible to improve the structure of an electrolytic capacitor, it would become the best one in all kinds of capacitors*¹ because they had already used oxide aluminium which had the highest quality as dielectric. As we believed, at last the dream has come true and the performance of the capacitor becomes excellent even in very high frequency range in which any caps had been impossible to operate completely. It is a real shock to people who believed that electrolytic capacitors were for low frequency range only. Moreover they are superior to any other kinds of capacitors.

The main purpose of a development at this time is to stop the harmful non-linear distortion generated from ceramic capacitors as we announced our Technical Report No.85. Until now, people only put an effort to make the L smaller in high frequency range and they use ceramic caps unconsciously there. For the sake of this, a large high frequency distortion noise(-60db) is generated from a ferroelectric because of an strong electrostrictive effect, and S/N ratio declines largely*²; but only a few people recognize these facts. It's a big problem!

Take a look other ones, for example, styrene capacitors which having good performance at high frequency range, however its film becomes thick on practical use since dielectric ratio is small, as a result, L value becomes large and the resonance point occurs over operation range, so it is sure a failure as a capacitor after all.

Therefore our company use oxide aluminium foil which has lowest loss, and make it extremely thin, and miniaturize its area as incomparably small which impossible for any other kinds of capacitors, and then the resonance point going up, moreover cancelling the resonance by Super E-Caps technology.

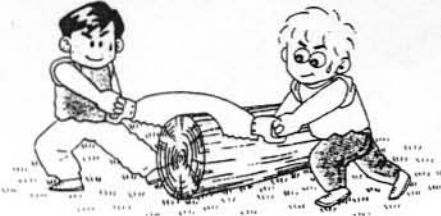
As the distortion characteristics of FIGURE 1 shows, ceramic capacitors generate enormous distortion noise unrelated to its capacitance or E.S.R. value. It's very large comparing to the average value of semi conductors, it's about -120db. The line c in FIGURE 1 shows an extremely small capacitance one used in a converter of satellite antennas, just the single capacitor makes S/N ratio of receivers decline sharply. On the other hand, Black Gate Hi-Q has an overwhelming difference of 40 to 100db comparing to b or c, therefore the capacitor can improve S/N ratio drastically.

FIGURE 2 shows impedance and E.S.R.characteristic of Hi-Q, and there is a resonance point whereas it's hard to be measured. Then connecting Hi-Qs by Super E-Caps*³ system to cancel resonance, so the capacitance becomes double, but the result is well with no bad influence. It can operate beyond 10GHz.

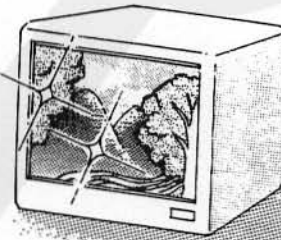
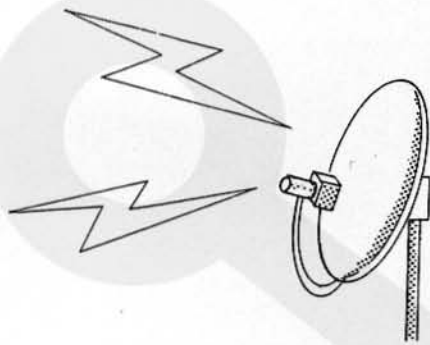
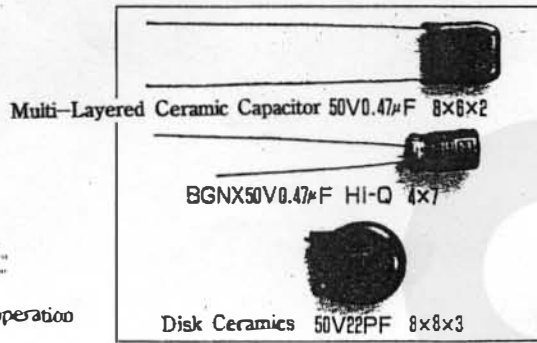
When replacing a capacitor c inside an above BS converter with the Super E-Caps Black Gate Hi-Q, the distortion noise is cancelled as expected, the picture becomes clear, the resolution and sensitivity is graded up much, and it is proved that it improves S/N ratio.

Refer to *¹...Technical Report No.35, *²...No.37, *³...No.68

Black Gate-N
Non-Polarized® Super E-Caps®



Power can be applied in both directions through cooperation of this pair. They're strongest on earth!



Please try to replace countless ceramic capacitors in all of radio communication equipment such as tuners, auto radioes, or bypass and coupling capacitors inside televisions, etc., with Black Gate Hi-Qs completely and see them. All equipment is freed from harmful ceramics distortion and the S/N ratio is improved incredibly. This is the birth of the dream capacitor! Finally, Black Gate becomes almighty over the digital transmission of all frequency ranges from audio frequency to GHz.

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Refer to Technical Report No.98 for Black Gate-NX Hi-Q 50V 0.1µF

Figure 1 BG-NX 50V0.47µF Hi-Q and Ceramics Capacitors, Distortion Characteristics Comparison

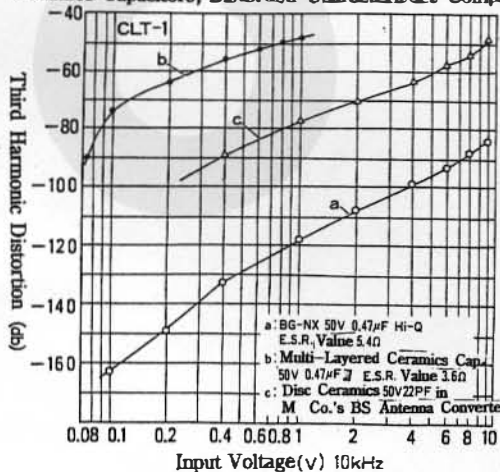
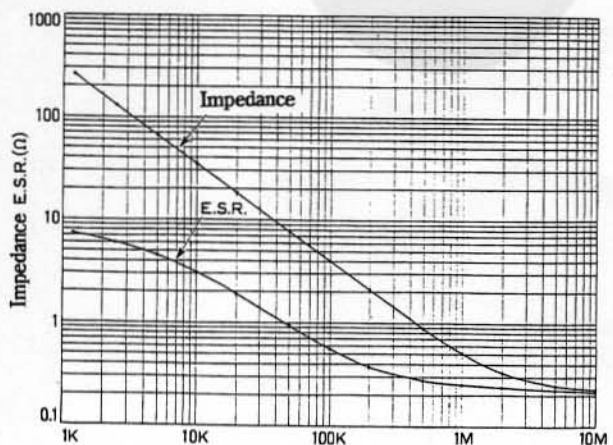
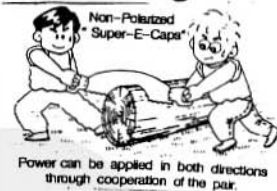


Figure 2 BG-NX 50V 0.47µF Impedance E.S.R.



“Super E-Caps” revive FM sound as the best
 FM can be higher grade and more economical with BG-NX

☆ Super E-Caps series vol.8 ☆



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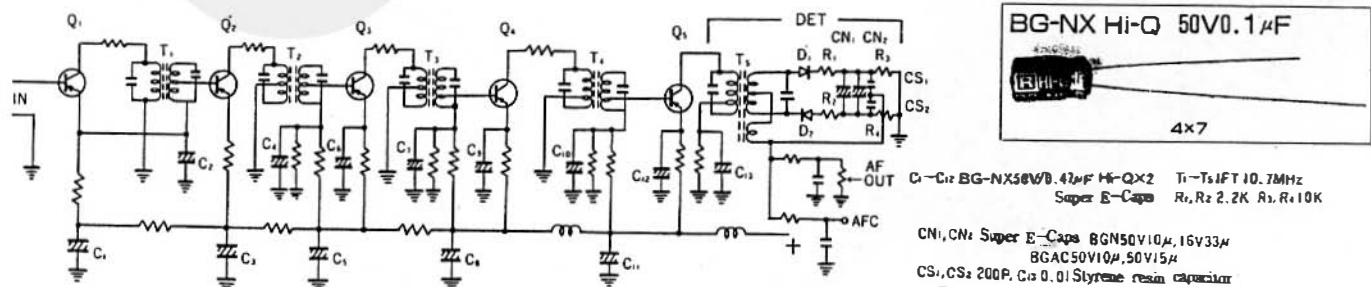
Many people think the tone quality of FM is inferior to the one of record. When the FM source is the same record as you listen on your player, the tone quality which once going through a FM receiver becomes certainly worse. This is not because of a defect of FM system, but the main cause comes from a wave detector or ceramic capacitors in the set.

In the case of a ratio(FM) detector DET circuit in figure below, which is widely used, the tone quality mainly depends on smoothing capacitors C_{N1} , C_{N2} which are set at an output side of diode D_1 , D_2 . Not only audio signals but also high frequency wave are flowing into the capacitors, and the caps should be symmetrical and have no distortion electrically. Moreover, they have to be linear impedance and phase characteristics over high frequency wave, however there's no such a capacitor on the market. Ordinary electrolytic capacitors are non-symmetrical and having inner resonance point, therefore inside both impedance and phase characteristics are completely disordered. The wonderful features originally FM has are almost lost when the signals go through a detector. As a result, the tone quality is far from brilliant.

On the other hand, Super E-Caps wave detector which use non-polarized Black Gates C_{N1} and C_{N2} making up Super E-Caps satisfies above necessary conditions perfectly, therefore the detection becomes no distortion and real-linear, it's the only one in the world. Of course, the output distortion noise decreases remarkably, the resolution improves, and it can receive marvelous sound for the first time. Now, FM system revives completely.

The second problem is ceramic capacitors $C_1 - C_{13}$ which used a lot in high frequency bypass coupling in each stage of intermediate frequency(IF) $Q_1 - Q_5$. As we introduced in Jelmax Technical Report No.86, ceramic ones generate non-linear distortion terribly in high frequency, the difference between the caps and our brand-new product BG-NX Hi-Q becomes 60db(a thousand times!) per just one piece. Therefore large distortion noise generated from high frequency IF each stage decreases by replacing with BG-NX Hi-Qs, then FM threshold level improves, S/N and tone quality graded up rapidly. The perfect DX, which had been impossible becomes real now!

By these above improvements, the quality of FM broadcasting such as a studio live and a live tape recorded by overseas' stations surpasses the one of a record, and it has been highlighted as the best sound source. Don't miss it, for all music lovers!



Unconventional BG–WK POWER TANK is born suppresses noise completely!

Remove an unavoidable self–interference occurred in a common power supply handles pulse: The most important process for your set!

A lot kinds of electronic equipment which handles with pulse such as a television has a cathode ray tube imaging display device inside. Without exception, it has a horizontal fly back circuit for an electron–beam deflection of fairly large voltage. In fact, this is the biggest source of noise generation.

The noise invades other numerous circuits connected with a same power supply directly, and self–interference occurs inside because the noise is unexpectedly larger than that of coming from outside.

(1) Removing a harmful effect on picture quality especially for color reproducing circuit

While horizontal output pulse flies back, a large ringing power including odd numbers harmonics generates. (See Figure 1) This is the cause of noise generation, and the ringing power goes through a power supply and hits other circuits directly. It damages Y signals enormously that deciding the picture quality, and also deteriorates the color signals of I and Q and the operation of a phase detecting circuit particularly.

A conventional electrolytic capacitor for smoothing noise is polarized, so it can smooth noise in only one direction. The opposite direction is left uncontrolled, and makes the performance of other circuits connected with the same power supply had.

Then, to replace such a capacitor with non–polarized Black Gate, the noise has vanished completely and picture quality has improved drastically because BG can work in the both directions. Now, Black Gate has got much attention for the perfect non–polarized operation of wide voltage range by even a single piece.

(2) The new brand BG–WK, the revolutionary structure

This Black Gate looks like a polarized electrolytic capacitor in appearance, yet it is entirely different. The inside is asymmetrical and non–polarized structure which has two different working voltages: the +pole is 200V and the –pole is 100V.

This is unconventional as well as the most reasonable structure because when a pulse voltage at its peak 100V adds to the ringing power that superposes on a driving DC voltage of around 130V that is rectified by 100V power supply can be smoothed and bypassed as no distortion, low loss, and ultra high speed. (See Figure 2)



(BG-WK POWER TANK/ Part 1)

At last, Jelmax has completed a state-of-the-art BG-WK 200V 220μF: high performance and very efficient capacitor for various characteristics in the same size as a conventional one.

Ordinarily, a ringing noise superposed on a conventional smoothing capacitor is all under 100V, therefore BG-WK can eliminate the noise completely. This is certainly the indispensable weapon against self-interference which HDTV has to face in the near future. We are going to explain why is the capacitor a power tank type in the next issue for a switching power supply.

(3) The power increases a lot and the life becomes longer by several times

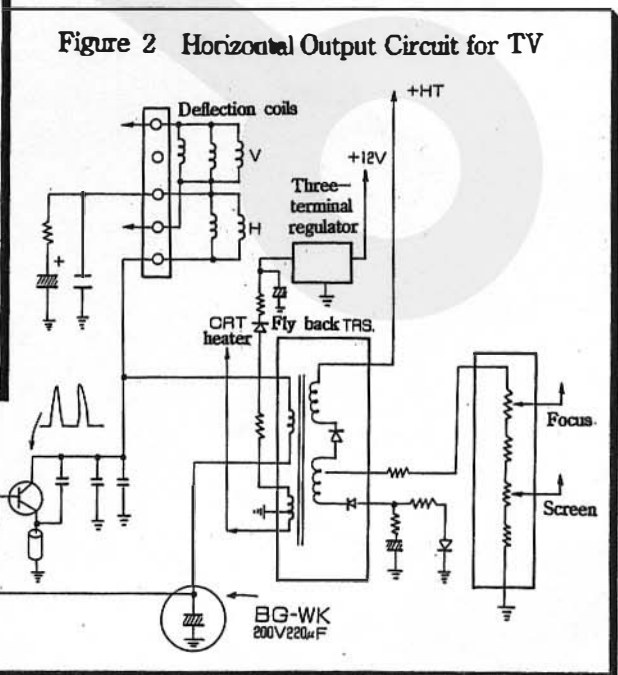
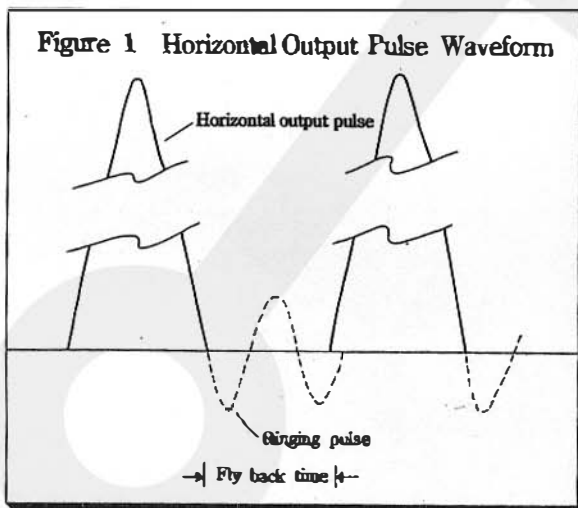
In a conventional capacitor, the reverse pulse is directly absorbed inside and becomes loss power that would make the temperature of electrolyte rises. It dries up faster and the life of the capacitor becomes shorter. TV monitors, image receiving devices and PCs, all of them which are very frequently used suffer much for this.

On the other hand, the inner loss of BG-WK is the only E.S.R. due to a non-polarized structure, so the temperature rises just a little.

The electrolyte inside is consumed as less as 1/100 compared to conventional ones. Therefore the power has increased and the life has become as much as 3 to 5 times longer!

We believe that these are wonderful news for TV stations that have to spend a lot of money to maintain VDT, for companies using OA, and medical institutions using high class medical equipment.

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30x25

Black Gate-WK₁ POWER TANK: The best capacitor ultra high speed charge and discharge at primary side

The great power for high efficiency, low noise, long life and miniaturization

Continued from the last Report No.89, this subject is for an important switching power supply. As electronic equipment advances, power supplies inside need to be **miniaturized, high-powered, and long life.**

The idea that the size would become smaller as a sampling rate becomes higher has been out of date and the rate has already reached the limit as around 100KSPS at present. This is because an existing main capacitor for charge and discharge at primary side lacks ability.

[Why does the electrolytic capacitor at primary side prevent to miniaturize a power supply]

When charging or discharging stored electric charge at ultra high speed, a main electrolytic capacitor needs the ability of following the speed. But any conventional capacitors cannot do this due to ion transferring structure—Ion is originally impossible to move at high speed. The output wave that should be square form loses its shape to triangle wave as Figure 1, and the output circuit always lacks transmission power and several parts in there heat up by overload. Thus the life becomes short.

Then, Black Gate-WK has finally been created to satisfy the expectation of the world hoping a brand new electrolytic capacitor that can operate thoroughly at ultra high speed.

(1) The internal structure is The Transcendent Electron Transfer

The inside of BG-WK POWER TANK is The Transcendent Electron Transfer: the internal signals are transferred at the speed of electron moving. Therefore the transferring velocity improves to GHz*¹; and the signal wave keeps square form without declining of the power by intermittent at ultra high speed. The function will not deteriorate by increasing of the sampling rate.

(2) The perfect non-polarized structure

The POWER TANK looks like polarized, but it is unprecedented non-polarized and asymmetrical structure having two different voltage proofs of 100V as +pole and 200V as -pole. This is the most reasonable and noiseless capacitor*² to charge and discharge square wave of its peak 130V for intermitting DC of around 130V which is turned from AC 100V by directly rectified.

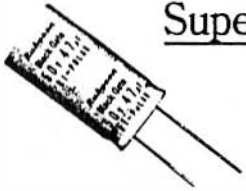
(3) Almost perfectly lossless and no heating up

The POWER TANK is non-polarized like a film capacitor, so the loss is only E.S.R.*³ (about 80mΩ) due to reactance mostly. When load current is 2.0A, the loss is only 0.32A, thus the heat hardly generates. This capacitor is small sized but has enough performance for power supplies of medical or OA equipment because of the large capacitance having as much as 200W. That is why we name this "POWER TANK".

Super E-Caps bias circuit for vacuum tube amplifier creates ultimate sound

It's also very effective for a heater lighting circuit

☆ Super E-Caps series vol.9 ☆



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Before Black Gate was invented, there had always been a question about a vacuum tube amplifier, which was better in quality, self-bias or fixed-bias. However, as we developed a self-bias circuit with non-polarized Black Gates*¹, we were aware that self-bias is overwhelmingly superior in tone quality without doubt.

There was a vacuum tube pre-amplifier set manufacture in the U.S. which once featured a fixed-bias one, but later they changed to a self-bias one because they noticed that they had made a mistake. It tells us there is a clear difference between them in S/N ratio. At this time, we're going to introduce self-bias circuits with Super E-Caps*² which is aimed at higher grade, and we'll pursue ultimate sound.

FIGURE 1 is a pentode tube and beam tube output circuit, when connect cathode and earth potential by Super E-Caps C₁₁ and C₁₂ of which lead wires are twisted each other at the shortest length, the cathode becomes perfect earth potential over high-frequency range, and noise which had been generated and fed back to grid are all cancelled, then, unprecedented high S/N level will be obtained. Therefore the sound of the circuit becomes more high-graded than any other circuit including a fixed bias one, of course. And BG-WKZ should be used for bypass coupling C₁₃ of high tension B+ for the best.

FIGURE 2 is an example of a filament type triode of large voltage, when earth the either end of filaments by Super E-Caps connection made by a pair of BG-N 100V 330μF, it is the best for output circuits such as 845, 300B, and 211, etc. At the same time, replace an ordinary heater and a filament lighting circuit with a Super E-Caps circuit like one of FIGURE 3, S/N will be more and more improved. Although a pulsating current of a rectifier has higher order pulsating noise, Super E-Caps cancell all of these. Not a few enthusiastic fans of Black Gate who practiced the above examples are amazed that it is very effective not only for a filament lighting circuit, but also for a cathode one.

Below figures are examples of single amplifiers, but we can say these are the same things as push-pull ones. And another important thing is tone quality is decided by distortion generated from circuit parts except vacuum tubes, therefore all of electrolytic capacitors inside should be replaced with Black Gates, and please avoid using ceramics and tantalum*³ capacitors, and so on which is the root of all evil for distortion, or everything will be spoiled.

*¹ - Refer to Technical Report No.49

*² - No.68

*³ - No.37 and 50

FIGURE 1 Multi Grid Tube Output Circuit

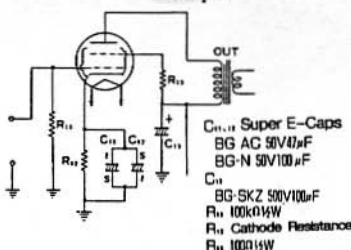


FIGURE 2 Filament Type Triode

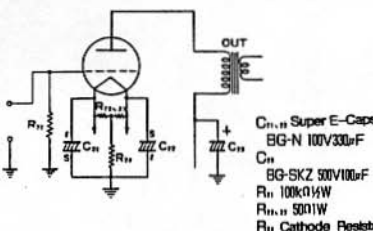
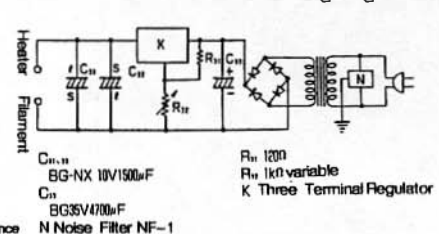


FIGURE 3 Heater and Filament Lighting Circuit



UNBELIEVABLE CAPACITOR, BLACK GATE IMPROVES S/N IN CIRCUIT DRAMATICALLY

DETECTING LESIONS RANGING FROM 1mm to 10 mm
IS NOW POSSIBLE.



Medical Doctor, Mr. S in Fukuoka Pref. is an enthusiastic audio-phile. One day he had a chance to listen to the audio amplifier in which all capacitors were replaced with Black Gate and he was enchanted by clear and bright sound coming from the audio system. After this experience, he replaced all capacitors in his CD players and D/A converter, and then TV set, video, and BS tuner with Black Gate capacitors enjoying new world of audio video equipment.

At this point he came to the idea that those effect might extended to the medical instruments. So he started to replace capacitors in ultrasound system with Black Gate. The result was far beyond his expectation. The resolution (S/N) enhanced drastically. He sent us the image in which the result was clear, although the idling process(*) had not finished yet.

Why could he get such a successful result? This is because the signal inside of an electronic circuit is transferred by electron (electron transfer), which means transmission is carried out by the speed of electron, while signal is transferred by ion in case of ordinary electrolytic capacitor in circuit. Due to the slow movement of ions, signal gets big distortion in power, phase and non-linearity. Consequently signal deform and dropout occur.

These distortion cannot be eliminated by circuit technique. As Black Gate is electron transfer, the signal transmits steadily without distortion, deterioration of quality and dropout. There is no other capacitor than Black Gate which brings extremely high S/N ratio.

*The idling process

Once Black Gate capacitor mounted on an electronic device is actuated, a signal current flows into it and then the electrodes are gradually activated, reducing nonlinear distortion and phase distortion dramatically while power transfer efficiency being enhanced. Although the time for this process varies with capacitance, voltage and signal level, total of about 30 hours is the standard. Once this process of idling is completed, the effect continues as long as the capacitor is kept at the same place, or as the operating environment is changed. The effect of idling has been proved with all types of electronic equipment— analog, digital, high-frequency and others. It must be noted that idling is different from aging which applies a direct current voltage without giving signals.

The sound covering effect of speakers by an interference is the great enemy for Hi-Fi.
 If you use just one piece of Black Gate Non-polarized 100V/330μF,
 you'll get the wonderful result like magic.

In the one amplifier with multi-speakers system, the sound covering effect is certain to happen because of the interference depend on each of speakers. Talking about a camera, the light covering happens when you take a picture against light, so there's a prevention by the hood for shading the light. However, there's no such good countermeasure for sound wave, it's defenseless. The sound wave generated from speakers interfere each other, then the cross modulation effect happens. Yet nobody notices and talks about it. We'll give you the general causes for this problem as follows:

*** Mechanical cause ***

In fact, the diaphragm vibrates pretty much even outside of its reproducing band, and generates harmonic distortion a lot, then it interferes the sound wave of other frequency bands: this is the sound covering effect. Especially, the low frequency band has a big influence over the middle and high ones.

*** Electrical cause ***

The driving power of a woofer is always large, therefore its non-linear distortion of capacitors which is paralleled by the network and the harmful distortion signals which is generated by the reflection from the middle & high freq. bands of the outside of the inner resonance point re-invade the middle and high freq. bands which have the network in common through the lines. It causes the sound covering effect among the signals each other.

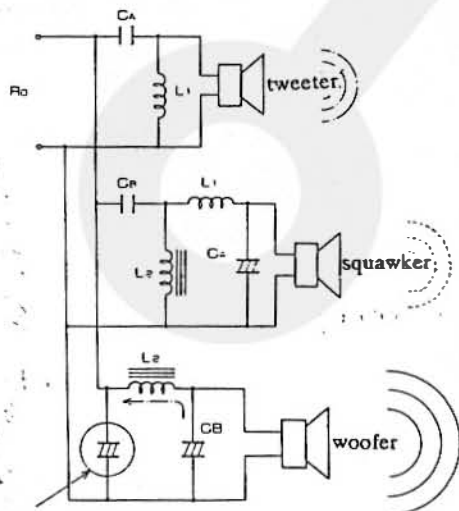
Effective Measures

The way is easy. Showing by the figure, all you have to do is just connecting BG-N 100V/330μF in parallel when the impedance of the line is under 8Ω.

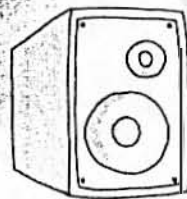
It looks simple, but the result will be great. We're not going to explain the reason in detail because it's complicated, but the rare and valuable purification which only Black Gate N(Non-polarized) has prevent the sound covering effect as if by magic, then the clearness, separation, sound staging and stereophonic effect will be improved much. It's a wonder that the sound volume will be up some.

You're make sure to use the amplifier replaced all caps. with Black Gates. There's a lot of unsolved matters in audio-visuals, it's hard to master. We're going to introduce the perfect measure for the sound covering effect in the next report. Will you please wait a while.

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BGN100V/330μF 12db/Octave



$$C = \frac{\sqrt{2}}{4\pi f_0 R_0}$$

$$L = \frac{\sqrt{2} R_0}{2\pi f_0}$$

f₀: Crossover frequency
 R₀: Impedance for each speakers!

Super E-Caps series 10

“SUPER E-CAPS” removes the cancer, the sound covering effect in a speaker system. You can change your room to a music hall easily! (PART 2)

As we mentioned in our last Technical Report No.94, this report will tell you the advanced measure for the sound covering effect by Super E-caps, the ultimate way!

The capacitor we're going to use is Black Gate-AC, of which foils are plain(no-etching), and it is non-polarized, has no distortion and the efficiency is the best in Black Gates. However, there is a little L-component due to the foil winding inside, because of that, the sound covering effect will happen. Therefore, if you remove the cause, the epoch-making super network will be completed. Before you try, the capacitors of the amplifier has to be replaced with Black Gates. Because it's meaningless to improve for the network which still generates distortion. You won't get the correct result.

[Basic way of Thinking]

Our ears are very sharp for the middle frequency band of 200Hz to 600Hz. Because this band includes human voice and the basic musical scale, e.g. "A" as 410/440Hz, and it is frequently heard in everyday life. Therefore, in three speakers system, please choose the best one for the middle freq.band, then you can get rid of the sound covering effect generated from the low freq.band which has an influence on the middle one. It will be very clear sound that wasn't existed before. For this improvement, would you please start with the low freq.band first.

Many people misunderstand that the deviation of the inductance L and the capacitance C influence the sound quality directly. In fact, we can hardly recognize the difference of around 10%, however, the distortion of L or C is very important. You'll understand when you hear the difference of the tone quality between an ordinary capacitor and the Black Gate even their capacitance are the same.

[Explanation of the Structure]

As the figure 1, there are two Black Gate-ACs C_{11}, C_{12} have the same capacitance. They have E.S.R.(Equivalent Series Resistance) R_{S1}, R_{S2} and the ideal capacities C_{N1}, C_{N2} and inside inductance L_1, L_2 , then the magnetomotive force and the electromotive force are generated when electric current runs inside. If you connect the lead wires in parallel as the structure in the figure, magnet power and voltage are cancelled each other, and the two BG-ACs become Super E-Caps of which capacity value becomes double, the E.S.R.becomes 1/2 between the terminals S_1, S_2 , then the outside of woofer will short completely, this brings the wonderful effect which the sound wave and the voltage of the covering effect will disappear. This is the birth of the non-reflected capacitor.

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Black Gate AC
50V 15 F
Non-Polarized

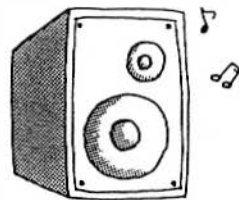


Figure 1:

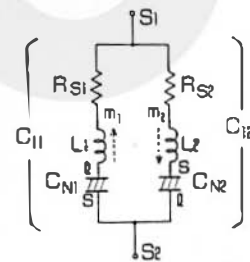
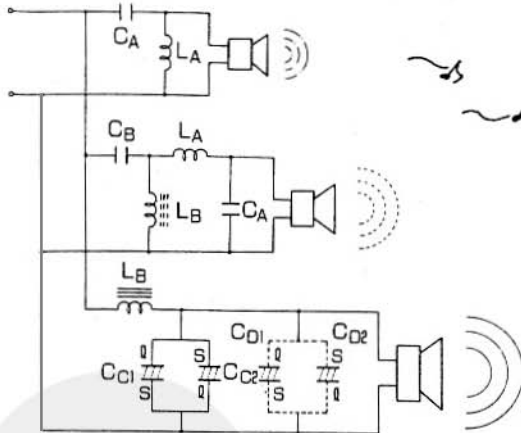


Figure 2: 12db/octave network by Super E-Caps



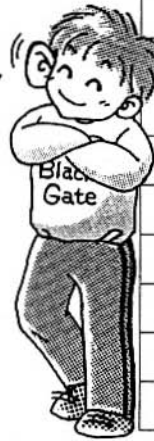
$$C = \frac{\sqrt{2}}{4\pi f_o R_o}$$

$$L = \frac{\sqrt{2} R_o}{2\pi f_o}$$

R_o: Impedance of each speakers
f_o: Crossover frequency

Chart 1: Needed BG-ACs depend on frequencies for Super E-Caps making Super Network

f _o Hz	L _{mm}	C _{μF}	C _{C1} /C _{C2} +C ₀₁ /C ₀₂ μF	合計C _{μF}
150	12.0	93.8	47 ×2	94
200	9.0	70.6	22 ×2 15 ×2	74
250	7.2	56.5	22 ×2 6.8×2	57.6
300	6.0	47.1	22 ×2	44
400	4.5	35.3	10 ×2 6.8×2	33.6
500	3.6	28.3	6.8×2 6.8×2	27.2
*600	3.0	23.5	22 ×1	22
700	2.6	20.2	10 ×2	20



*The normal network applied to this band (not Super E-Caps)

In the case of the network of the figure 2, the sound covering effect is generated for about 80mV, -36db when you put the signals voltage of 5V with using an ordinary electrolytic capacitor. On the other hand, this effect will be reduced to 17mV, -49db with using just one piece of BG-AC. Moreover, if you make the network Super E-Caps, the value becomes 3mV, -62db, it almost disappears. There is the little covering from the middle frequency band to the high one, but its level is normally very low and it doesn't have much influence, therefore you don't have to change the network of the middle frequency band CA, CB to Super E-Caps.

The chart 1 is the list of BG-ACs for making the network of 12db octave. When the frequency is 600Hz, you'll use just one piece of BG-AC due to the kinds of BG capacitance. For other frequencies, you'll use two or four pieces of ACs to make Super E-Caps for the super network. The deviation doesn't influence to the sound quality.

[The Conclusion]

There is another way to decrease the only high frequency band with adding other parts to the woofer's diaphragm, however, this way has the week point that remove even the needed information of the low freq.band, therefore we don't recommend this.

On the other hand, there is no any unnatural part in the super network of Super E-Caps, the sound is the clearest than any other system, it has full of reality, the sound staging and stereophonic effect is overwhelming. You'll know the sound from your speakers become endlessly close to the one of a live performance in a music hall, then you're amazed by the great power of Black Gate.

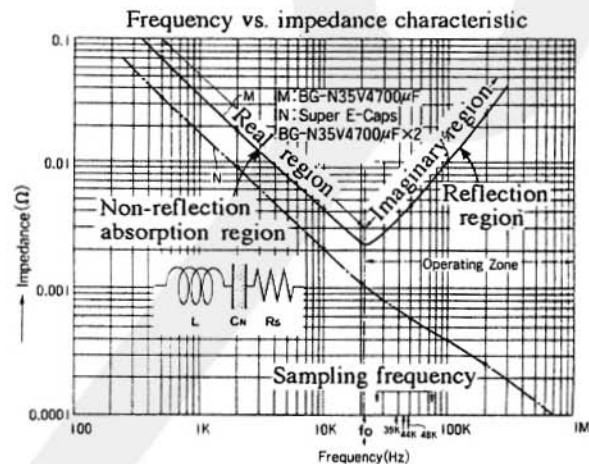
All capacitors have internal reflection, except for the "Super E-Caps"

Using "Super E-Caps" is the only available alternative for overcoming the capacitance of densely packed digital circuits

All capacitors are built with rolled their electrodes in a way that they cannot eliminate internal resonance. The impedance curve of ordinary capacitors jumps sharply to the right of the "fo" point and has a "V" shaped curve, as shown in the figure right. The elevated portion comes from the "impedance" curve of the materials and construction, not from capacitor's function. Then energy is reflected instead of being absorbed so, in effect, all ordinary capacitors function to reflect the energy put into them. That is why ordinary capacitors cannot eliminate residual ripple-noise and why they produce EMI noise in power supply smoothing over a wide band of frequencies *1.



Real innovation in capacitors. The "Super E-Caps."



Designing equipment which integrates noise generating power supplies cannot possibly give the expected results. The only way to substantially resolve the noise is to make a capacitor which does not have a reflection capacity and which will reduce the impedance in a continuous fashion as the frequency increases. The "Super E-Caps," *2 the top of the Black Gate capacitor line, met this requirement for the first time in the world.

Although readers already know about the details of our "Super E-Caps" from our catalogue and published technical reports, we would like to describe the essential points as follows, for your consideration:

(1) Power supply noise vanishes

"The Super E-Caps" completely eliminate the ripple noise which occurs during pulse rectification. The noise level reduction is proportional to the total E.S.R value of the "Super E-Caps."

(2) No need for noise filters

If you just combine impedance elements with ordinary electrolytic capacitors, all you do is move out the impedance from the inside of the capacitors. This is just like collecting your trash inside corner of a room instead of taking it outside. When the "Super E-Caps" are used, the use of "L" elements is no longer needed.

(3) No need for EMI treatment

Power supplies using "Super E-Caps" do not produce any external reflection, so shielding is not required. In addition, no measures are needed to treat EMI noise. Therefore, the "Super E-Caps" offer unlimited cost savings.

(4) Eliminate interference between circuits

In densely packed digital circuits, pulse noises are mutually reinforcing and there are no counter measures available in their design. Only the "Super E-Caps" can eliminate this interference. The elimination provides dramatic effects and clears problems before they occur, which has been a headache for almost every engineer. Therefore, the amazing results, offered only by the "Super E-Caps" makes it the Gospel for the advancement of electronic technology. Everyone can expect great advancements in electronics.

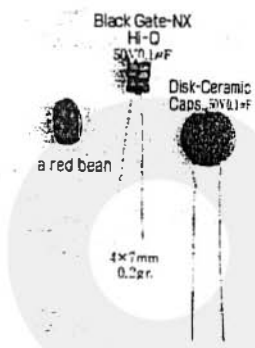
The superficial "re-organization" of corporations to make them efficient seeks to downplay the power of technology.

This is not the way to hit a homerun in business. We recommend the "Super E-Caps" to these worriers. The fruits of doing so will far exceed what they can imagine from corporate rationalization.

*1: See technical report No. 71.

*2: See our "Super E-Caps" catalog

HIGH FREQUENCY NON POLARIZED BG-NX Hi-Q 50V0.1 μ F FROM DC TO GIGAHERTZ HAS COMPLETED SAPPHIRE CAPACITOR WITH NO RESONANCE, LOW E.S.R. AND UNBELIEVABLE LOW DISTORTION



BGNX-HiQ has developed into BGNX-50V0.1 F_i/HiQ which has excellent quality and works from DC to gigahertz with no resonance as a result of reducing electrode area to the limit of manufacturing technology.

Film and mica capacitor arise internal resonance in this capacitance, consequently they are not able to operate in high-frequency. Ceramic capacitor, also, worsen S/N in the set because of large distortion noise from high dielectric material. Those capacitors, therefore, are not suitable for these purpose.

No capacitor fully works for every frequency band. We made extra thin dielectric to increase capacitance per area, and then minimized the size of electrode while maintaining the capacitance. Finally, sandwiching both electrodes with patented graphite particle containing dielectric material of loss-free electron transfer together with aluminum oxide thin layer, we expelled ion transfer which is the cause of inefficient quality of capacitors. As a result, the dielectric with aluminum oxide (AL₂O₃), the same quality as sapphire, demonstrates its power hundred percent. We may call it the appearance of sapphire capacitor. It also means the appearance of dream capacitor which attained all the condition such as no resonance, low E.S.R. and extra low distortion.

- *No limitation to frequency band :as is shown on fig. 1, in terms of impedance characteristics, resonance point is below measuring range.
- *Extra low loss, low E.S.R. :as same level as foil type polypropylene E.S.R.:1.5Δ on 100KHz, it is unprecedentedly good at high frequency.
- *Extra low distortion noise :as is shown in fig.2, distortion decreased -160db that is 60db lesser than ceramic capacitor. Tremendous improvement of S/N is unquestionable.
- *Size, cost :as is shown on the picture, extra small size of 4x7mm, 0.2g with copper lead and low cost.
- *Connection with BG Super E-Caps is OK:
to make assurance doubly sure, BG Super E-caps connection is recommended in high frequency as GHz

This capacitor has no limitation of frequency and application, and is suitable to apply to all electric devices up to 50V. It will contribute to low noise measure that Personal Handy Phone Systems and transmitting device of multi media require.

Fig.1 Impedance characteristics of BGNX-50V0.1 μ F HiQ and film capacitor

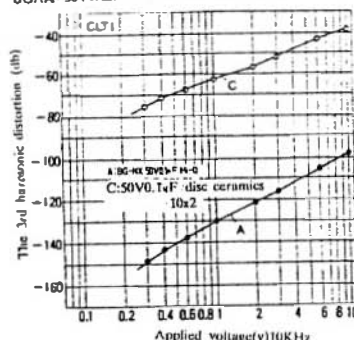
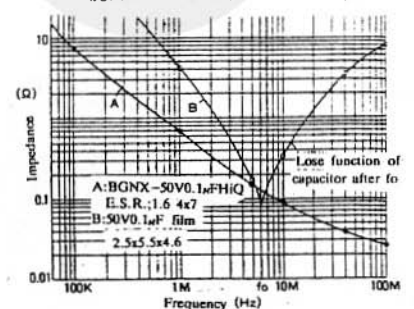


Fig.2 Distortion characteristics of BGNX-50V0.1 μ F HiQ and ceramics capacitor

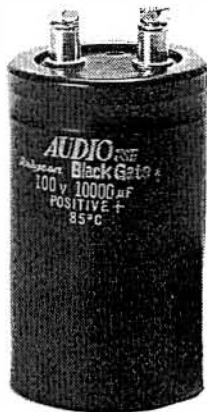


YOUR AUDIO SYSTEM CREATES ABSOLUTE SOUND BY BLACK GATE ONCE YOU REPLACE ALL CAPACITORS WITH BLACK GATE

BLACK GATE'S ABILITY IS FIVE TIMES as MUCH as CONVENTIONAL CAPACITORS. YOU DON'T NEED TO CONCERN ABOUT SPACE.

Before using Black Gate, everyone wonders "Does the sound become such a good quality only by the replacement of capacitors with Black Gate?" However, everyone who experienced Black Gate admires the quality and send us letters of gratitude. We remember our early days when we first listened to our audio system with Black Gate and moved deeply.

Actually, ion transfer which is the only defect in the circuit by replacing capacitors with Black Gate is expelled and all the circuit is activated by electron transfer as the result of exchange. As a matter of course everyone was surprised at the revolutionary improvement.



BG-K 100V 10000µF



BG-N 100V 2200µF

These are several points if you would like to replace capacitors in your equipment with Black Gate.

1) Space for replacement

No room for replacement? No problem. Black Gate has more than twice to five times ability compared to conventional ones. Therefore as far as you keep voltage, half of the capacitance would be enough. If your Black Gate is too tall to set up, you can lay it down and extend lead wire. Ion transfer has low ability for its capacitance therefore Jelmax's Black Gate 10000µF is worth 30000µF to 50000µF conventional ones. If you prefer to use BG-N, capacitance of 2200µF is O.K.

2) Change all capacitors

You should not keep any of conventional ones. Only a conventional one in equipment is enough to spoil whole performance. You will realize how badly ion distortion damage the sound when you replace the last one by Black Gate. Most people believe distortion as true sound.

3) Selection of Black Gate

BG-FK and BG-N are recommended for NF, bias and coupling circuit, though standard type would be available.

4) Idling process

Since around thirty hours for idling is required at least, you need not worry about overdoing. It is fun to observe sound changing of your audio equipment while idling.

"SUPER E-CAPS" IS ABSOLUTELY NOISELESS and A PIONEER IN THE FIELD OF DIGITAL TRANSMISSION



What is ideal power source?

After we succeeded in developing perfect noiseless secondary side SR power supply, we have recently developed high-voltage SUPER E-CAPS for primary side which is widely used for image machinery, so that all noise is cut down. At the same time it still demonstrates the characteristics of phase stability, which only SUPER E-CAPS has. Therefore we proudly announce the birth of an ideal power supply to the world. (US PATENT No.5,379,181)

The structure of high-voltage SUPER E-CAPS

Using a pair of same conditioning electrodes and a newly developed separator, JELMAX has completed high-voltage non-polarized BLACK GATE which has perfect symmetric characteristics working up to ultrahigh frequency, paired them as SUPER E-CAPS connection, and finally created ideally efficient high-voltage SUPER E-CAPS which works up to GHz. As the result, perfect noiseless characteristics covering overall frequency is attained. In addition, it has solved the big problem of pulse interval disturbance of digital signal while passing through the capacitor. It is a revolutionary result that any kind of capacitor has yet been obtained. SUPER E-CAPS eliminates phase change caused by inner resonance which ordinary capacitor always has.

List of high-voltage SUPER E-CAPS

Since it has no limitation of use, it is classified according to power, power supply zone and smoothing ability. All power supply for any kind of electronic devices will be covered by these four kinds of Black Gate listed below.

Power supply zone	Up to 1.2KW	Up to 2.5KW	Application
100Vzone AC80V ~123V	BG-NH 160V 100 μ Fx2 22x25 17g.	BG-NH 160V 220 μ Fx2 30x25 32g.	PC BOARD
200VZONE AC90V ~264V	BG-NH 350V 68 μ Fx2 30x25 32g.	BG-NH 350V 150 μ Fx2 35x35 56g.	PC BOARD

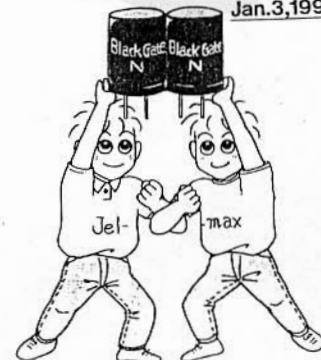
What is the meaning of SUPER E-CAPS ?

These days everyone is talking of digitization; in the area of broadcasting, medical, DVD, multi media and so on. But no one talks of power supply which supports these systems. If you don't have adequate capacitors in your power supply, they might not work well. Power supply with Black Gate SUPER E-CAPS can only survive next age. JELMAX is always looking forward next century.

NEW

U.S. Patent NO.5,379,181

Jan.3,1995



BLACK GATE CAPACITOR

GURANTEED HIGH QUALITY SOUND
at STATION, in AUDITORIUM, or in STUDIO...



U.S. Patent No. 5,379,181



BG-PK		
50V	4.7µF	5X7
50V	10µF	6.3X7
50V	22µF	6.3X7
35V	33µF	6.3X7
25V	47µF	6.3X7

BG-N		
50V	1µF	5X11
50V	4.7µF	5X11
50V	10µF	6.3X11
16V	33µF	6.3X11
50V	47µF	1.5X24

BG-N Power		
50V	1000µF	22X35
35V	4700µF	40X40



3rd Harmonic Distortion on BLACK GATE PK



Current (A) @ 100Hz	Dry type aluminum capacitor (100µF/50V)	Wet type conventional capacitor (100µF/50V)	Black Gate PK (100µF/50V)
0.1	-80	-100	-110
0.2	-85	-105	-115
0.4	-90	-110	-120
0.6	-95	-115	-125
0.8	-100	-120	-130
1.0	-105	-125	-135

A mixing room is the kitchen of sound, a place where you can show off your professional skills by cutting or connecting signals from a variety of sound sources and partly mix signal levels with making them up and down.

On the surface of a mixing console contains first grade switches, however, the inside of it has several amplifiers and equalizers consists of thousands of varieties of small electrolytic capacitors of poor quality, each of these capacitors generate distortion noise and damage information signals, and deteriorate tone quality.

Jelmax Black Gate PK series will solve the problem because it is an optimum capacitor for signal levels of a mixer. One piece of BG-PK reduces distortion by amazingly -20 to -40db (See the Figure), therefore replacing all capacitors in the whole circuits with this capacitor, the difference will be beyond belief.

Be sure to use BG-N (Non-Polarized Black Gate: The red one in the Picture) for a coupling circuit between zero potential because ordinary polarized ones are fatal for the performance of the circuit.

A power supply needs to be replaced its capacitors with BG as well. The BG-N Super E-Caps connection will be the best choice (Refer to the Jelmax Super E-Caps catalog for details).

Professionals enthusiastically endorse the excellent performance of Black Gate - makes sound brighter than original! The Black Gate capacitor has a life span five times longer than a conventional capacitor. Try BG for ideal sound.

New Product

The ultimate capacitor Black Gate—WKZ for tube use amplifier has completed

All defect of tube use amplifier is expelled and real sound arises



Nowadays tubes for audio equipment become easy to obtain. Consequently, all over the world, there is a sign of revival of tube amplifier. However, in the case of tube amplifier we can hardly satisfy with the sound quality because it heavily depends on high voltage electrolytic capacitor. Traditional technology is not eligible for high voltage electrolytic capacitor which adapts perfectly to high operation signal action of tube amplifier.

Jelmax carried out bold and thorough reform of the inside structure of capacitor which matched to dynamic characteristics and created new revolutionary structure(*1). What we did was to introduce gate electrode layer using conductive particles into high voltage electrolytic capacitor for the first time.

After more than three years research and development, we have succeeded in invention of this new product, BG—WKZ. Now, we launch BG—WKZ to the market all over the world with pride.

[The feature of sound with BG—WKZ]

You will be overwhelmed by the presence of ultimate quietness and torrential quantity of information. Moreover, most people will be thrilled at unusual stability of sound position and distance. Gate electrodes layer with patented conductive particle put into original action for the first time when it is used in high voltage electrolytic capacitor. Since signal phase is perfectly stabilize, true value of "Black Gate" is demonstrated one hundred percent. While testing Black Gate, we had listened to the record of famous woman pianist and felt as if the Muse was there playing the piano. That is why we named BG—WKZ "Heart of Muse"

[Caution]

To draw out the ability of BG—WKZ fully, please replace all other electrolytic capacitors with Black Gate. Since power smoothing choke coil(*2) is also harmful because of sound distortion, use resistors. Rectification tube is not necessary so that diode only is acceptable. D.C.(*3) should be cut by BG—N for NF loop. These are the "must" for high fidelity sound system. If you follow thus, you will enjoy the world's best sound.

By the way, BG—SKZ has fulfilled its important mission and is to be retired for transferring the position to BG—WKZ.

size	BG-SKZ	BG-WKZ
500V 100µF×2	35×120	35×120
500V 47µF×2	35×60	35×65
500V 100µF	35×60	35×65
350V 100µF×2	35×60	35×60
350V 220µF×2	35×100	35×100

*1 Technical Report No.90

*2 Technical Report No.32

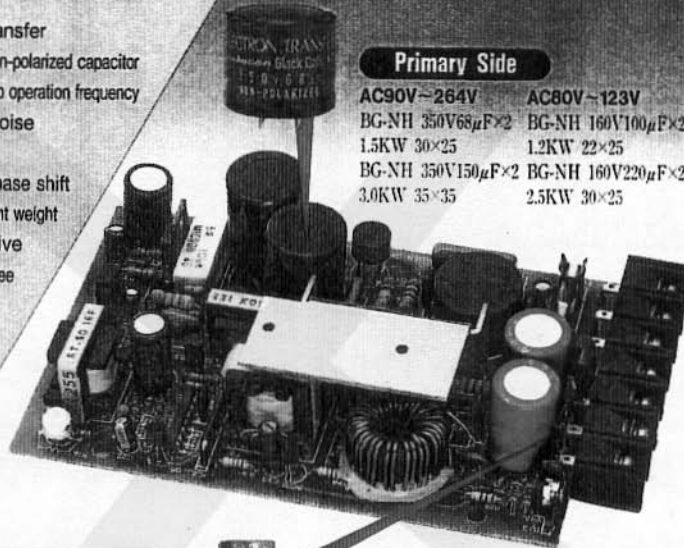
*3 Technical Report No.55

YOU DON'T KNOW HOW MUCH NOISE CAPACITOR GENERATES.

SUPER E-CAPS cuts down circuit noise from capacitors and brings crisp, clear diagnostic-quality IMAGE.

SUPER E-CAPS features:

- Electron transfer
- Completely non-polarized capacitor
- No limitation to operation frequency
- No ripple noise
- Long life
- No digital phase shift
- Small size, light weight
- Cost-effective
- Completely free from every regulation



Primary Side

AC90V~264V	AC80V~123V
BG-NH 350V68 μ F \times 2	BG-NH 160V100 μ F \times 2
1.5KW 30 \times 25	1.2KW 22 \times 25
BG-NH 350V150 μ F \times 2	BG-NH 160V220 μ F \times 2
3.0KW 35 \times 35	2.5KW 30 \times 25

Secondary Side

DC/DC converters

Output:DC 3.3V~5V

BG-NX 6.3V 470 μ F 12.5 \times 24

BG-NX 6.3V 220 μ F 8 \times 11

BG-NX 6.3V 100 μ F 6.3 \times 11

AC/DC

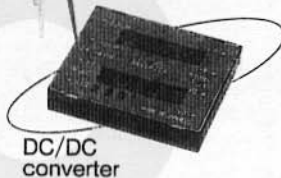
Output:DC 5V~35V

BG-NX36V 680 μ F 16 \times 24

BG-NX25V 1000 μ F 16 \times 24

BG-NX10V 1500 μ F 16 \times 24

■ H are all unfiled to be 25mm max and D to be 16mm. Other type BG-N having large capacitance 35V 4700 μ F and BG-N 50V 1000 μ F are available.



DC/DC converter

What is "SUPER E-CAPS"?

A pair of nonpolarized Black Gate electrolytic capacitors are particularly connected in parallel or in series so that each one of the capacitors cancels internal magnetic flux generated by the other, thereby completely eliminating internal resonance and decreasing total impedance to absolute zero as the frequency increase.



“Black Gate” Promises to Ultimately Improve Every Electronic Equipment
The Brightest Capacitor holds unconventional performance and life span

エレクトロニクス
No. 106



Black Gate
新特許第1,662,570号登録



www.partsconnexion.com

[Performance]

20 years ago, we started reforming the structure of an existing electrolytic capacitor of ion transfer that worst affects signal information. We finally completed “Black Gate” due to succeeded in creating the revolutionary separator that lead to The Transcendent Electron Transfer. We export our products to many parts of the world today.

Black Gate possesses amazingly unconventional performances that the signal runs 100 times faster, the distortion noise decreases 1/1000 and the power transmission efficiency improves 10 times larger compares to an ordinary one. Replacing with Black Gates, any electronic equipment such as audio systems, videos, PCs, cellular phones, DVD players, studio equipment or medical electronic imaging devices will drastically upgrade.

[Life Expectancy]

This characteristic counts more importance. The structure of an ordinary electrolytic capacitor is ion transfer that depends very little amount of electrolyte which is impregnated in capacitor paper. Gas is generated whenever current runs, and the electrolyte gradually dries up. This fatal defect is killing a capacitor within three to five years that is the shortest life span in all electronic components. The life of electronic equipment must finish when the lives of inside capacitors are over.

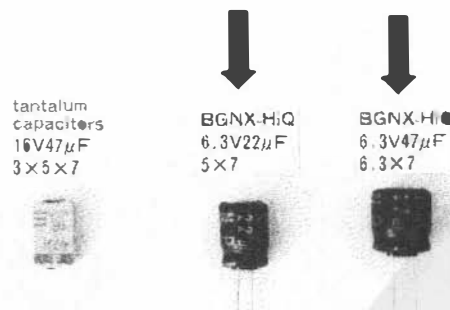
Black Gate, on the other hand, the inside structure is The Transcendent Electron Transfer and consumes as small as 1/100 of electrolyte compares to an ordinary one, the life expectancy is prolonged by five to ten times. BG will greatly help you economically.

[Black Gate: Japanese most influential invention]

Most of the Japanese electrical equipment manufacturers nowadays pursue more of cost reduction than technology. They have forgotten their fundamental principles and have surrendered PC field to other countries especially the U.S.

The revolutionary Black Gate, however, overwhelms existing electrolytic capacitors in the world, that means it becomes on the top of essential basic components used in all electrical equipment. This is the finest and ultimate Japanese invention in the finale of the 20th century.

Non-polarized Very Low Noise Electrolytic Capacitor



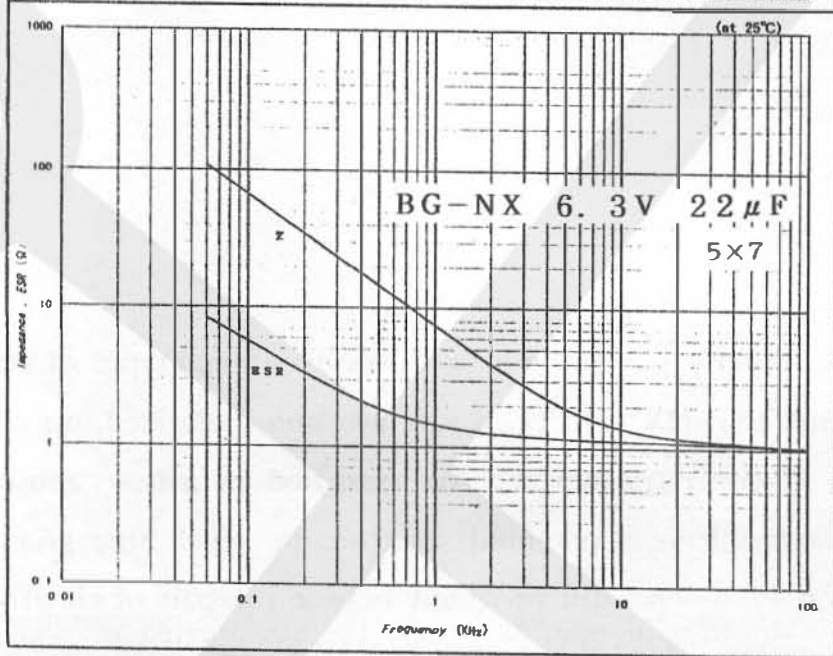
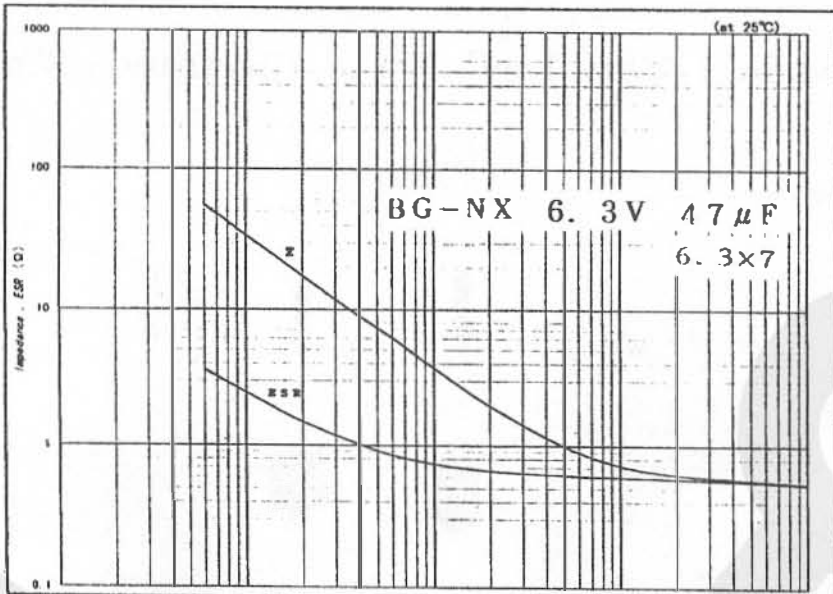
Jelmax has recently put on sale two unconventional types of very small Black Gate capacitors BG-NX Hi-Q which are non-polarized, noiseless capacitors based on an electron transfer and are classified in a new genre.

These capacitors have a patented structure in which fine graphite particles are distributed in a separator provided between a pair of electrodes and including electrolyte. Ion transfer inside of the capacitors is converted into an electron transfer in operation, and thereby having marked a noise level of -174db by measurement with a distortion meter CLT-1 EX which level being the lowest in the world.

The noise level generated by them is lower by 40-50db than that generate by tantalum and organic semiconductor capacitors ordinary used. Therefore, when they are used in a DC-DC converter of cell phones, they can completely eliminate the harmful noise generated from the smoothing capacitors by a switching wave and can wipe out the noise contamination against medical and communication equipments.

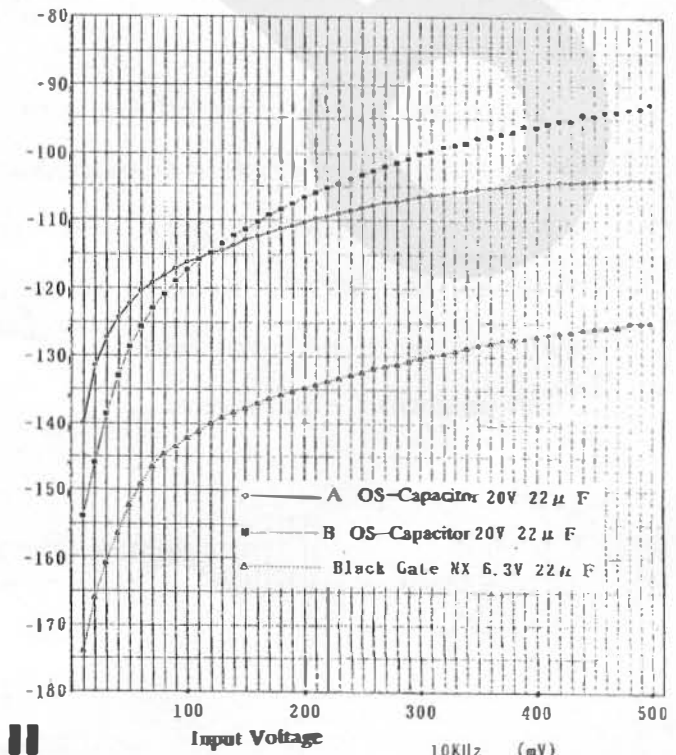
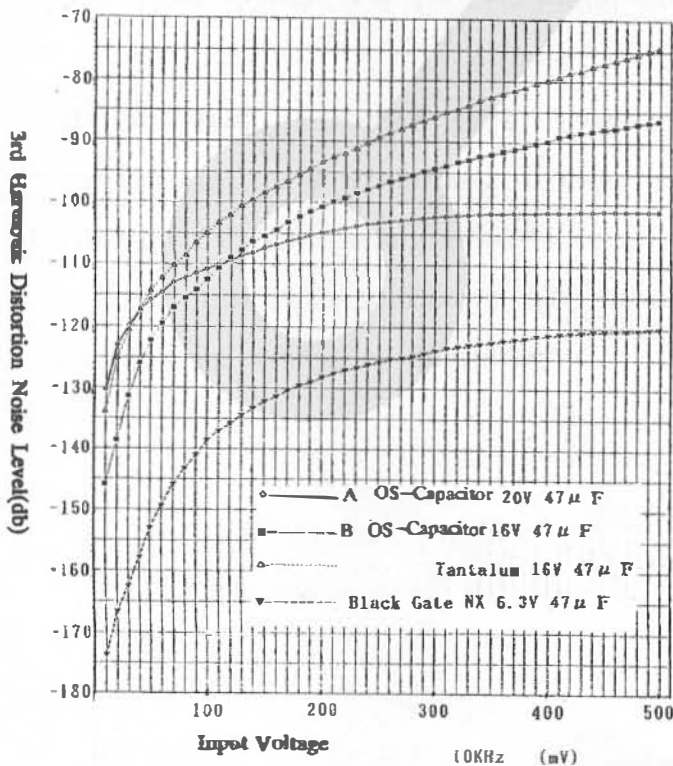
CHARACTERISTIC VS. FREQUENCY

1



2

3rd Harmonic Distortion Characteristics (CLT-1 EX)



The Only Capacitor Survives Digital War

Black Gate Works on Giga-Pulses without Problem

While Other Capacitors Cause Digital Signals To Delay and Distort

[Defective capacitors worst affects equipment]

You may think the performance of capacitors are all the same as far as their capacitances are equal. In fact, ordinary capacitors generate enormous distortion noise that is 10,000 times(80db) larger than that of Black Gate. The performance of devices using ordinary ones is very poor and cannot be improved without Black Gate.*1

(1) Delayed Characteristic

This defect occurs in a wet type electrolytic capacitor using electrolyte inside. The capacitor of this type does not have a contact noise, however, the inside mechanism is an ion transfer as the electrolyte is a current path, therefore the signals speed down, the phase between signal pulses are delayed, and a part of each bits drops, then some of the signal information are missing.

This capacitor is originally created for audio systems and cannot follow the speed of the super high frequency bit transfer which is quite faster than that of an audio system. This capacitor is totally unsuitable for the digital transmission.

(2) Distorted Characteristic

The dry type capacitors such as a tantalum, an aluminum-solid, an OS, a ceramic and a layered-ceramic capacitors have this defect. They have low E.S.R. value due to a contact structure, however, they generate terrible contact noise of -80db(10,000 times larger than that of Black Gate: measured by a distortion meter CLT-1). The S/N of equipment with this capacitor worsens a great deal, and the tone and picture qualities deteriorate particularly in a circuit with an A/D or D/A converter. This type of capacitor should not be used in a high quality equipment.

A ceramic capacitor*2 has a piezoelectric effect distortion due to the quality of the material and it never be removed. We believe the capacitor industry needs the distortion measuring system(RCF-2003 of EIAJ) that has already been enforced in the resistor industry. Although the distortion standard of a capacitor requires at least -120db, ordinary capacitors have extremely larger distortion and most of them will disqualify.

[Perfect Countermeasures]

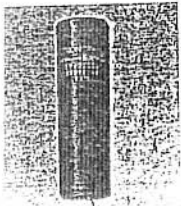
You must be surprised that almost all the existing capacitors are imperfect and poor quality. The capacitor manufacturers have not known or been biding this fact.

Jelmax discovered the fact more than 30 years ago, and aimed to develop the real and indefectible electrolytic capacitor. We finally completed the amazing "Black Gate" that smoothly transfers pulse signals of giga Hz without any problems*2 and having very low E.S.R. value that is 1/10 of ordinary ones, and reduces the distortion noise to -160db. Such outstanding characteristics have come true for the first time ever. The inside mechanism is the complete noiseless Transcendent Electron Transfer that is so novel and revolutionary, and belongs to new genre.

The digital age has come and varieties of its devices are overflowing for broadcasting, multimedia and medical equipment or computers and so on, all of them need high performance. Black Gate is the only component to make these equipment demonstrate the maximum ability. The world's demand for the product is drastically increasing. This is the time for you to decide.

*1: Jelmax Technical Report No. 50, 51 and 52

*2: Jelmax Technical Report No. 98



BG-N

100V 2200µF
for Hi-Fi Power Output
Easily 1KW Above
Wonderful Performance



BG-N

35V 4700µF
for Power Supply
with Super E-Caps
The Capacitor Champion



BG-PK

25V 47µF
for Reforming
Mixing Console
Ultra Small Size



BG-NX

50V 0.1µF Hi-Q
for Ultra High Frequency
Transfer
World's Only One



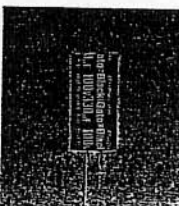
BG-WKZ

500V 100µFX2
for Vacuum Tube Amplifier
Top of the World
"Heart of Muse"



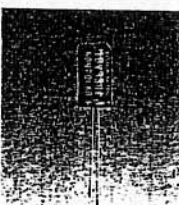
BG-NH

350V 58µF
for High Power Drive
Unrivaled Ability



BG-N

100V 330µF
for Self-Bias of
Vacuum Tube
Definite Improvement



BG-N

16V 33µF
for Any Small-Sized
Digital Device
Highest Performance

www.partsconnexion.com

Black Gate Decides Picture and Tone Quality: World's Knowledge You Will Enjoy The Unsurpassable Sound Throughout Your Life

Review: The essence of Black Gate*

Although an electrolytic capacitor employs the dielectric of the best quality on earth, its ion transfer mechanism most worsens signal information and much lowers the operating range of equipment. The ion transfer is the root of evil because signals have to swim the long distance of electrolyte that is 20,000 times wider than the thickness of the dielectric, with riding on ions which moves very slowly. The signals are always delayed a great deal.

Black Gate was born following the the discovery of the revolutionary fact that with introducing some amount of fine graphite particles into a separator, electrons were freed from the confinement to ions and started to run by themselves in a noiseless electron transfer along the particles without contacting to an electrode.

This Transcendent Electron Transfer shortened the long distance of electrolyte virtually zero, and all the bad influences that had affected signals were canceled.

The dielectric that was equal to the quality of sapphire demonstrated the full ability for the first time, and the performance was incomparably improved. The operation range expanded over 10 GHz, the signals speeded up as almost the same as the speed of light, the distortion noise was reduced to 1/1000, and the power transfer efficiency increased 10 times larger. We believe this is the one of the greatest progress in the basic electrical component.

The performance of any devices replaced all the inside capacitors with Black Gates improves to its maximum because Black Gate removes 99% of all the cause for deterioration of the tone and picture quality. This capacitor also contributes to the cost reduction best because it will completely work almost permanently because of no ion consumption. Black Gate is coming to the world's new standard.

The voices from our customers

A building inspector Mr. M.M. in the U.S. personally came to Japan for Jelmax as a representative of his top-level audiophile fellows in order to buy lots of pieces of BG--N 35V 4700 μ F. He emphasized that how the Super E-Caps system of non-polarized Black Gates was effective to audio systems. He said at parting with satisfaction that he much appreciated Jelmax create such wonderful component. We were amazed and very glad that Black Gate was more understood and accepted overseas than Japan.

A high school boy called us in an excited voice that the performance of his low-priced CD player exceeded luxury ones by replacing inside all ordinary capacitors with Black Gates in his allowance. We thanked and explained that only Black Gate makes audio systems perfect.

Why BG?

Because the only way to improve the deterioration of tone and picture caused by the defect of basic components is just replacing them with the real quality ones. Black Gate is the sole component for the ideal capacitor.

The technical magazines and newspapers, however, repeat the articles that circuit technologies can solve the problem, against the truth. The publishers are lying to their readers, and the manufacturers which continue to produce defective audio systems betray their fans. They have to face the reality immediately.

Conclusion

The Black Gate has been spreading out in the world and steadily obtaining many supporters. You are welcome to join when you would like to gain supreme tone and picture. We promise that you will be wholly satisfied with the performance.

*: Refer to The Jelmax Technical Report No.50,51 and 52.



BG-N

100V 2200 μ F
for Hi-Fi Power Output
Easily 11KW Above
Wonderful Performance



BG-WK2

500V 100 μ FX2
for Vacuum Tube Amplifier
Top of the World
"Heart of Muse"



BG-N

35V 4700 μ F
for Power Supply
with Super E-Caps
The Capacitor Champion



BG-NH

350V 68 μ F
for High Power Drive
Unrivaled Ability



BG-PK

25V 47 μ F
for Reforming
Mixing Console
Ultra Small Size



BG-N

100V 330 μ F
for Self-Bias of
Vacuum Tube
Definite Improvement



BG-NX

50V 0.1 μ F Hi-Q
for Ultra High Frequency
Transfer
World's Only One



BG-N

16V 33 μ F
for Any Small-Sized
Digital Device
Highest Performance

www.partsconnexion.com

The Harmful Noise Generated from Cell Phones is Caused by an Inside Smoothing Polarized Capacitor Switches



SPECIAL TOPIC

Black Gate Eliminates the Distortion Noise on Earth

The Noise Pollution Today

The number of cellular phones are drastically increasing over several millions, and its harsh noise can affect devices for communications, security, medical, and so on have been reported. The noise pollution due to inside smoothing capacitors which Jelmax Co. warned in our Technical Report has become a reality.*1

A champion of super low noise level: -174db
Two kinds of new Black Gates

BGNX-HiQ 6.3V22μF 5X7 0.3gr	BGNX-HiQ 8.3V47μF 6.3X7 0.4gr	tantalum capacitors 16V47μF 3X5X7
--------------------------------------	--	---

The amount of noise generated from capacitors much varies according to their distortion values even if their smoothing ripples are the same

The majority of smoothing capacitors are dry-type electrolytic ones in DC/DC converters as a switch of cellular phones. This type of capacitor is congenitally defective because only its forward direction works properly and the opposite direction works as a resistor. It possesses just half of the essential ability of a capacitor (Refer to Figure 1). Even if the E.S.R. value is low, the actual performance can not be so good. The non-reciprocal element in which the forward and backward impedance values are different like this have a large non-linear distortion characteristic and produces harmonic distortion noise in wide bands when alternating current is passed. This is the root cause of the noise pollution.

The pulse wave also generates larger distortion noise, and DC lines after smoothing a switch or neighboring human bodies radiate enormous EMI noise wave. The sole countermeasure is to terminate rectifying loads by a capacitor having super low distortion noise and loss characteristics.

Figure 2 is the comparison of distortion values between two kinds of organic semiconductor capacitors and a non-polarized Black Gate N, each of them has the capacitance of 100μF and almost the same voltage. There is a surprising difference (40-60db, 100-1000 times) even the input voltages are the same. You will understand which one is the cause of the noise generation.

Figure 1: The operation of dry-type electrolytic capacitor for alternating current

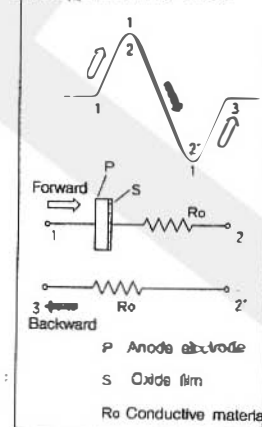
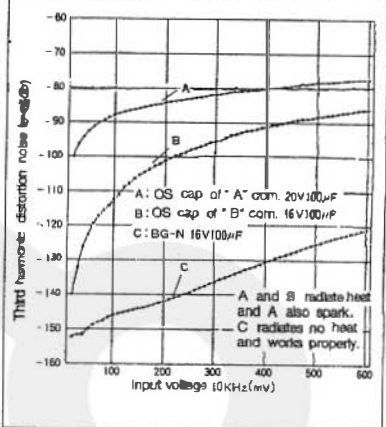


Figure 2: Third harmonic distortion characteristics (CLT-1 EX)

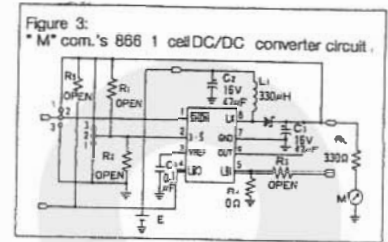


Why is the non-polarized Black Gate "BG-N" noiseless?

The non-polarized electrodes of BG-N are perfectly symmetrical and does not have non-linear characteristic. The Transcendent Electron Transfer occurs between the electrodes due to the patented fine graphite particles introduced in its separators without contact, and the distance between two electrodes where electrons come and go becomes virtually zero.

Black Gate does not have any noise factor and radiates no harmonic noise when a rectifying input voltage is applied. Only ripples corresponds to a capacitance is generated. Moreover, this capacitor consumes no ions and radiates no heat and have a long life, and the quality of dielectrics is as same as that of sapphire. Black Gate therefore has an ultra-low loss characteristic and does not generate any noises. This is surely the unrivaled capacitor.

Jelmax Co. has created two kinds of very ultra low noise, super small sized and non-polarized Black Gates BG-NX Hi-Q. We tested them in a 1 cell boost converter produced by "M" company in the U.S. The circuit was simple as Figure 3. The noise level was decided by C_1 , C_2 or C_3 , and the distortion value of C_3 enormously influenced the level.



—The measuring result—

BG-NXs did not generate any noise, but as expected tantalum capacitors generate noise that caused the noise pollution. The result of using BG-NX 6.3V 22 μ F was almost the same as that of BG-NX 6.3V 47 μ F except that their ripple values were different, thus we omit it.

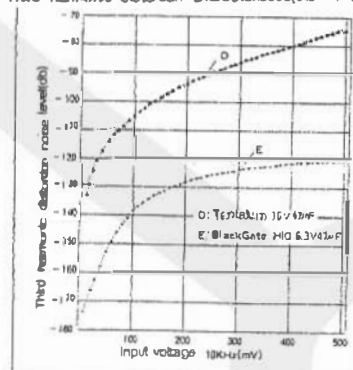
The great difference of performances between the tantalum and the BG in Table 1 is caused by their distortion gap. When the residual ripple was 15mV, the harmonic noise of Black Gate was -174db(0.00005 μ V) as Figure 4: The level was surprisingly low that can be recognized as zero. Black Gate will definitely improve the quality of the various mobile information devices used for the transmission of multimedia, such as cellular phones, medical and banking devices by making their power supplies noiseless.

When a pair of non-polarized Black Gates are particularly connected in parallel or in series, each one of the capacitors cancels the internal magnetic flux generated by the other, and completely eliminating internal resonance and decreasing total impedance to absolute zero as the frequency increases. This system also cancels phase changes of digital waves and remove noises in a super higher frequency band.* 7

Table 1: Noise test of BG-NX in 1 cell boost converter

Smoothing capacitor(See Picture)	Capacitor in "M" com.'s converter	Jelmax new product
Smoothing capacitance C_1, C_2	"S" com.'s chip tantalum 16V 47 μ F 3x5x7	BG-NX HiQ 6.3V 47 μ F 6.3x7
E.S.R. value #3 100KHz	130m Ω	430m Ω
#4 Bypass capacitance C_3	USA ceramic chip #1 μ Distortion value -73db	BG-NX HiQ 50V0.1 μ F Distortion value -150db
#5 Residual Ripple	15mV	15mV
Switching frequency	250KHz	250KHz
Input voltage/current	One piece of alkaline battery 1.4V 32mA	One piece of alkaline battery 1.4V 32mA
Output voltage/load current	3.3V 110 Ω 10mA	3.3V 330 Ω 10mA
Efficiency	80% (from its catalog)	
#6 EMI noise generation	Yes	#6 Nothing(indetectable)
Heating up of capacitor	Slightly yes	Nothing

Figure 4. Third harmonic distortion characteristics(CLT-1 EX)



- *1 Refer to Jelmax Technical Report No.85
- *2 Refer to Jelmax Technical Report No.50
- *3 100KHz E.S.R.meter 273A
- *4 Refer to Jelmax Technical Report No.98
- *5 By "K" com.'s 100MHz 2ch. oscilloscope
- *6 Locating a receiver closely to an output line
- *7 Refer to Jelmax Catalog of Non-polarized BG

Black Gate improved a distortion meter and marked the world record of low noise: For reviving the technological industry

CLT-1, a Danish distortion meter having highest sensitivity was introduced to Japan* and contributed to the invention of Black Gate a few decades ago. Jelmax Co. later replaced all the inside capacitors of this device with Black Gates in order to improve its S/N, collaborated with one technical school.

After three years of operation, the inside Black Gates finished charging up and the level of measuring limit of CLT-1 lowered its minimum and finally reached -180db, the ultra low noise zone. We renamed it CLT-1 EX and utilized it for the development of the non-polarized Black Gate--NX Hi-Q. This capacitor marked super low noise level -174db: the value was too low that any other distortion meter never detects it.

The quality of BG-NX Hi-Q surpasses any other existing capacitors including a film capacitor regarding the performance, size, cost and life span. We are proud to create and develop such an innovative component and highly recommend you our products to break through the technological recession.

Special
News

If you get rid of E.M.I. noise, you can control all over the world.
Black Gate capacitor is the only one to kill the noise completely because of the Transcendence Electron Transfer as tunnel effect.

The noise difference estimates 60db; even though you make a cheap trick as a counter on a circuit, it radiates harmful noise outside, its S/N and the function inside become worse, causing self-destruction.

[The Transcendence Electron Transfer as tunnel effect is the essence of the invention of Black Gate.]

A: Figure 1 shows an ordinary polarized electrolytic capacitor its structure is an ion transfer at a slow speed. This is the source of the noise generation due to the non-linear characteristic. Figure 2 shows the non-polarized Black Gate, it's symmetric perfectly. The inside of BG is the Transcendence Electron Transfer that isn't effected by a medium ion which always binds an electron. Jelmax has finally achieved the revolutionary non-defect connection between dielectrics. The great difference 50db in the chart A is a natural result.

[The difference of E.S.R. is over one digit, the noise difference between them will be bigger even more.]

B: There is a great difference about the characteristics between ordinary electrolytic cap. and BG even in the chart B of E.S.R. value. This is the proof of the non-defect connection in BG. The noise is lowerd even 10db, therefore the total difference about the E.S.R. and the noise reaches 60db. That's because of the Transcendence Electron Transfer—the great pioneering invention in this century that you can realize the first time. Moreover, if you connect non-polarized BG by Super E-Caps way, the difference will be bigger very much particularly in high range.

[It's completely wrong and useless measures for getting rid of noise if you do some cheap tricks on your sets without removing the source of the generation.]

To get rid of the noise generated from defect polarized caps., there's only one counter-measure that replacing them to Black Gates which has non-defect characteristics. Any other measures are meaningless and useless. Without Black Gate, the sets have to generate much noise not only to outside, but also to inside other components, it's the cause of deteriorating the function and S/N ratio. It will be a big obstacle for multimedia.

[We must wipe out the generation of noise which damages an environment and the technology progress.]

The electromagnetic interference wave and noise generated from cellular phones have become a serious problem and caused a quite sensation recently. However, the newest Black Gate has conquered it by its excellent power. On the other hand, there's a SR power supply that generates more noise which is several hundred times bigger than the cell phones'. A lot of collusive companies make a low standard for it, then they use a cheap trick as useless countermeasures on their products, thus they let the noise goes out in public. They say, "I'm not the only one for doing it!" with one voice. Such situation is exactly the same kind as the case of "The harmful effects of a medicine for AIDS" in Japan. We have to crack down on them as soon as possible by BG, the strongest weapon in the world.

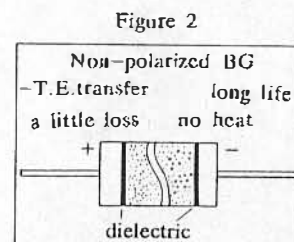
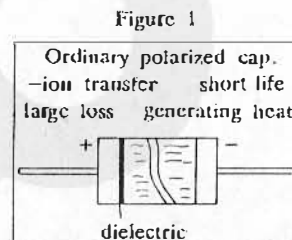
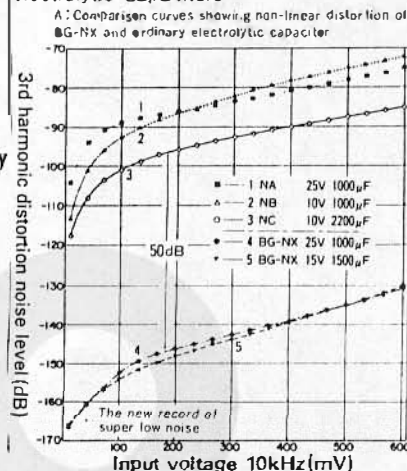
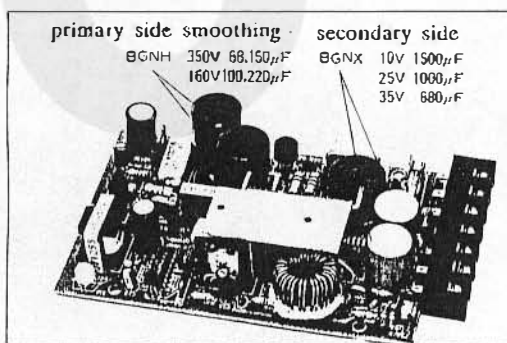


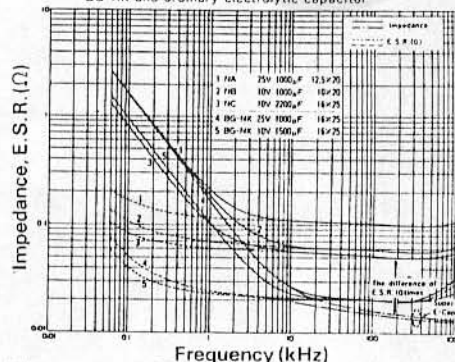
Chart A: Comparison graph with ordinary electrolytic capacitors



Perfect noiseless switching power supply



B: Comparison curves showing impedance, E.S.R. of BG-NX and ordinary electrolytic capacitor

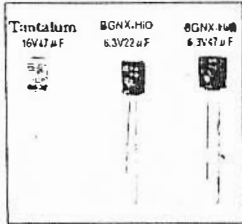


Special Big News

It's fatal for digital sets if you make a mistake to select CAPACITOR inside. A leading CPU company makes a dangerous bet that running through to a BLANK ZONE. they ignore the theory of digital.

However, Non-polarized BLACK GATE breaks through all frequency bands easily.

Which caps. do you choose for your future digital sets being as a wise consumer?



Time-bomb ticks in Pentium motherboards: there has been a rumor so far, the accident becomes a reality at last as its processor was up-grade for the type II of 200MHz. A magazine had above underlined heading said a number of no-name brand electrolytic capacitors are used on the boards and they caused PCs out of spec. It also mentioned PCs would be all right if these caps.were replaced with tantalums or O.S.caps. Really? It's too optimistic because there's no capacitor can operate perfectly over the frequency 200MHz. Without any improvement, the mortal accident will occur which shakes the business at the company to its foundation.



[1]In the BLANK ZONE, there's no existence of capacitor can operate perfectly except BLACK GATE

For the pulse transmission of 200MHz, its band is required at least 10 times or more than the value of its pulse, hence there has to be 2GHz and above. Please look at the "blank zone" on figure 1. If you use ordinary electrolytic capacitors on sets for this zone ignoring its theory, the phase changes widely, the pulse spacing isn't working properly and the CPU gets a heart attack, then it will be greatly damaged (that's a common knowledge about pulse transmission!). For this blank zone, no capacitors which could operate perfectly has been invented except Black Gate.

[2]Reliability of dry-type electrolytic capacitor is the worst in all kinds of caps.

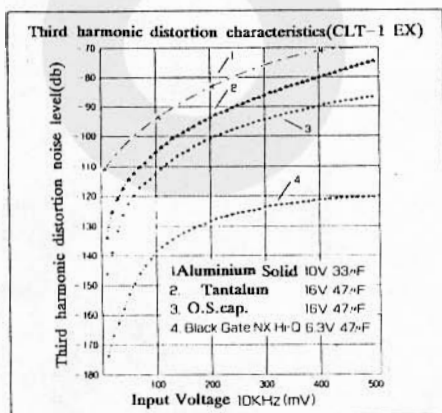
We measured the distortion (=reliability) about dry-type electrolytic caps: a tantalum, an O.S.cap. and an aluminium solid by CLT-1 EX: a distortion measuring device having the highest sensitivity. The result is on figure 2. All the dry-type ones are over the standard level of -120db by far, the worst in all kinds of caps. Moreover, they are weak at the reverse pulse, but there has been no announcement that this point can be improved. Dry-type ones have to be non-polarized originally, however, it has been impossible to produce it yet. This is the another reason make their reliability the worst.

*Non-polarized Black Gate is the champion of super high-speed digital transfer

As you are aware, Black Gate is the greatest invention of the century that makes a new genre. The internal speed of this becomes the Transcendence Electron Transfer: it's nearly a light velocity. Moreover, the frequency range reaches even 10GHz. Therefore the Black Gate satisfies the above heads not only [1], but also [2] about reliability: the best capacitor in the world. Please look at figure 3: BG wins as a champion literally by an overwhelming margin over any other electrolytic capacitors. This is the ideal one which for the companies pursue digital has been waiting for eagerly. We expect very much that motivated firm will start using the Black Gate.

Figure 1:Working frequency range of various capacitors.

Figure 2: Reliability characteristics of various capacitors



Non-polarized Black Gate capacitor		BLANK ZONE
Organic Semiconductor capacitor		There's no caps can operate digitally in this zone except BG.
Tantalum electrolytic capacitor		
Ordinary Aluminium electrolytic capacitor		

Figure 3: Comparison of various capacitors' characteristics Superior: (●) (○) (△) Inferior

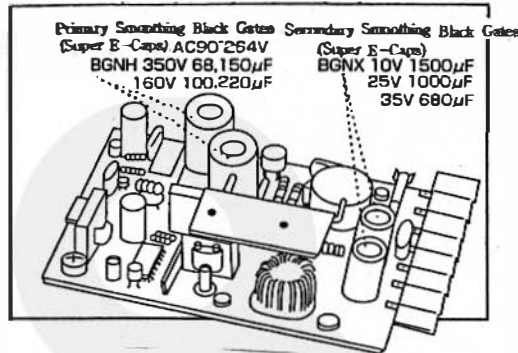
	Non-linear distortion noise	Phase Characteristics	Power transfer efficiency	Down sizing	Frequency Characteristics	Temperature Characteristics	High Voltage	High Capacity	Life	Cost
Black Gate Capacitor	●	○	○	○	○	○	○	○	○	○
Ordinary Aluminium Electrolytic Capacitor	×	○	×	○	×	×	○	○	×	○
Tantalum Electrolytic Capacitor	×	△	△	○	○	○	△	△	○	△
Multi-Layered Ceramics	×	△	△	○	○	×	△	△	○	×
Film Capacitor	○	○	○	×	○	○	○	○	○	×
Organic Semiconductor Capacitor	×	×	×	○	○	○	×	△	○	△

Conventional Polarized Electrolytic Capacitors: The Source of Generating Electro-Magnetic Wave

Black Gate "Super E-Caps" Perfectly Smooths Pulses,
Offers The Best Performance, Long Life and Cost Benefit

1. [Polarized Electrolytic Capacitor Can Not Stop Generating Electro-magnetic Wave]

The Perfect Noiseless Switching Power Supply



A conventional polarized electrolytic capacitor of ion transfer is impossible to keep an oxide film on its cathode, so it only works half of its initial ability. Even once the film is formed on the cathode, it is destroyed by ions moved from an anode. Due to an undesirable inverse current flows from the cathode to the anode, high-frequency pulses are easily radiated. This type of capacitor is the biggest cause of generating electro-magnetic wave because it is apparently a non-linear component, and whenever pulses are applied, various harmonic waves are generated enormously.

The amount of these waves is 60db (1000 times) larger than that of a non-polarized Black Gate as in Figure 1: The gap is so tremendous that can not be covered by any shield or absorber. Please remember that conventional polarized electrolytic capacitors are not a noise absorber, but a noise generator.

2. [Smoothing Capacitor Should Be Non-polarized and Have Low E.S.R.]

A conventional polarized electrolytic capacitor is incomplete due to these serious defects, however, a non-polarized Black Gate is a real capacitor. With using the capacitor, the electro-magnetic wave is ceased, and any noises decrease as the E.S.R. value goes down.

Figure 2 is the comparison of impedance and E.S.R. characteristics of capacitors. These values of a non-polarized Black Gate is almost 1/10 of others because of its electron transfer system, and the noise value is also reduced to below a natural noise level, as Figure 1.

The "Super E-Caps", shown in Figure 2, is the patented structure that totally cancel its internal resonance by particularly connecting two pieces of the identical non-polarized Black Gates. On the contrary to conventional polarized capacitors which lose its proper function in the frequency band over the resonance point, the Black Gate "Super E-Caps" system perfectly operates over the point because its impedance and E.S.R. values limitlessly decrease. The improvement with Black Gate is the most effective but reasonable.

3. [How Was The Amazing Capacitor Black Gate born?]

When distributing incredible amount of fine conductive graphite particles in a separator interposed between the dielectrics as in Figure 3, a tunnel effect unexpectedly occurred and electrons separated from ions in an electrolyte, and an ion transfer system converted to the powerful Transcendent Electron Transfer one along the particles. Because the H₂ ions which had destroyed an oxide film stopped moving, the film was permanently fixed on the surface of the cathode for the first time. This was how the exceptional non-polarized Black Gate capacitor born. The non-polarized Black Gate operation does not consume the electrolyte so that the typical heat generation does not occur.

The main features are The Transcendent Electron Transfer, perfect non-polarized structure and long life: No other capacitor realizes them.

Utilizing the Black Gate, a switching power supply does not generate any electro-magnetic wave, and the quality of digital devices significantly improves because no information signals is lost as well as no any E.M.I. noise is radiated. The supreme component Black Gate is widely spreading all over the world.

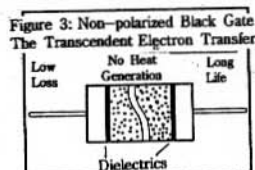


Figure 1: The Comparison of Non-Linear Distortion between Black Gate NX and Other Capacitors (Measured by CLT-1 EX)

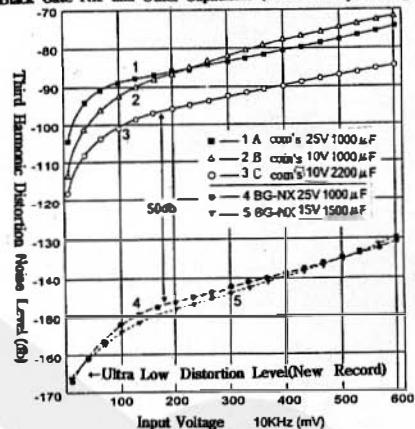
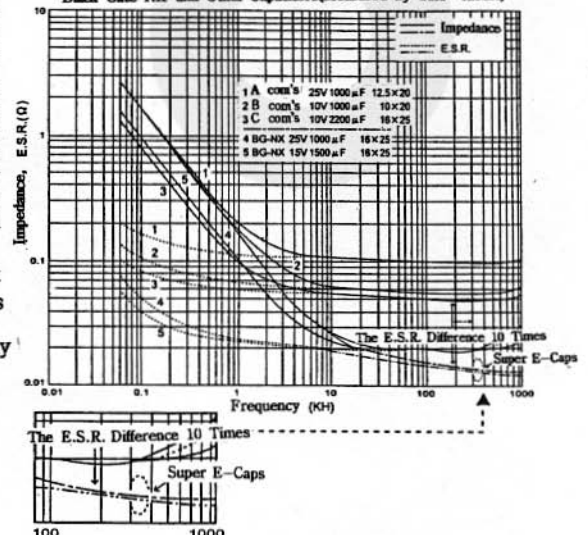


Figure 2: The Comparison of Impedance, E.S.R. between Black Gate NX and Other Capacitors (Measured by YHP-4192A)



Rule The World with The Revolutionary Capacitor King BLACK GATE, Eradicates Electro-Magnetic Wave and Distortion, Realizes The Ultra Hi-Fi, Super High Information Density, Freezeless

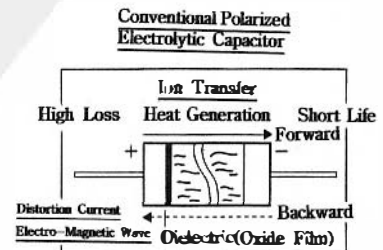


(Polarized Capacitors Drive Signal Information into Deteriorating and Dropping)

There is no essential dielectric(oxide film) on the cathode of existing dry and wet type polarized electrolytic capacitors because it is always destroyed by ions. The signal direction from the cathode to anode becomes loss resistance as Figure 1, and the capacitors just work half of its initial ability.

The performances in a forward direction and backward one are, therefore, totally different when AC signals flow into the capacitor. The backward one is 1000 times(60db) worse than the forward one in an analog circuit(Refer to Table 1). In a digital circuit, pulse signals in the backward one become radiated to other nearby circuits or outside, and change to electro-magnetic wave noise.

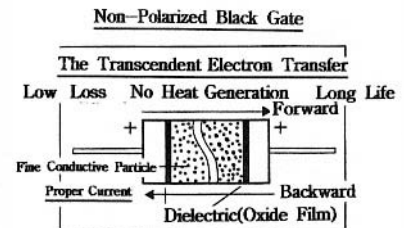
Figure 1: The Structure Comparison



The noise deteriorates information signals, and 16 bit signals declines to around 10 bit. Heat is generated as well when current runs through the loss resistance, and it is mainly responsible for the short life of the capacitor.

A notorious computer MPU freezing is also caused by the capacitor because they are driven in a frequency band higher than their operation band in electrolyte. Such bother would ultimately cause a very serious incident as the whole system break down. Now is the time to consider these troublesome capacitors.

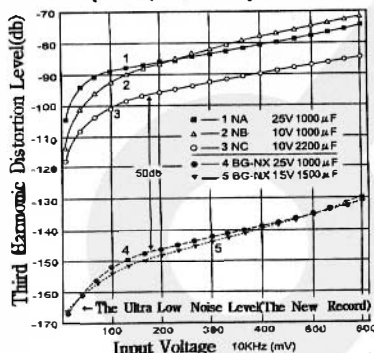
It is surprising how many companies are still pursuing the electronics without noticing or understanding the critical defect of the capacitor structure. The best resolution is, utilizing a wide-band non-polarized electrolytic capacitor of which the eternal oxide films are formed on the both electrodes even under DC current. Such capacitor, however, was thought to be impossible to realize.



(The Perfect Non-Polarized Black Gate Completed by The Revolutionary Patented Method)

Jelmax discovered that when distributing some amount of fine conductive particles without any contact each other in a separator, the DC electric field which had been occurred from one electrode and influenced on the other disappeared. Electrons separated from ions, and an conventional ion transfer system independently converted to an electron transfer one having 100,000 times ultra faster speed. The typical destruction on the oxide films due to the impact of ions stopped, and a perfect non-polarized Black Gate was born.

Table 1: Non-Linear Distortion Comparison(Measured by CLT-1 EX)



The unprecedented achievement was a giant leap for capacitors. The excellent chief features are the frequency characteristic improved 100,000 times faster, distortion noise reduced to 1/1000, impedance and E.S.R. characteristics 1/10 less, power transfer efficiency improved by 5 times, and moreover, the life prolonged to almost permanent(Refer to Table 2). The extraordinary long life span of Black Gate is due to no ion consumption, and it would be the best cost benefit for your products.

A permanent oxide film with selected voltage is formed on the cathode of every Black Gate capacitor as Table 3, and the non-polarized operation of ultra low distortion is secured within each selected voltage.

As you are aware, all the electronic devices are comprised L, C, R and active components, and C is finally become perfect by Black Gate. It contributes significantly to the improvement of your products, and that has been proved all over the world.

No other existing capacitor has realized its wonderful features and operation. Adopt the Black Gate and commit the quality revolution for the new century.

Table 2: The Features Comparison among Capacitors

	Non-linear distortion noise	Phase Characteristics	Power transfer efficiency	Down sizing	Frequency Characteristics	Temperature Characteristics	High Voltage	High Capacity	Life	Cost
Black Gate Capacitor	○	○	○	○	○	○	○	○	○	○
Ordinary Aluminum Electrolytic Capacitor	×	○	×	○	×	×	○	○	×	○
Tantalum Electrolytic Capacitor	×	△	△	○	○	○	△	△	○	△
Organic Semiconductor Capacitor	×	×	×	○	○	○	×	△	○	△

Table 3: The Cathode Formation Voltage for Whole Black Gate Products

Kinds	BG-Standard	BG-FK	BG-WK	BG-WKZ	BG-WKZ	BG-AC, BG-N
	BG-PK, C	BG-VK, K	350V	500V	BG-NX, BG-NH	
Cathode Formation Voltage(V)	2.0	10	100	160	250	The Same as Anode. Perfect Non-Polarized

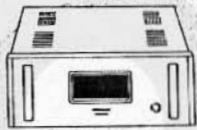
The Best Chance of Adapting Incredible Black Gate Capacitor To Win The Fierce Electronic Competition

"Black Gate Features"

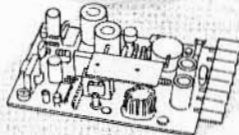
The Transcendent Electron Transfer due to a tunnel effect contributes to the frequency characteristic improved 100,000 times, noise reduced to 1/1000, Impedance and E.S.R. 1/10 less, and very long life.

"Reciprocal Characteristic": The electro-characteristic always equal to the both directions when AC current flows in a component. The essential point for noiseless equipment.

www.partsconnexion.com



● **TR Hi-Fi Amplifier** ●
For the vital Bias Slant on complementary input: Use Black Gate.



● **SR Power Supply** ●
For Hi-Fi amplifier, the best measure for noise suppression without trouble: Use Black Gate "Super E-Caps".



● **Digital Camera** ●
For accurate signal pulses, more important than the numbers of pixels: Use Black Gate.



● **TV** ●
For NTSC, digital and high-definition, improvement on the resolution, color and stereophonic effect in detail: Use Black Gate.



● **Cellular Phone** ●
For the transmission of moving picture: Use Black Gate.

High Voltage



BG-NH 350V150μF

Low Voltage

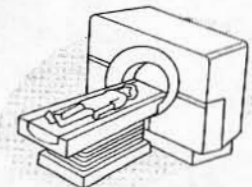
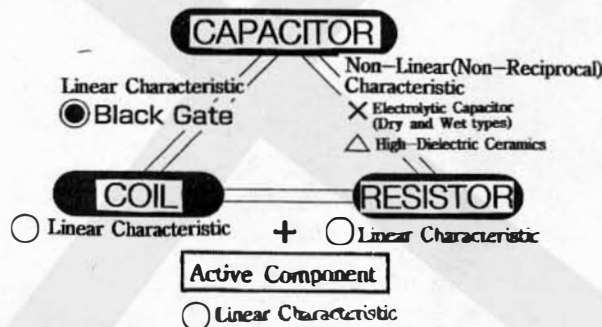


BG-N 35V4700μF

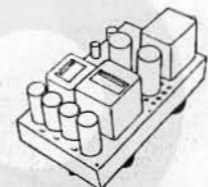


● **PC** ●
For the freeless operation over GHz: Use Black Gate.

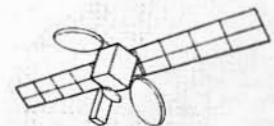
Passive Component Triangle



● **CT** ●
For improvement on the S/N for resolution in circuits, having more meaning than the operating speed: Use Black Gate.



● **Tube Amplifier** ●
For the finest tone quality due to the perfect NF operation: Use Black Gate.



● **Satellite** ●
For the excellent features, reliability and cost benefit surpassing those of tantalum: Use Black Gate.

All the electronic equipment comprises the combination of active and passive components. Their total quality for signals directly decides the performance of the equipment.

Any component is required a linear characteristic. While the active components have this characteristic, most of the passive components have non-linear one, and generate unavoidable distortion and noise. A wave form in a digital signal is worse than that in an analog one.

An electrolytic capacitor is the worst component because it has non-linear characteristic and non-reciprocal structure. The improvement is so difficult that any attempt throughout half a century has been failed.

Jelmax finally accomplished the creation of the perfect capacitor at the end of 20th century: This is Black Gate. Currently exported to 17 countries and highly esteemed. The Black Gate revolution has been started in the world. This is your best chance to adapt our product to get rid of copy technology.