

KENWOOD'S CAR AUDIO EQUIPMENT

Organisation	Kenwood
Trigger	<ul style="list-style-type: none"> • High level of car audio component theft in the US. • Aggressive competition pushes companies to develop better designs. • Kenwood's position in the audio electronics industry dropped significantly during the 1980s and 1990s.
Objectives	<ul style="list-style-type: none"> • To reduce the incidence of car audio equipment theft. • To make securing car audio equipment more convenient. • To improve Kenwood's product quality, market share and brand image.
Tools/techniques	<ul style="list-style-type: none"> • Market research into the value of secure car audio equipment and the limitations with existing systems. • Design and engineering teams worked together.
Enablers	<ul style="list-style-type: none"> • To reestablish market prominence the firm needed to develop innovative products valued by consumers.
Tensions	<ul style="list-style-type: none"> • Developing a product that was both convenient for consumers to use and effective at deterring theft.
Impact	<ul style="list-style-type: none"> • This product has been on the market for several years and is considered successful and worthy of emulation.
Lessons	<ul style="list-style-type: none"> • Design innovation can help a firm carve out a niche and reestablish itself in a competitive marketplace.

Synopsis

This case concerns a car stereo system designed to deter theft of an audio system from a vehicle. During the 1970s, Kenwood stereo equipment was among the most respected and sought after equipment on the market. However, its position in the audio electronics industry dropped significantly during the 1980s and 1990s. In order to reestablish its position, Kenwood pursued an innovative design based around consumer need for crime resistant car CD systems. The D Mask system was developed, which does not rely solely on component removal to deter would-be-thieves, but also incorporates disguise using a faceplate that rotates in order to create an impression that the CD player has been removed. Such a system is activated automatically, thus reducing inconvenience to the car driver. This new approach is based on an in-depth analysis of the different systems on the market and research into problems with existing Kenwood products. The different approaches to reducing theft of car audio equipment, including new products just entering the market, are fully documented in this case study conducted in the United States.

Background to Kenwood's Car Audio Equipment

Car stereo cassette and CD systems have long been prime targets of both professional and petty thieves. The NICB (National Insurance Crime Bureau) was unable to provide exact numbers regarding car audio theft in the US because many of these thefts apparently go unreported. It suggested, however, that it was safe to assume that the numbers were in the millions, as every year over 400,000 vehicles are stolen and not recovered and that each one of these most likely had some form of audio system in it.

While the theft of such systems can be costly and highly aggravating, the car stereo frequently represents only a fraction of the costs a car owner or insurance company must incur. In addition to the replacement costs for the receiver/tuner component, the act of stealing a car stereo system frequently results in substantial damage to car windows and/or dashboards. Manufacturers of car audio systems have wrestled with this problem for decades and have tried a number of novel solutions ranging from low technology approaches to sophisticated technology approaches.

At the low end of the technological continuum, a very basic approach to help prevent car stereo system theft is the false faceplate. Selling for approximately \$10, a consumer can buy a false audio faceplate that fits over the receiver of an expensive audio system and generates the appearance of a simple AM radio. The theft deterrent in this option is disguise. The goal is to fool a would-be thief by making it appear that there is nothing worth stealing in this car.

This system has several problems, however. First, the false faceplate must fit over the actual car stereo receiver's faceplate. Second, this false faceplate must be put on every time the car is left unattended. This can quickly become a nuisance for the car driver. Finally, would-be thieves are not likely to believe that expensive cars are equipped with only an AM radio audio system.

The next design up the technology continuum is the removable stereo system. In 1984, Kenwood introduced the first removable car stereo system which they dubbed the 'Pull Out'. In this design, the entire receiver/tuner unit is housed in a self-contained box and features a fold down handle on the face of the component. The receiver/tuner fits into a metal housing that is fixed to the dashboard of the vehicle. Wires that carry sound to the speakers and power to the system are permanently attached to this housing. Removal of the receiver/tuner component is simply a matter of pressing one release button and pulling the system out. The receiver/tuner unit can then be slipped into a bag and taken along when the driver leaves the vehicle unattended. On return, the driver simply slips the unit back in place and, through a plug arrangement, the requisite wires are reconnected to the system. The advantage of this system is that it is clearly visible to would-be thieves that the stereo system has been removed.

While effective at reducing theft, such systems were inconvenient for the consumer and prone to technical problems. A former Kenwood Pull Out car stereo system consumer explains his frustration with the system:

"It seemed like a good idea at the time. But it became a real pain in the neck to have to lug that thing around all the time. What really got on my nerves was that thing kept breaking down. I sent the stereo back six times because it kept malfunctioning. Every time it broke down, I had to send the whole unit back to them. They took about six weeks to repair it and ship it back. Of course I had to pay for shipping. I swore I'd never buy one of their products again".

On reviewing the market, it is apparent that such systems are no longer developed, as the weight of the receiver/tuner unit makes it inconvenient to carry around and the procedure is soon abandoned. The alternative was to remove the unit from the dashboard and lock it

in a glove compartment, boot or hide it under a seat. Again, consumers found this inconvenient and less safe.

The current method employed by nearly all manufacturers of car and light truck audio systems is the detachable faceplate. First introduced by Pioneer, the controls for car audio stereo systems in this design are housed in a faceplate that typically measures between six and seven inches in width and between 1.5 and 2.5 inches in height. Most systems with removable faceplates allow for the activation of this feature by pressing one button and then gently pulling the faceplate away from the receiver/tuner housing, which remains permanently attached to the dashboard. Once detached, the driver simply puts the stereo system faceplate into a pocket, purse or bag. Upon returning to the car, the driver simply snaps it back into place and the stereo is ready to play.

A car stereo system that is missing its faceplate is far less valuable to would-be thieves and as such, they are less likely to vandalise a car when only half of a system would be available. To further discourage would-be thieves, faceplates are sometimes electronically coded and are therefore not interchangeable. This system has proved to be much more user friendly than the removable stereo system design, as a salesperson explains:

"All of the manufacturers use this kind of technology. It's really easy to snap the faceplate off and on. Yea it can be a hassle if you lose it, but I haven't heard of that happening too often" (car audio sales person).

While the size of the faceplate makes the system relatively convenient, should it get lost, the audio system is useless. Since faceplates are not usually interchangeable, they cannot easily be replaced. Most manufacturers will require proof of ownership before selling a replacement faceplate. The process of proving ownership, gaining authorisation from the retailer, sending information and serial numbers to the manufacturer, and then waiting until a new faceplate can be properly coded and shipped out is quite lengthy. Moreover, the typical price for a replacement faceplate is around \$150 - almost as much as some tape/CD decks cost new. There is also a perception in the industry that many consumers do not bother to take the faceplate off when they leave their cars unattended, for fear that elements like sand and rain might damage the device.

In light of the limitations of previous approaches, Kenwood's design team decided to develop an alternative. This case study describes the new design, called the Kenwood D Mask Line. Information was gained from discussions with sales personnel at car audio equipment stores in Colorado Springs and owners of various models of car stereo equipment. Interviews were conducted with personnel from Kenwood's US headquarters in Long Beach California and Kenwood regional sales managers. It should be noted, however, that designers in Japan who were not contactable did much of the design work. This case is particularly relevant to the UK, in view of its high levels of car crime relative to other European countries (Roberts, 1997).

Design Process

Concept

Kenwood's design team has taken the detachable faceplate concept one step further with its D Mask and D Mask + lines. Rather than simply being detachable, faceplates on these Kenwood systems have been designed to rotate completely around. This helps to create

the impression that the CD player etc. has been removed from the car.

Design

When the power is turned off the D Mask + faceplate revolves to a standby position and remains there for a few seconds. At this point, the faceplate can be easily removed. If the faceplate is not removed it continues revolving until only a black panel is visible. In lower priced D Mask units, Kenwood's designers elected to accomplish this through a manual process and thereby avoid the added expense of an additional motor. In their higher priced units a motorised system was designed to automatically rotate the faceplate when the system is turned off. This removes the need to detach the faceplate every time one gets out of the car.

The illusion that the receiver/tuner unit has been removed is further enhanced by the fact that the connecting electronics are all on the top edge of the faceplate, which is hidden after being rotated. The big advantage of this system is that it takes care of disguising itself automatically. However, should an individual require more security for the system, the entire faceplate can also be easily removed with the simple push of a button.

The Kenwood D Mask and D Mask + lines were designed to have three levels of security built into each product. First, each system can be programmed with a four-digit security code. Second, these systems use disguise to give the appearance that the system is not operational. Third, the removable faceplate disables the system.

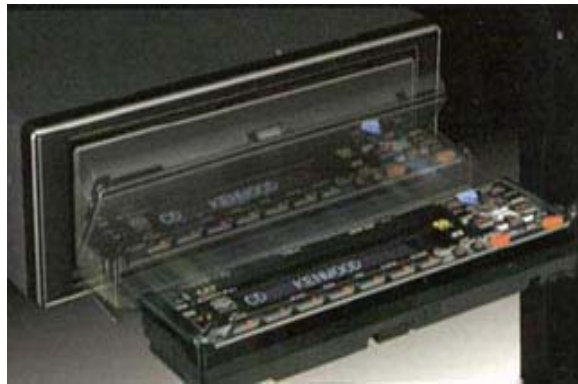


Figure 1: Kenwood D Mask +
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Testing and Technology

Several specific design considerations have been included in the D Mask line to ensure its durability. First, the clutch motor assembly was designed to prevent motor burnout should a foreign object such as a hand or a pencil interrupt the rotation of the faceplate. Second, metal gears have been used throughout the system to prevent burnout. Kenwood D Mask line stereos have been subjected to a 1,000-hour test of continuous openings and closings to insure their mechanical integrity. Third, a special lubricant has been used in this system that will not freeze during very cold weather or evaporate during

very hot weather. The D Mask line has been designed to withstand temperatures above 150 Fahrenheit and below zero Fahrenheit because US market temperatures range from the extreme heat of Arizona to the extreme cold of Minnesota. The new system has therefore addressed some of the problems encountered with previous models, as Kenwood's USA Western Regional Sales Manager explains:

"Retailers were concerned that there were too many moving parts in the D Mask + line and that it would not be reliable. Kenwood engineers subjected the models for the D Mask + line to 1,000 straight hours of opening and closing to ensure that the final design was durable" (Oliver Williams).

Impact

The Kenwood D Mask line was developed in Japan, but was specifically designed for the US and European markets, as car stereo theft is not a problem in Japan. It was designed to help the company retain its position as a market leader. The USA Western Regional Sales Manager says:

"We want to be out front in this industry. Kenwood puts a heavy emphasis on innovative design. In the D Mask line we combine stealth and disabling technologies to give the consumer the best chance of keeping what they've paid for" (Oliver Williams).

This design appears to be catching on as Sony recently introduced a new model that does essentially the same thing, although at this time the face is not detachable. There are two potential drawbacks to this design, however. The first is that the more mechanical devices there are on a system, the greater the chance for eventual mechanical failure. However, no retailer or consumer interviewed expressed a problem with this technology. Second, and probably of greater concern, is the fact that sophisticated thieves may come to recognise the back of a Kenwood system and realise that an entire receiver/tuner unit is available for theft. While the use of a simple four-digit code would render this system virtually useless to a thief, the fact remains that most people never program their system and that car audio component thieves know this.

Lessons Learned

This case illustrates how designers attempt to improve upon current methods of crime prevention and address the limitations of their own designs, so as to maintain competitive advantage. However, this is a fast moving marketing where new, potentially better, products are being developed all the time. The emerging state of the art in car and light truck audio safety systems is the computer disk security system by Eclipse, a division of Fujitsu Industries. The design team for the Eclipse system wanted to create a car stereo that did not have to be "disassembled" each time an owner left the car unattended, thus reducing inconvenience and potential for damage/loss. Rather, the team wanted to create a secure car stereo system that was permanently mounted into the dashboard of a vehicle. The main component in this system's security design is the Key Disc, i.e. a CD from an individual's collection. Through a series of easy steps, an individual can program the Eclipse system to recognise the CD of his or her choosing. To activate the system, a

user must insert that CD into the system. After the system recognises the CD the user can then elect to either play that CD or eject it and select a different one. If the system does not receive the Key Disc it will reject the disc and fail to function. The system is designed to allow three tries before it deactivates itself thus rendering the system useless. The only way to make the unit operational again is to insert the secret Key CD. The advantage of this system is that there are no codes to remember and no components to detach and potentially lose.

While this system is just emerging onto the market, there are several potential problems with it. First is the price. This system can easily be double the price of good quality moderately priced systems. The second, and potentially bigger problem is that there is no visual clue to a would-be thief that this CD player has this kind of protection system. Not until such time that it becomes widely known that these systems are useless if stolen will there be a visible deterrent. Until that time, the potential for smashed windows and ripped up dashboards still exists. Finally, should the key CD become damaged the owner of the stereo system will have to purchase another copy of that CD before the system can be reactivated.

Contact Details

Kenwood USA Corporation
PO Box 22745
Long Beach, CA 90801-5745
p: 310-639-9000
800-KENWOOD (536-9663)
www.kenwoodusa.com

Oliver Williams
Western Regional Sales Manager
Kenwood
Denver, Colorado
303.738.0978

Ms. Joanne Johnson
NCIB Statistical Information Manager
1.800.447.6282.

References, Related Case Studies and Further Reading

Povey *et al*, (2001) *Recorded Crime: England and Wales, 12 months to September 2000*. Home Office, Crime Reduction Unit. www.crimereduction.gov.uk. Statistics on vehicle crime in the UK.

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Classification Index

Ekblom's crime classification	Misappropriation (theft).
BCS crime classification	Theft
DAC	Protecting vehicles and products
Primary motivation	Gain competitive advantage.
Type of designer	Engineer
Approach	Analysis of previous approaches
Sector	Automobiles
Location	Vehicles
Author	Eric Olson

DAC – Car stereo