

RADAR.txt

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[ -           The Modern Speeders Guide to Radar and State Troopers           - ]  
[ -                                     By : Exilic Xyth                         - ]  
[ -                                     January 11, 1988                       - ]  
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Introduction:

Touched off by the discussion on Ripco <312>-528-5020, I found many users asking questions about police radar, radar detectors, and speeding. With Ron Majors talking about the oil spill that will appear in detail on the news at ten I thought a informative file on the subject might be beneficial. I myself had my first experience with police radar in my fathers car, then following in baseball and my own driving, much more on the subject. What a fascinating device, that it will return your speed instantly, what fun one would be to have! After a quick talk with a police friend of mine, I soon took possession of a used police radar gun.

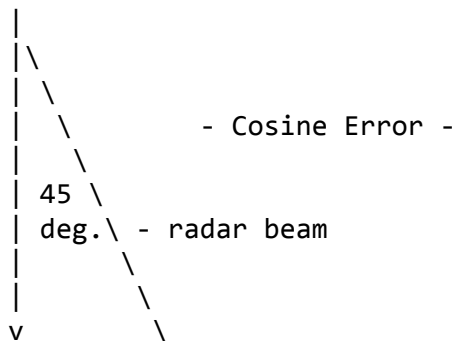
Part one: Operation.

Police Radar works via the doppler effect, best demonstrated by sound rather than microwaves. The doppler effect is the relation of speed to the pitch of 'sound'. Sometime, all of you must have had the distinct pleasure of being honked at by a motorist on the go, you might have noticed that the horn <an F flat on most american cars> begins with a higher pitch and as the car passes, drowns off to a lower tone. The sound waves at the front of the car are pressed together by the forward motion of the car, creating a higher pitch. As the car passes, the tone dies off to a lower pitch because the waves are spread out. Police radar works in much the same way. The major differences are the frequency and the concentration of the carrier.

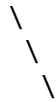
As of 1988, the F.C.C. is rumored to have lifted restrictions on police radar frequencies. Before, only two frequencies were approved for police radar use. X-band <10.525 GHz> which is most commonly used, and K-band <24.15 Ghz>. I will assume for now, due to lack of any SOLID evidence supporting the restriction lift, that those are the only two in operation. Police radar 'beams' are similar in shape to a flashlight beam. They begin with a thin width and cone outwards with distance. Most guns operating at the X-band level have a range of about 2000 ft., although high power units can exceed 2500 and 3000ft., and K-band guns fall shorter at about 1200 ft.. At 1500ft., the radar beam becomes about the width of four highway lanes, so for practical purposes radars range is around 1700 ft.. A radar signal transmitted from the 'Radar Gun's' transmitter, (called the oscillator) will bounce off a object and return to the radar receiver (or antenna). If the object is moving, the frequency of the beam will be altered as it bounces. This is most easily visualized watching water ripples. Assume now that I

RADAR.txt

have just dropped a pebble in a pond, and the ripples are moving outward, assume also for purposes of simplicity that the ripples are moving at 1 foot per second, and that they are one foot apart. The ripples are therefore also one second apart. Upon bouncing off a stationary object the ripples will return weakened, but at the same interval and speed <Not really the same speed, but let's not complicate things>. Now let us assume that a toy boat is traveling in the water at .5 ft. per second, 1/2 the speed of the ripples, away from the point which I dropped the pebble. Assume the first ripple has hit the boat and is traveling back. The second ripple now traveling at 1 foot per second is only gaining on the boat by .5 feet per second <1 ft. per second - .5 ft. per second>. This means that the ripple is one foot away from the boat, as the ripples are one foot apart. The ripple will take 2 second to reach the boat, as the closure speed is .5 ft. per second and the distance is 1 foot. The ripple strikes the boat and bounces back two seconds after the first ripple. The process works inversely for an object moving towards the pebbles point of impact. As the distance between the ripples can be determined by the speed, on the other side, the speed can be determined by the distance between the ripples. Police radar works in the same way with microwaves. The microwave signal bounces off a moving vehicle and returns altered in frequency. In this way the radar unit determines the speed of the object. Radar is only accurate when the object is moving directly at, or directly away from the gun, although some modern guns will account for this 'COSINE error', most won't. Cosine error can be defined as this: When a radar signal bounces off an object at an angle from the objects direction of travel it will return a portion of the objects speed computed by the cosine of the infraction angle. If the angle of the objects direction and the radars direction is 20 degrees the speed returned by the radar is 93.97% of the objects actual speed. $\cos(20) = .93969262$ * objects speed = returned speed. For example: A car is traveling at 75 m.p.h.. The state trooper, in his infinite wisdom, decides to "Clock" the automobile in hopes of meeting his quota for the month. Picking up his handy radar gun, he aims, and fires an invisible beam of microwave energy. The officer however, being the rookie he is, leaves a high angle between the cars direction and his beam of 45 degrees. $\cos(45) = .707106781$ $.707106781 * 75 \text{ m.p.h.} = 53.03300859$ 53 m.p.h. is displayed on the officers screen. Lucky motorist. Sorry 40 column users.



Direction of
cars travel



X - state trooper.

Part 2: Application

In 1986, over 15 million speeding tickets were issued, and experts estimate that over 25% of them were in error. Police have been using radar for speed control for many years, and as the technology has become more complex and accurate, so has the ability to get away with the slight infractions of the speed limits set by the government become more difficult. In recent years, the three most damaging advances to motorists in radar technology include: A> Instant on radar. B> K-band radar. and C> Cosine error correcting radar units.

Instant on radar.

With the increase of radar receivers, or "Detectors" on the roads, police have attempted to bypass the motorists first line of defense. The most damaging advance in the war against speeding motorists is instant on radar. The idea behind instant on radar is to make the radar detector useless to the motorist by making his warning too late to react to. Instant on radar was developed in early 1983, but never marketed until late 1984 when the michigan state troopers were equipped with the first instant on radar guns. It operates by deactivating the oscillator until triggered by the officer. When used properly and under the right traffic conditions, it is indefensible. It works like a camera, the officer operating the radar will position himself behind a blind corner or over a hill. When the approaching car crests the hill or rounds the corner, the officer will activate the oscillator, taking a "snapshot" of your car. As microwaves travel at the speed of light, any attempt at slowing down is futile, the officer behind the gun has your speed in less than a tenth of a second.

K-band Radar.

When radar detectors were first marketed by the makers of ESCORT, there was only one type of radar. X-band. In an attempt to increase the dwindling speeding ticket revenue, K-band was brought to life. K-band is a different frequency that could not be picked up by the primitive detectors of the age. However, as the frequency got out, the detectors adapted, and now any detector worth a dollar will detect both X and K bands. K band is more dangerous as most K-band guns are instant on and they have less 'Splash' and range than X-band guns. This means that a K-band signal is probably closer to you.

Cosine error correcting guns.

RADAR.txt

Cosine error was a major failing of radar in the judicial system, all readings were under question in court, the result was a gun which will correct for cosine error by determining the angle which the radar beam "impacts" with the car. Also new in correcting cosine error were guns with 'Speed lock on' in which the highest speed reading received by the gun is locked in and displayed.

Moving radar guns.

Until new developments, all radar units had to remain stationary as radar measures only closure speed, and not actual speed. Moving radar ended this trend. Moving radar works like this. First the radar gun determines the patrol cars speed by clocking a sign or fixed object. The closing speed of the patrol car to the sign is subtracted from the now taken closing speed to the target car.

Patrols speed - 60 m.p.h.

Closing speed to car - 120 m.p.h.

120 m.p.h. - 60 m.p.h. = 60 m.p.h..

Part 3: Defense

From the dawn of speed enforcement, motorists have sought to defeat the laws, starting with detectors, continuing to jammers and topping out with the new 'CHiPs detectors' The unfortunate conditions now favor the police and law enforcement officials with the introduction of new radar technologies such as instant on radar.

Detectors:

The simple radar receiver is the first line of defense from radar. Varied in operation and features, the radar detectors of today are designed to provide high sensitivity and low rates of false alarms. Good detectors will measure signal strength and type <K or X> and have an effective range of about 3000 ft. and a probable range of well over a mile. Sensitivity tops out around 110.5 dBm/cm² for X band and 108 dBm/cm² for K band <Both set by the passport>. A detector can give you an excellent advantage over radar by alerting you it's there. Detectors become especially useful in Chicago where instant on radar is not typically used.

Jammers:

Radar jammers are essentially units that transmit microwaves at a frequency dictating a certain speed. The result is regardless of your speed, the police radar unit will display the speed you set the jammer to transmit. Jammers are highly illegal and will be confiscated if discovered, expect a stiff fine.

Chip's detector.

RADAR.txt

This is a new device, which is really a scanner on the police radio band. It takes advantage of a signal transmitted by the patrol cars in some states as part of their dispatch system. The signal carries for about three miles, and the Chip's Detector will alert you if you are within that range of a highway patrol unit. It also allows scanning of police radio channels.

Last words.

Radar is a basically accurate instrument, when used properly, it can be deadly. As I have said before instant on radar is impossible to avoid when there is no other traffic around, regardless of a detector. The only thing that comes close is a Radar Jammer, which will most likely not serve you well unless it is WELL hidden. Radar jammers are dangerous with the introduction of the HAWK, a radar unit by Kustom Signals, which DETECTS radar jammers in the hold mode.

Aside from radar, VASCAR

<Visual average speed computer and recorder>

is a new danger to motorists. It is basically a stopwatch used to time your movement between two point of which the interval distance is known. Using the formula $\text{Average velocity} = \text{distance} / \text{time}$, the state trooper can determine your speed without setting off your detector.

Instant on radar defense.

The only real defense for instant on radar is traffic. Traffic will cause the trooper to activate his radar gun more often, cluing you into his presence. A jammer well hidden will help, but the best technique is to follow a car making good time. Any police units in the area will clock him first, and legally they have to ticket him, unless you're too close.

Remember:

Do not speed, it is a dangerous practice, and I can not be responsible for any injury, or action due to this file, it is for informational purposes only. The state troopers enforce speed limits for your safety.

Radar guns: Models.

Radar guns are manufactured by many different companies, but the primary ones are Kustom Signals, M.p.h. Industries, and Decatur.

The deadliest gun now available is the HAWK manufactured by Kustom Signals. It is the first gun capable of clocking cars moving the SAME direction as the patrol car. It has two antennas, one forward, and one back. Like I stated before, it is also the first gun capable

RADAR.txt

of detecting radar jammers. These run about 2000\$

Kr-11

This gun is a two piece model which uses a weak pulse signal in the moving mode to determine the patrol car's speed while not triggering detectors. This gun permits a faster clocking time for instant on moving radar, it runs about \$1200

Falcon

This is a hand held gun operating on K band Small and compact it is preferred among law enforcement radars. It runs about 600\$

Hr-4 Hr-8 Hr-12

400,500,750\$ respectively, these are hand held radar guns made by Kustom Signals

All these units are available to you via me for less than the troopers pay for them. For prices, and statistics, call my board at (312) - 787 - 2174 or send me mail at Ripco (312) 528-5020

Prices for radar units range from 250-2000\$
I personally enjoy harassing that 911
who barrels by at 95 with a detector.

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