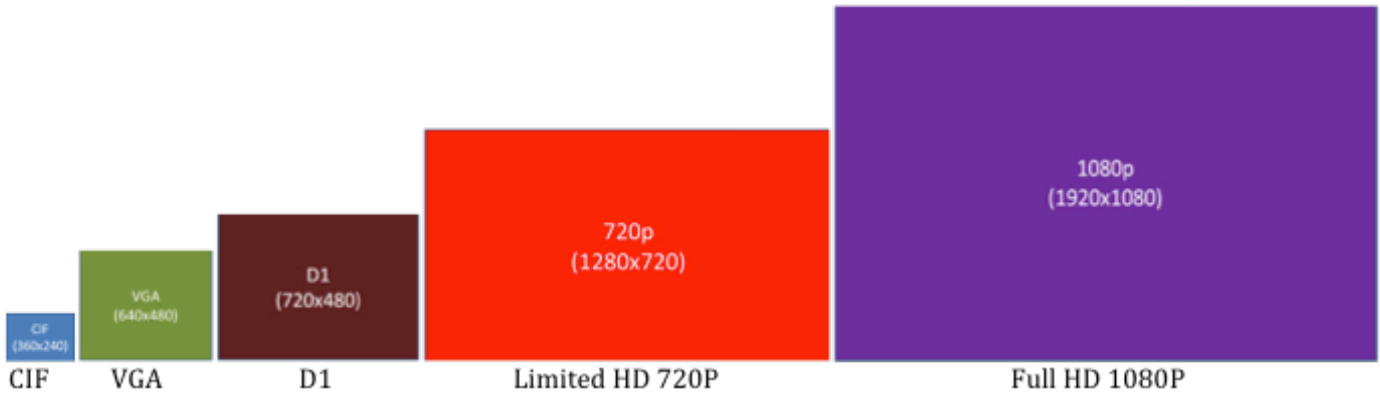


High Definition Mobile Video Solutions Overview

Comparison of Mobile Video Camera Resolution

Higher the number of pixels, the Higher Resolution and Image Clarity



- CIF** About useless due to the low-resolution, poor images, currently used in low bandwidth video streaming.
- VGA** While slightly less useless; this was standard for VCR based systems more than a decade ago.
- D1** Current standard in 4-channel mobile video systems, good value for low cost mobile solutions.
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- 1080P** True “Full HD” High Definition, highest resolution in conventional 4-channel mobile video solutions.

Image Resolution by Pixel Numbers			
Type	Width (Vertical Pixels)	Height (Horizontal Pixels)	Total (Pixels)
CIF	360	240	86,400
VGA	640	480	307,200
D1	720	480	345,600
720p	1,280	720	921,600
1080p	1,920	1,080	2,073,600

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Why Invest in High Definition 2+ Mega pixel Mobile Video?

In a single word: “clarity”

D1 (720x480 TVL) resolution is the current standard for 4-channel mobile video solutions. The D1 systems are what we have been selling for more than 5 years, and while most customers tell us how happy they are with the D1 images, we understand this is a perspective issue they may be comparing the D1 images to older technology like VGA which was standard in the VCR products sold for almost 2 decades.

Contrast that to someone who spends days working on a 27” iMac with resolution set to 1920x1080 (Full HD). I can tell you from experience D1 images that our standard mobile video systems produce may be very clear on a small screen laptop; however, those same images are much less awe inspiring when viewed on a 27” display or worse yet the 48” bench monitor we use to test and focus cameras. As the normal visual computing world is 4 times

higher resolution, so D1 looks blurry, graining, has poor color saturation, and poor image quality in almost every way you can define it when compared to the Full HD 1080P we use daily on large screen displays.

For several years we have been searching for a higher resolution technology than D1 in a mobile DVR platform to deliver the extremely high-resolution images we use daily in the computing world of digital graphics. For the first time in 30 years we can now introduce a 4-channel mobile DVR platform that offers true Full HD 1080P High Definition for mobile video solutions in vehicles.

Mobile Video Solutions 3 Categories

- There are 3 general categories of mobile video solutions for 3 different budgets:

Event Recorders - Windshield mounted low budget solutions, which are self contained devices that usually attach to the windshield offering little to no intrinsic security from the driver and generally useless for Fleet vehicles applications. These are consumer grade products with limited service life, usually a short-term solution.

This type of system is acceptable for those applications where the driver is the vehicle owner, so there is no adversarial relationship with the driver and vehicle owner, such as owner operator trucking companies or owner operator taxi drivers. When the vehicle owner is not the driver, you create an adversarial relationship and the low cost windshield mounted systems are not protected from tampering and assault by the driver they are often monitoring.

Analog Fleet Mobile Video - These are systems developed and designed for fleet vehicle applications, employing remote cameras and a separate 4-channel DVR in a locking steel box to prevent driver tampering and insure chain of evidence custody. The SD4mX versions are examples of analog D1 resolution DVRs. These systems come with varying grades of image resolution from CIF (320x240) VGA (640x480) to D1 (720x480). These systems offer fleet based features and are secured from casual driver tampering for a commercial grade fleet driver risk management mobile video solution.

High Definition Fleet Mobile Video - These are systems developed and designed for fleet vehicle applications, employing remote cameras and a separate 4-channel DVR in a locking SD card door to deter driver tampering and insure chain of evidence custody. The SD4H series and the SD4FH series are both High Definition DVRs. These systems come with either Limited High Definition SD4H DVRs in 720P (1280x720 TVL) or Full High Definition SDFH DVRs in 1080P (1920x1080 TVL).

All HD video is vastly higher image quality than anything D1 resolution can ever offer, the images are amazingly clear and can be zoomed in to show details never before realized by D1 technology.

For the first time in my mobile video 30+ year experiences I can now provide high definition images where you can tell if the shiny object in a child's hands is a foil wrapper on a stick of gum or a switchblade knife from a very wide-angle camera. Likewise you can now clearly see the car license plate of a vehicle in front of a vehicle or passing a school bus aka Stop Arm Violation citation camera.

Between 720P & 1080P the difference is tremendous, whether sheer pixel count (921,600 pixels in 720P or 2,073,6000 for 1080P) or zoom in definition the lower cost 720P systems have about ½ the pixels of the Full HD 1080P, so while it can provide a great image in most situations it lack the extremely high Definition of the 1080P systems that has 2 times more pixels for superior resolution. I can see the 720P systems as a short-lived step to the Full HD 1080P systems that may soon become the standard as their image is truly breathtaking in its clarity depth of field. Over time the difference in cost between the 720P & 1080P will be narrowed and there may simply

not be any reason to have a limited HD 720P based system when for about the same cost you can have the Full HD 1080P system.

Dollars Follow Value

This self-evident truth is the underlying principal for determining the value of a product to the purchaser, and the basis for the common adage: “you get what you pay for.” The only time this is not true, is when one party in the transaction deceives the other. The customer will decide if the additional cost of the HD1080P systems is justified for the added value it provides.

Image Resolution Categories:

D1	Industry Standard Resolution, low cost for low budget customers
HD 720P	Limited High Definition higher cost for better quality images
Full HD 1080P	High Definition, costs the most for the highest quality images

HD 720P

Systems incorporating the 720P High Definition DVRs offer High Definition with small file sizes. While this may not seem like strong selling point consider this; the advantages of 100% solid-state SD memory over fragile Hard Drives is reliability and ease of use. By using 720P systems your video files are much smaller about ½ the size of 1080P DVRs so you can store 2 times more hours/days/weeks/months of storage on a card then when you step up to the much larger files and higher resolution of the 1080P DVRs.

Seeing Full HD1080P Is Believing

Higher resolution is a driving force in the video industry in general and it is very difficult to go back in technology once your have seen what is possible. Your eyes and brain readily adapt to the higher image resolution and richness of image qualities so happily that you rapidly learn to resent anything less when presented with it. For example, have you ever tried to watch a VHS movie after getting used to Blu-Ray, it is actually painful to suffer through the poor resolution when your eyes and brain are now used to the much richer video qualities and resolution of Full HD. Some of us can no longer watch TV or Cable if it is not HD (720P) as the standard broadcast (480P) is now so poor by comparison it is actually distracting. It has gotten so bad some of us can no longer enjoy football on TV unless we can see every blade of grass on the field.

Do You Need Full HD 1080P High Definition Mobile Video

While it is difficult to imagine anyone choosing standard D1 image resolution when they could have clearer images from a similarly priced 720P high definition vehicle security surveillance systems, some still purchase the low resolution systems.

Many believe higher quality HD resolution hardware and cameras costs more. 720P systems now compare in cost to the Standard resolution systems, so for most applications the 720P is affordable and much higher resolution than Standard D1.

Does your specific application require high definition bus surveillance cameras or vehicle security surveillance camera systems?

To answer this question honestly it may help to examine what your application needs are and what mobile video solution best suits those requirements.

Mobile video security surveillance camera systems are a product designed primarily for Fleet Driver & Passenger Risk Liability Protection and in many ways an "Expert Witness" who is unbiased, dispassionate and without prejudiced. Meaning, the primary purpose of installing one of these systems in your vehicle is to enable management to document driver & passenger activities or events within or outside that vehicle for the purpose of liability litigation defense in case of lawsuit, accident or accusation.

Every week we hear customers ask how they can zoom into the image to see more detail in the video images to determine some aspect or variable of an incident for event that occurred on their vehicle. Customers send us images from their D1 resolution cameras looking for any help we can offer at making the image clearer to reduce the image pixel blurring so they can determine some important detail in the video evidence. Each time we must respond that the D1 resolution is limited to what the system provides and while it is clear on small laptop sized displays, it is not when you start blowing the image up on a 27" display, or worse yet on a 48".

When you are facing a problematic child / passenger incident or legal liability challenge the ability to provide much more detail, much higher resolution, or the ability to zoom in several times to an image and still see important details may be the difference between successful resolution of a false claim or successful defenses of a frivolous liability lawsuit. When investing in mobile video systems for security surveillance and liability protection "Seeing is Believing" and nothing less than Full HD 1080P high definition will insure others can actually see the vivid details of what happened.

Personally I operate several high definition Full HD Surveillance cameras in my personal vehicles because I demand the highest level of resolution from a system that creates video evidence that may someday protect me from a wrongful liability lawsuit. The main difference is I do not drive other people's children or passengers around all day, so my level of liability risk is much less than all school buses and most other commercial passenger vehicles. Each customer must weight the value of having images 4 times higher in their vehicle surveillance application to determine if the lower cost standard D1 images are sufficient for their needs or if they wish to provide a higher level of video evidence that will provide a higher level of video image resolution.

SD Card or HDD DVR Memory Choice

Hard drive based DVRs have high failure rates (some customers experienced 50% in the first year) and are poorly suited for mobile school bus applications due to their fragile design.

"About 560,000 hard drives crash every month" ([*Mozy.com](http://Mozy.com)).

"Disk drive failures 15 times what vendors say, study says, drive vendors declined to be interviewed" (Computerworld)

100% Solid State SD based DVRs offer the highest reliability, longest life, operate in extreme; heat, cold, vibration, shock and impact.

The future is unwritten; circumstance and misfortune can combine without warning creating unanticipated problems in the best-laid plans. In my opinion it is better to have a device that works as reliability as possible when protecting the district from liability concerns.

Application Based Advantages of HD1080P

While every mobile video security surveillance application will benefit from the much higher definition of the Full HD 1080P systems, certain aspects of some applications may make the systems extremely advantageous as they may redefine the scope of the security surveillance and provide new depth into the video files that was never before evident. Each different application or vehicle use will present different advantages when employing the higher resolution Full HD systems.

School Bus Number of Cameras

The availability of cameras of such high resolution may make it possible for fewer cameras to provide more coverage and details than a larger number of cameras. Often there are mid-ship cameras installed in the bus to look at the back half of the bus from the front as current industry technology D1 cameras have a very short Depth of Field, meaning you can only see good details about 10' from the standard 2.8mm or 3.6mm wide angle lens. When using HD1080P systems, you will not require as many cameras as the images are 4x clearer, so even the front camera can be zoomed to see the rear of the bus. Conversely, the rear camera is often just used to record activities going on in the last three rows of seats, and while it is pointed to the front of the bus you really cannot see any details as again, the Depth of Field is short only about 10'. When using the HD cameras you will now be able to see much more detail in the front of the bus and in some cases you may not require the camera over the drivers shoulder that would document any inappropriate contact between the driver and a child.

Wheel chair lift buses also require separate cameras to record the activities of lift and lower of children to insure it is performed in a professional and safe manor. The standard front and rear HD cameras will again provide so much Depth of Field that the Wheelchair lift camera can usually be eliminated.

Some Stop Arm Camera solutions employ 5 - 7 cameras on the outside of the bus in a box which are all aimed to specific target zones or travel lanes for cars passing the bus. All seven cameras can be replaced with 2 HD 1080P Stop Arm Cameras one facing front and one facing rear that can not only capture the car tag of the vehicle passing the bus, but can also capture the drivers image to help document they were the actual driver of the vehicle. Again the ability to zoom into the image and still have a clear image will provide a reduction in cost by requiring fewer cameras to provide the same coverage capabilities. As fines and penalties for Stop Arm Violation can be considerable, including loss of driving privileges or jail time for repeat offenses, those charged with these citations will often contract legal representation to have the charges dismissed and in these cases especially the more usable video evidence available the better.

Taxi & Limousine

Taxi and Limousine mobile video security surveillance cameras are often installed to provide a criminal deterrent to those who might take advantage of the driver by robbing them of cash or assaulting them in some way or hijacking the vehicle. The high definition HD cameras can provide a much higher level of video evidence than the typical lower resolution currently in use. While the presence of HD cameras will not deter crime on it's own, this can make police suspect identification much easier and as arrests are made it is possible the public awareness may help reduce the frequency of incidents.

Another common occurrence in the taxi markets is violations of other drivers who may cause an accident or cause your vehicle to swerve to avoid having one. It is a common request for a taxi or limo application to be able to capture the vehicle license plates of vehicle in front of them who may cut them off or force their vehicle off the road or into another vehicle.

Some locations like airports or luxury motels have sanctioned Taxi Waiting Areas where taxis wait in turn to pickup the next customer in an orderly fashion. In a perfect world with rational drivers this would be functional and without

issue, but I have had many taxi and limo fleet owners remark on how many times other drivers who were not in the waiting queue were creating potential safety hazards cutting in line making other drivers and customers uncomfortable. They also informed me that in some areas of taxi operation this is a crime and citations are issued to offending drivers, as they cause a potential safety hazard. Again the high definition taxi camera would be able to capture the incident and the offending taxi license plate so that driver could be issued a citation for the violation.

Paratransit

Transporting groups of people who may be elderly, handicapped or under medication may bring added liability for the company nor transportation provider.

When using HD1080P systems with HD cameras you will not require as many cameras as the images are 4x clearer, so even the front camera can be zoomed to see the rear of the Paratransit bus. Conversely, the rear camera is often just used to record activities going on in the last 3 rows of seats, and while it is pointed to the front of the bus you really cannot see any details as again the Depth of Field is shortened to only about 10'. When using the 2 Megapixel cameras you will now be able to see much more detail in the front of the bus and in some cases you may not require the camera over the drivers shoulder that would document any incidents in the stairwell area where passengers may injure themselves in a slip or fall or in some case may stage a fake fall in order to receive some payment in a liability claim.

Wheel chair lift vans or shuttle vehicles also require separate cameras to record the activities of lift and lower of special needs passengers to insure it is performed in a professional and safe manor. The standard front and rear Megapixel cameras will again provide so much Depth of Field that the Wheelchair lift camera can usually be eliminated.

First Responder

First responder vehicles are often the first on the scene and often it is important to document what the condition of the scene or an event was upon arrival for operational, training or liability purposes as important decisions must be made quickly and often without supervisory guidance. In this high risk environment the advantages of a Megapixel camera looking out the windshield can accurately document the situation as it was first encountered to provide a basis for actions that were taken or for later review.

On occasion bystanders may become a hindrance or problem preventing the responders from performing their duties and should they become such a hindrance the responders abilities to act effectively are reduced in some cases charges may need to be filed and the video evidence will provide justification for those charges.

Law Enforcement Operations

When bad things happen such as the Anthrax threats, DC Beltway Sniper incident, Boston Marathon bombing, police shootouts etc., federal agencies like DHS, FBI & ATF are often seeking as much data as possible to try to determine exactly what happened, identify who was involved, were they alone or with others, what were they driving, license plate of the vehicles involved, what direction they were traveling etc. Most of this data is in the form of video surveillance files from fixed cameras in the streets or in storefronts.

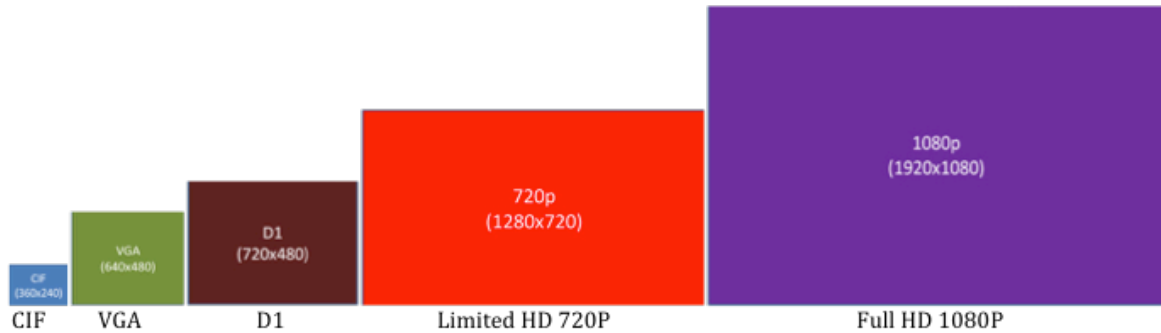
In those rare instances of heightened law enforcement information gathering, the forward facing 2 Megapixel camera can provide law enforcement a valuable tool in the form of expert witness from a mobile platform, as a fleet of taxis or limos could canvas a wide area of a city, and as long as the vehicles are in operation their recorded files might be of use to those who would be looking for this sort of evidence.

The same can be said of Amber Alerts, as most amber alerts are accompanied by a vehicle make and model, and

again if the vehicle travels in a city with a fleet of taxis incorporating the new 2 Megapixel system you may have captured useful evidence or tracking information on the forward facing cameras, that could be of help to law enforcement agencies in returning the missing child.

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