

## Hard Drive Space Tutorial

### Resolution

- CIF – 352 x 240 pixels
- 2CIF – 704 x 240 pixels
- DCIF – 528 x 320 pixels
  - 2CIF and DCIF have the same # of pixels but the DCIF has a better aspect ratio (3x4)
- 4CIF – 704 x 480 pixels – has the best resolution
- QCIF -1076 x 120 pixels – Is almost never used

Storage space is a constant question in DVR systems. We will simplify the calculation process for you.

To calculate storage space the required factors are:

1. Number of channels
2. FPS desired
3. Resolution
4. Number of day's storage desired
5. Compression
6. and VMD

Items 1, 2, 3, and 4 are easy to determine, while 5 and 6 take will require some explanation.

1. Number of channels – dictated by the project
2. FPS – the faster the recorded frame rate the better, more video data is captured leaving less to the imagination and more evidence. All our Solus, Medius and Firmus systems can record every channel at between 1/16<sup>th</sup> and 30 fps. Recommended Commercial, Retail and residential recording rates are between 8 and 20 fps per channel.
3. Resolution – The higher the resolution the greater the detail captured, but also the more expensive the hardware and more storage space used. H.264, our compression technology, delivers a higher quality image at all resolutions than other DVRs in the market. CIF resolution is typically the resolution used in commercial, retail and residential applications.
4. A minimum of 7 days, recommended 14-30 days.
5. Compression – This affects the image quality and file size. The lower the compression the high quality the image, but the larger the file size. This is a real concern with older compression technology, but in H.264 is it not as critical a factor due to its efficiency. 1mpbs at 30fps CIF resolution delivers a very high quality image. See the chart below for recommended fps/compression rates in retail, commercial and residential situations. The higher the expected motion, the higher the bit rate should be set.

**Recommended Bit rates (higher motion requires higher bitrates)**

Resolution/Fps	4fps	8fps	16fps	20fps	30fps
CIF	160-320kbps	224-448kbps	320-640kbps	384-768kbps	448-896kbps
DCIF	192-384kbps	256-512kbps	384-768kbps	448-896kbps	512-1024kbps
4CIF	320-640kbps	512-1024kbps	640-1280kbps	896-1792kbps	1024-2048kbps

**\*\*Our bit rates max out at 2048kbps at 4CIF 30 fps, other compression technologies require 30-60% higher bit rates to match this fps and image quality if they can at all\*\*\***

6. VMD (Video motion Detection) – In most applications video motion or external motion sensors are used to trigger recording. It is a waste of storage space to record unless there is motion in front of the camera. Recordings with no motion also drastically increases search times in the event of an incident. Surprisingly to most, VMD % in a retail or commercial space can be as low as 20-40% during operating hours. This means that in a 12 hour day only 2.4-4.8 hours of video would be recorded in most cameras.

### Doing that math the long way

Once the above factors have been determined, the storage space can be calculated.

The formula is:

Bit rate in kbps / 8 \* 3600seconds = hourly storage in MB per channel

Hourly storage \* 24 \* VMD% for the day = daily storage per channel

Calculate this per channel, sum the daily storage MB for all channels and

Multiply this daily total by the desired number of day's storage to get the total storage required.

Example:

16 cameras

16fps

CIF

30% VMD

14 days storage

$320\text{kbps} / 8 \times 3600 = 144\text{MB per hour}$

$144\text{MB} \times 24 \times 30\% = 1,036\text{MB per day (1.036GB)}$

$1.036\text{GB} \times 16 \text{ cameras} = 16.588\text{GB per day}$

$16.588 \times 14 = 232\text{GB}$

As a rule of thumb, we add 20% to this calculation to allow for increased VMD and ensure the desired storage time. This system would be equipped with a 300GB HDD storage.