



Introduction to the Video Recorder

The one fact about recording television pictures which helps explain all the difficulties and high cost of good-quality recording is the sheer quantity of information which has to be recorded. In order to reproduce a typical television picture faithfully, we have to record slightly in excess of five million pieces of information a second. Even a 'cheap' domestic recorder has to cope with between two and three million. (A good quality audio cassette deck may be capable of recording up to fifteen thousand pieces of information a second).

The history of recording using magnetism dates back almost one hundred years and by the start of the Second World War had advanced to the stage where the BBC were regularly using a Marconi-Stillie recorder. This machine recorded sound onto steel tape and the reels were 2 feet (60 cm) in diameter, and held over two miles (3.2 km) of tape, giving a recording time of about 30 minutes. Apart from the poor quality of the recordings, other disadvantages were the weight of the spools (it took two people to lift them on and off) and the sharp edges of the tape (a tape snap at speed during rewind could kill). Editing was crude, the tape was cut and then spot welded to join it to the next piece: the heat of the weld erased the recording at the edit point and the resulting lump on the tape smashed the tip on the replay head as it went through.

Boosey and Hawkes (more famous as musical instrument makers) developed a wire-recorder which was capable of recording speech onto a thin steel wire - this medium is now used in the "black box" flight recorder fitted to aircraft. Magnetic tape recording, as distinct from previous systems using steel tape or wire, was developed during the Second World War in Germany. Captured Magnetophon recorders, along with the secret recipes for the manufacture of the tape, formed the basis of all immediate post-war research and by the early 1950s a number of significant improvements had evolved.

The development at this time of instrumentation recorders capable of recording vast amounts of data encouraged the belief that video recording was a technical possibility and a number of establishments engaged in research work towards this end.

In this country the BBC were at the forefront and VERA - Vision Electronic Recording Apparatus - was an end product of this research. To record the video signals Vera had to rush tape through at a speed of nearly 70 feet per second (21 metres per second). This gave a recording time of only 15 minutes from a 21" (50cm) diameter reel of tape.

In the United States the main thrust of research was by RCA and Bing Crosby Enterprises (Ampex at this time did not publicise their own attempts). Telefunken in Germany and notably Toshiba and Sony in Japan were all undertaking considerable development.

By 1950, Ampex were well established as manufacturers of broadcast audio tape recorders in the United States and were developing a multitrack instrumentation recorder. At the start of 1952, a project to investigate video recording had been set up headed by Charles Ginsberg. A young engineering student, Ray Dolby (whose name was later to become synonymous with noise reduction systems), soon joined him and by the autumn the two of them were able to demonstrate almost recognisable pictures. Following this the project was abandoned for over a year (Dolby had been drafted into the army) but in 1954 the project was restarted in earnest with a larger team who were able to solve the remaining problems within 18 months.

Of the many technical obstacles to overcome, one of the major ones was the problem of tape speed. In order to record the vast quantities of information in a television picture, the tape has to pass the record head at a very high speed and it was on this point that most other designs foundered. RCA demonstrated an experimental machine in 1953 which ran at 360 inches per second (approx. 9 metres per second) and rushed 1.5 miles (2.4 km) of tape through the recorder to give just four minutes recording time. The team at Ampex used a rotating head technique to solve the problem - four heads mounted on a rotating head wheel spinning at high speed (3600 rpm) scan the slowly moving tape. Although the tape speed was only 15 inches per second (38 cm per second), the relative head-to-tape speed was 1600 inches per second (approx. 40 metres per second), giving one hour of recording on a ten inch (25 cm) spool.

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Ampex had kept their success a secret, so when a surprise demonstration was given in April 1956 at the National Association of Broadcasters Convention in Chicago, the industry was taken by storm. Ampex took orders for 80 machines within the first four days (an order book worth four million dollars).

The first broadcast use of the machine was by CBS on 30 November 1956; by early 1958 a UK version of the machine was available and initially machines were purchased by Associated Rediffusion and Granada TV, with the BBC following the year after.

The Ampex system was so successful that it rapidly killed off the opposition to the extent that several companies (notably RCA) signed licensing agreements to allow them to market machines using the same format. The Ampex 2" format was to reign supreme in broadcast television for over twenty years and change fundamentally the way in which television companies operated.

How video recording changed television programme making
In the mid 1950s the vast majority of television programmes in the world were broadcast live. This involved complex extended rehearsals, shift working by production crews and presenters, interludes - to allow resetting of studios between programmes, and most importantly, programme choice and style was restricted to a format that would suit live working.

From quiz shows to sophisticated drama the television medium was still essentially transitory and as the live programme, warts and all, went up the aerial you knew that it would never be seen again. Programme planners also had to cope with the fixed events that had to be fitted into the schedule. So Saturday afternoon became the time for football and other sporting events - to time shift an event like Match of the Day was impossible without video recording. The headache of coping with a boxing match which could either last the full term or end half way through the first round was equalled by the problem of what to do when a sporting event overran its time slot. Every television station had its stack of caption cards and gramophone records, and phrases such as

"normal service will be resumed as soon as possible" or "we seem to have lost that programme.....in the meantime here's some music" were both accepted and expected.

The move away from live television towards the present situation where, with the exception of news programmes, virtually no studio-based productions are broadcast live took many years. This was partly due to the high cost of video recording technology in the 1960s and 1970s. As recently as 1970, BBC Leeds did not have their own video recorder but had to share Manchester's. Interviews for the evening regional news programme were often produced in Leeds with the recorder on the end of a cable forty miles away in Manchester.

All this of course was only a precursor of the much greater television revolution following the introduction of the inexpensive domestic video recorder. The dramatic shift in viewing habits during the 1980s now means that the transmission time of a programme or a clash of two "good" programmes on different channels is no longer a problem for the viewer.

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