Helical Scan VTR's and the Cablecaster

By: Keith Y. Reynolds
VTR Product Manager

International Video Corporation

The average American Family is exposed to several hours of good quality color programming every day of the week. Eighty to ninety percent of this material is on video tape and originates from the major commercial TV networks, the educational TV network (NET) and the local TV station. If these viewers subscribe to the local cable system and the cable company is originating program material, they expect the same basic quality from the local origination channel that they see on other program sources.

High performance, reliable helical scan video tape recorders are capable of providing network quality color at a reasonable cost so most cable system managers are--or will be--interested in these recorders.

There are several VTR characteristics that are important to the cablecaster.

The first and most fundamental characteristic is the helical scan format. A format must be chosen which satisfies the requirements for color, wide bandwidth, good signal-to-noise ratio, good audio, time base stability and so on. Tape width, 1/4", 1/2", 1" and 2" is a primary consideration.

To date, 1/4" and 1/2" VTR's have not been designed which provide the stability and bandwidth required by the cablecaster. Two inch helical scan VTR's have all but disappeared from the market. This, then leaves the 1" format for the superior performance required for cablecasting. Several 1" formats are available and it is important

that the cablecaster pick one that provides the best picture quality as well as one which is popular with the cable industry so that interchange with other cable systems is possible.

International Video Corporation manufactures a full line of 1" helical scan video tape recorders, all of which meet the stringent requirements of the cablecaster. These VTR's vary in price from under $3000 to over $30,000. Tapes made on the low cost VTR's can play on the more expensive recorders and vice versa.

A recent survey revealed that more cablecasters are using color recorders manufactured by IVC than by any other manufacturer. The primary reasons given were reliability and performance.

One important performance specification is video bandwidth. In order to properly record and playback the video bandwidth required for full color recovery and high picture resolution, the VTR's video frequency response must extend from 30 Hz to 5 MHz. A VTR with bandwidth significantly less than this will produce pictures lacking detail.

Video bandwidth is related to Horizontal Resolution. The term horizontal resolution is used to describe the ability of television equipment to reproduce fine detail. As a rule of thumb, with United States television standards, the relationship between resolution and frequency response is 80 lines of horizontal resolution for each 1.0 MHz of frequency response.

Therefore, if the VTR has a video response up to 5 MHz, the horizontal resolution is 400 lines.

If the VTR has a video frequency response of 5 MHz, it is possible to record the entire NTSC color video signal onto the tape. Color recovery, or stabilization, is then a function only of the playback electronics. The advantage of this approach is that you can record color signals with a monochrome VTR and either play the tape back on another VTR that is equipped with color recovery electronics, or purchase color electronics at a later date for updating the monochrome VTR. In either case, the taped program is in color.

Of course video bandwidth alone isn't the only requirement for high quality pictures. It is also necessary to have a VTR with good video signal-to-noise ratio. This is the ratio of amplification of useful information, or signal, to spurious information, or noise, and is expressed in decibels. A good video tape recorder should have a signal-to-noise of at least 42 dB peak-to-peak signal to RMS noise.

A VTR with a low signal-to-noise ratio will reproduce pictures with a noisy or grainy appearance.

All tape recorders introduce time base errors. They are present in audio, instrumentation, quadruplex and helical scan video tape recorders. Time base errors are significant if they cause an observable effect in the picture displayed on the monitor or television set. Various brands of receivers vary in the extent to which they are sensitive to these time base errors.

Video tape recorder time base errors can be caused by capstan servo instability, capstan eccentricity, drum instability and tape tension variations. These errors can be minimized by careful mechanical design as well as by electrical means.

IVC recorders are designed to exhibit very low time base errors. This is accomplished by the incorporation of a number of design features. The small scanning drum, with a diameter of 3.8", produces a relatively short 12" track length which minimizes the effects of tape tension variations For proper playback, the length of the video scan covered by one pass of the video head must exactly equal the length covered during playback or there will be a discontinuity in the reproduced time base at the time of the transition from one field to the next. Therefore, the shorter the scan length, the less it is effected by tape stretch caused by temperature and humidity variations.

Since the IVC capstan is located ahead of the scanner and meters the tape onto the scanner assembly rather than pulling it around, a tape tension of only 8-12 ounces is required. This also minimizes tape tension errors.

Conservative design and precision construction have minimized the possibility of mechanical imperfections contributing to time base instability.

Although all the parameters mentioned are very important, such things as good differential gain, or the amplitude change introduced by the video circuits; and good differential phase, or the phase change introduced by the video circuits are important too.

Good audio is necessary and it is important to choose a VTR that can reproduce audio frequencies up to 10 KC with minimal distortion and flutter and with maximum signal-to-noise ratio.

Although all IVC VTR's meet all of the requirements mentioned, each model has been designed with certain special features for different applications.

The newly announced IVC-700 Series is designed for the cablecaster who needs good quality, but who must operate on a very low budget. The IVC-700 Series has many of the quality features of the IVC-800 Series which has become the industry standard. They satisfy many system needs since tapes made on the IVC-700 Series VTR's are completely compatable with all other IVC-VTR's. The basic IVC-700 VTR is a recorder/reproducer with 5 MHz bandwidth.

The addition of a $500 color board provides color reproduction. A IVC-700-PB unit is also available. This configuration is a video tape player only. The IVC-700-PB is a valuable addition to any cable system because these units can free up the more expensive record/playback units for production recording schedules, remotes etc.

All IVC-700 Series VTR's are equipped with an advanced design, reliable transport mechanism similar to that used on the IVC-800 Series VTR's. This includes an optional remote control panel which controls all tape motion functions. These include: rewind, fast forward, play, record and stop.

The IVC-800 Series VTR's include several models designed for various special applications. Each IVC-800 model configuration is a rugged, field proven, reliable VTR, designed for monochrome or color operation.

The basic IVC-800A-SM is a recorder/reproducer with slow motion. The IVC-800A has a 5 MHz bandwidth and excellent signal-to-noise ratio. Next in the series is the IVC-820. This model includes the exclusive

Instant Video Confidence feature which allows playback of the video while recording. This is accomplished by locating an "I. V. C." video head in the scanner immediately after the video record/playback head. Annoyances such as head clogging, excessive dropouts and over-deviation can be detected immediately and corrected before the entire program is recorded.

The IVC-825 incorporates a capstan servo which insures precise program timing. In addition to this feature, the IVC-825 uses selected components to provide superior signal-to-noise ratio, lower flutter and better differential phase. This configuration is extremely popular with the cablecaster and others who require superior quality.

The IVC-870 features both assemble and insert editing. Assemble editing is used to produce an uninterrupted program tape from several separate segments. With this type of editing a completely new recording--video, audio and control track is made for each new segment and it is not possible to retain previously recorded information following the end of the assembled segment.

Insert editing is used to insert a new segment into a previously recorded tape without disturbing the information immediately before or after the inserted segment. Typically, it would be used to correct a mistake that has been made in the middle of an otherwise good program, or perhaps used to update a short segment in a pre-recorded program tape. With insert editing the original control track is retained while new video or audio and video are added. Precautions are taken in the video erase system so that previously recorded information either before or after the inserted segment is not disturbed.

The IVC-870 is the most sophisticated video tape editor in its price class. It is a vertical interval editor. This means that when you want to make an edit, the edit logic waits until the vertical interval before the edit can take place. When in the insert mode, the exit splice also takes place during the vertical interval. This results in a disturbance free edit every time since the electronic splice occurs between television fields.

Every cable system using video tape recorders should have at least one good editing VTR to handle program goofs or to consolidate program material on video tape.

The top of the IVC VTR product line is the IVC-900 Series video tape recorder. This VTR was designed from the gound up to be the finest quality helical scan recorder ever manufactured. Performance, such as time base stability, is the best in the industry. Since it meets all FCC and EIA specifications, it can be used as a broadcast recorder. An optional time base corrector manufactured by IVC not only brings the IVC-900 output stability to an undetectable ± 4 nanoseconds, it also permits direct color recovery and permits the VTR output signal to be mixed and faded with camera or other switcher input signals. In addition, for the first time, a helical scan VTR can dub to a quadruplex recorder.

All IVC-900 Series VTR's feature 3-1/2 hour playing time and Instant Video Confidence. A unique tension servo automatically corrects for tension errors during playback.

Three package configurations are available. A cased version, a rack mounted configuration and for the ultimate in operation convenience, an optional console. In the console version a standard IVC-900 Series VTR is mounted on a center pivot, providing complete access for maintenance. An eye level location is provided for a color or monochrome picture monitor, waveform monitor, audio amplifier and speaker,

video display switcher and an optional IVC-4102 color time base corrector. Additional 19" rack space is provided below the recorder for other video equipment or tape storage. The basic IVC-900 configuration is a monochrome recorder/reproducer. Additional plug-in circuit board options include an NTSC color processor, a processing amplifier and a color drop out compensator. The IVC-960 includes insert and assemble editing capability. This editor is more sophisticated than the IVC-870 editor since it not only waits for the vertical interval, it also waits for the proper frame before making the edit. This results in a perfect frame to frame edit everytime.

The Cablecaster can use the IVC-900 Series recorders to provide the utmost in picture quality to his subscribers. In addition, an entire evening of color local origination programming can be accommodated on one reel of video tape.

The IVC-700, IVC-800 and IVC-900 Series VTR's all completely compatable with each other. All designed for color. All with state-of-the-art performance specifications. All reliable, and all priced for every budget, large or small and all part of the IVC family of recorders that have become the standard of the cable industry.

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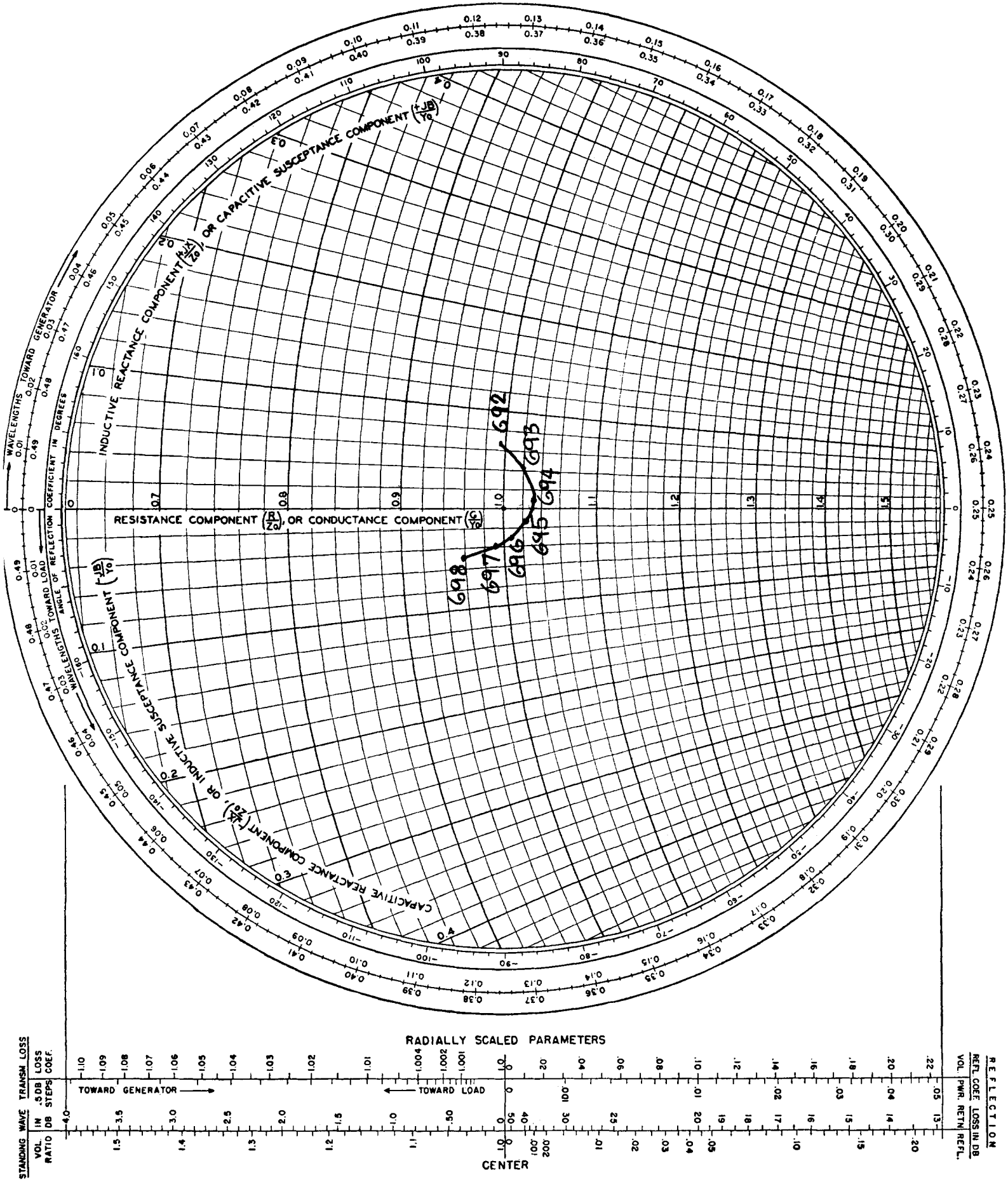
NAME	TITLE CHANNEL 51 ZIG ZAG	DWG. NO.
SMITH CHART FORM 5301-7561-NE	GENERAL RADIO COMPANY, WEST CONCORD, MASSACHUSETTS	DATE

IMPEDANCE OR ADMITTANCE COORDINATES



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