

## Frequency Control Products and HDTV Broadcasting Applications

### Introduction

High-Definition Television (HDTV) is the most significant breakthrough in video broadcasting since color. It enhances the viewing experience by offering wider pictures with much more detail and clarity than analog broadcasting video.

### The Market

Across the globe HD has already made its mark. In early 2006, HD broadcasts were available in 12 countries: USA, Canada, Japan, Australia, South Korea, China, Germany and Austria, and the Nordic markets (Sweden, Finland, Denmark, and Norway). By the end of 2005 there were 19 million households with HDTV sets in the US (17% of total TV households) with 11 million of these watching HD broadcasts. At the same time, 14% (6.7 million) of TV households in Japan were HD ready.

On a global basis, by the end of 2010 the number of HD ready households is expected to reach 174 million or 22% of TV households. The figure will be 59% in the US, 66% in Japan, and 30% in Western Europe. North America is characterized by the analog cutoff schedule for February 17, 2009 in the US, whereas Latin America is currently an open market with regard to DTT (Digital Terrestrial Television) standards; although, decisions are expected within the coming months that will start to add definition to this region. Most of the forecasts have been derived based upon TV House Hold numbers, along with expectations for analog cutoffs.

### Fundamentals of HDTV

The basic concept behind high-definition television involves an increase of the definition by offering a higher resolution while maintaining the projected display size. (Increase number of pixels).

The majority of the proposed analog and digital - HDTV systems are working toward approximately a 100% increase in the number of horizontal and vertical pixels. (Proposals are roughly 1 MB per frame with roughly 1000 lines by 1000 horizontal points). This typically results in a factor of two to three improvements in the aspect of the vertical and horizontal fields. The majority of HDTV proposals also change the aspect ratio to 16/9 from 4/3 - making the image compatible with movie theater standards.

Table 1 summarizes few of the more conventional HDTV resolutions in comparison with existing analog TV systems;

Name	P= Progressive 60 FPS I = Interlace 30 FPS	Total Lines	Active Lines	Vert. Res.	Horz. Res.	Aspect Ratio	Vert. Field (degrees)	Horz. Field (degrees)	Frequency MHz
USA, HDTV	P	1050	960	675	600	16/9	23	41	8
Europe, HDTV	P	1250	1000	700	700	16/9	23	41	9
Japan, HDTV	I	1125	1080	540	600	16/9	17	30	20
NTSC	I	525	484	242	330	4/3	8	11	4.2
NTSC	P	525	484	340	330	4/3	12	16	4.2
PAL	I	625	575	290	425	4/3	10	13	5.5
PAL	P	625	575	400	425	4/3	13	18	5.5
SECAM	I	625	575	290	465	4/3	10	13	6
SECAM	P	625	575	400	465	4/3	13	18	6

**Table 1**

## Participants

Table 2 below lists some of the active participants in the current HDTV broadcasting equipment market.

Manufacturers	Manufacturers
<a href="#">Telestream Inc.</a>	<a href="#">Broadcast Electronics, Inc.</a>
<a href="#">Grass Valley, Thomson Group</a>	<a href="#">Calrec Audio Ltd.</a>
<a href="#">Thales Broadcast and Multimedia</a>	<a href="#">LPB Communications</a>
<a href="#">Harris Broadcast Communications</a>	<a href="#">Broadcast Technology Ltd.</a>
<a href="#">Videotek Inc.</a>	<a href="#">Sace Elettronica</a>
<a href="#">Clear-Com Intercom Systems</a>	
<a href="#">Scientific-Atlanta Europe</a>	
<a href="#">Evertz Microsystems, Ltd.</a>	
<a href="#">Ikegami Electronics Co., Ltd.</a>	

Table 2

## How does CTS support HDTV Broadcasting Equipment?

As demands for high resolution **VIDEO** on demand (VOD) and **VIDEO** over Internet Protocol (IP) applications grow, equipment manufacturers, such as those mentioned in table 2, require high frequency reference VCXOs and clock oscillators to encrypt and decode the high-resolution video packets. Such frequency sources ranges from +/-50PPM to +/-25PPM accuracy with very low noise jitter performance of <1pS RMS over 12KHz to 20MHz bandwidth. The two most common frequencies required are 74.250 MHz and 74.1258MHz or their multiples (frequencies may vary based on the design approach used by each equipment mfg.);

- VCXO 357 models at +/-25PPM stability and +/-100PPM APR;

**Examples P/N; 357LB3C074M2500 and 357LB3C074M1258**

- CTS Models CB3LV, 635 LVCMOS or LVPECL respectively are series of 5mm x 7mm crystal based clock oscillators;

**Examples P/N; CB3LV-5I-74M2500 and 635P5C3074M1258**

All product families are RoHS compliant. The following web link offers access to CTS data sheets for each model, <http://www.ctscorp.com/components/xo.asp> and [http://www.ctscorp.com/components/vcxo\\_vcxo.asp](http://www.ctscorp.com/components/vcxo_vcxo.asp)

Model Name	Frequency Range	Overall Frequency Stability	Temperature Ranges	Jitter	Package Size
Model CB3LV	1.5 - 160 MHz	± 50 ppm standard (tighter stabilities available)	-20 to 70°C -40°C to 85°C	<0.5pS	7.5 x 5.0 x 1.8 mm 0.295 x 0.197 x 0.071 inch
Model 635	19.44 – 212.5 MHz	± 50 ppm standard (tighter stabilities available)	-20 to 70°C -40°C to 85°C	<0.5pS	7.5 x 5.0 x 1.8 mm 0.295 x 0.197 x 0.071 inch
Model 357	1.5 - 77.76MHz	±25 ppm to ±50 ppm	-20 to 70°C -40°C to 85°C	<0.5pS	7.5 x 5.0 x 1.8 mm 0.295 x 0.197 x 0.071 inch

Written by: Ronen Cohen  
Date: 12/14/2006

