# STEREO TELEVISION AND CABLE : ONE YEAR LATER

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## ABSTRACT

At the 1986 N.C.T.A. Convention, the item on everyone's mind was BTSC Stereo Television. As this was a new development in cable television, much attention was focused on the technology of the standard. In particular, the questions concerned- How does it work? Can it be implemented? How do we test? and, Can the standards be met? These questions and others revolved around the encoder systems, and the generation of the signal. Subcommittees and working groups were formed to discuss issues such as proper alignment, test procedures, and specifications. This year saw much of this effort discontinued, possibly with the impressions that the obstacles had been overcome and little further concern was necessary. In reality the situation is quite different.

## INTRODUCTION

The introduction of BTSC stereo generation to CATV systems has, since its inception, been faced with two situations unique to the industry.

(a) The CATV system typically involves more complex signal handling than does the basic broadcast to TV transmission.(Fig.1)

(b) The average CATV operator possesses less test equipment, particularly audio test equipment than does the average broadcaster.

These two situations were the thrust of most of the research and investigation performed up to now. We have addressed, and for the most part, solved the problems of dealing with Baseband Converters, Modulator Bandwidth, level calibration, system degradation and other fairly obvious difficulties.

We now face an entirely new set of challenges, as we attempt to implement television stereo in the average cable television system.

### Source Signals

Step one of any implementation is to recover the program material from the delivery medium. This is, for most applications, a satellite delivery system. Up to now, this recovery has been a simple matter of either a single high level subcarrier, or the output of a digital descrambler system. In many cases, this signal has been designed to facilitate MONO recovery and is therefore either a DESCRETE MONO source, or a MATRIXED 'M' signal (L + R). In other cases, the signal is duplicated as a high level mono accompanied by a DESCRETE LEFT and RIGHT low level pair. In rare cases, the signal may be a high level MULTIPLEXED STEREO format. Whatever the format, the operator is probably looking for a source signal which has not been previously employed, and possibly incorrectly identified : (Feeding the L and R inputs of stereo encoder with 'M' and 'D' sources can produce some rather interesting results).

Due to the lack of both stereo programming and stereo awareness, it is practically impossible to distinguish by ear between a DESCRETE RIGHT (or LEFT) and a MATRIXED L + R (M) signal. (The aspect of stereo program context will be further examined later in this paper).

A further complication may arise as program sources which are equipped with stereo encoders today change to encrypted or digital transmission formats at a later date.

### Head End Modulators

As it was realised early on that most CATV modulators would not have the baseband modulation capability required for BTSC, most ENCODER manufacturers have provided an internal 4.5 MHz modulator feature. This feature, which allows the encoder manufacturer to provide the properly deviated aural signal appears to solve the problem, however, the implementation is less than simple. Most CATV modulators which accommodate external 4.5 MHz, are designed to accept 4.5 MHz/video combined on a single input port.(Fig.2)

This brings about the somewhat pointless situation of being required to multiplex the 4.5 MHz on to the video, to be fed to the modulator, where it is immediately separated and processed separately! Not only is this a cumbersome situation, but some modulators can develop intermodulation problems when operated in this manner. The ideal situation is a modulator with separate video and 4.5 MHz inputs. This option is currently being made available by most major manufacturers, but those CATV systems employing lower grade and offshore equipment may face a difficult situation.

## Terrestrial Encryption Interface

When the addition of stereo is considered, it most often involves a premium service, which is invariably protected for distribution. We are now adding a BTSC encoder not only to a receiver/modulator system, but to a receiver/descrambler/scrambler/modulator system. A particular case in point would involve a baseband scrambling system, and a video/4.5 input modulator. In this situation

- if the video is looped through the encoder before encryption, how is the 4.5 MHz added to the video after encryption but before the modulator.

  but

  if the video is encrypted prior to being fed to the encoder loop/combiner, there will be no sync to allow pilot phase lock and therefore no stereo.

To more clearly illustrate this situation, we can examine one actual case where this problem has arisen. The Rogers Toronto System employs a downtown head end hub system with baseband scrambling. Due to T.I. problems, the C BAND signals are received at the North edge of town and delivered to the hub head end via FML microwave as a baseband to baseband link to allow encryption at the hub site.

The question now becomes:

(a) Place the stereo encoder at the hub head end and attempt to deliver the DESCRETE left and right on separate subcarriers via microwave?

(b) Place the stereo encoder at the remote antenna site and attempt to transport BTSC stereo via separate microwave subcarrier?

(c) Place the stereo encoder and the baseband scrambler at the remote site?(this would involve backhaul of the encryption data).

This, and many similar situations are beginning to become apparent as implementation progresses.

In this particular case, the following method was selected as the most workable solution: The audio is BTSC encoded at the remote site and presented as a video/4.5 combined signal to the FM microwave link. At the downtown head end, the microwave is demodulated to video/4.5 combined, and diplexed to separate video and 4.5 sources. The video is encrypted and delivered to the modulator as separate video and 4.5 signals for modulation to channel.(Fig.4)

## Home Installation

It is now quite apparent : only the fully stereo television receiver, with internal drive for auxiliary external speakers will provide a satisfactory solution to the customer. It is probably best, at this point, to quote an actual case example.

As the proud owner of a new large screen combination cable ready TV/Monitor with "Stereo Adapter" feature, I proceeded with utmost confidence to add an auxiliary stereo decoder. Thus armed with a multi-input (baseband, 4.5 MHz, Ch.3) decoder, and a set of auxiliary powered speakers, I undertook the 15 minute task of "just hooking this stuff up" to get stereo television. I had deliberately chosen a decoder which included a synthisizer in order to improve both my cable as well as my baseband VCR and Satellite receiver sound. Several frustrating hours later, I had achieved the following insight.

(a) The "Stereo Adapter" port on my television consisted of an amplified IF SPLITTER

providing an IF sample, with a pin diode output switch(possibly a crude form of mute system!)

(b) When switched to video/audio input such as satellite, the "stereo adapter" port continued to deliver the sound from the last tuned cable channel!

(c) The amplified speakers required separate volume adjustment at every program change, which results in the final conclusion being arrived at by myself as well as other interested household members: (i.e. Take that mess down to your workshop and play with it there!)

What does, in fact, become apparent, is that with a few audiophile exceptions, most listeners will probably convert to stereo when it becomes an interesting extra in their new television receiver. Certainly many people will install decoders to be adjusted separately for a program of interest, but general "no second thought" use will only only occur with the true stereo television receiver.

Stereo Programming(or lack of):

The first observation made by a customer with stereo television that of two distinct audio formats being employed by the broadcaster. In one format, programms with little or nothing to offer in the way of stereo but transmitting in stereo: i.e. stereo transmission of a single talking head!

The second format attempts to employ every possible mechanism to exploit the fact that they are in stereo. One popular Friday night program has the soundtrack so overloaded in order to exploit stereo that it is decidedly annoying to watch(hear). (Gone forever the silent pause!).

## CONCLUSION

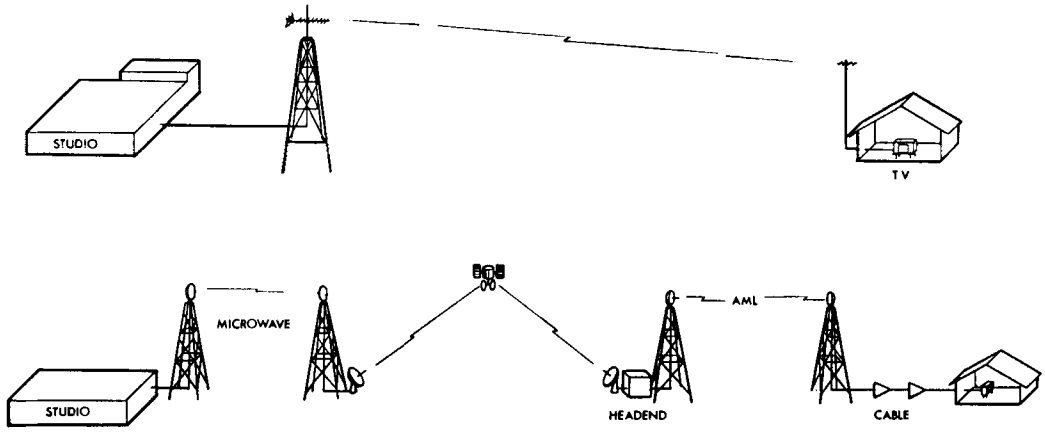
At this stage in the implementation process, it is wise to take stock of several obvious points:

(1) Those people involved with stereo over the last few years: the subcommittee, the manufacturers, the experts, etc. while knowing the field quite well, are not those who will be doing the majority of the implementation. It is our responsibility to provide as much education as possible to the system operator on whom the actual implementation burden will fall.

(2) The first stereo subscribers, the audiophiles, will be the most difficult to please, and this will, of course occur at the lowest point of the implementation learning curve.

(3) The conversion to stereo is not inexpensive but if a question of time vs capital arises, it is best for most operators to wait until they can afford to do it properly rather than to undertake half-way measurers.

(4) The list of surprises is not yet complete.




MODERN LINK COMPLEXITY FIG. 1

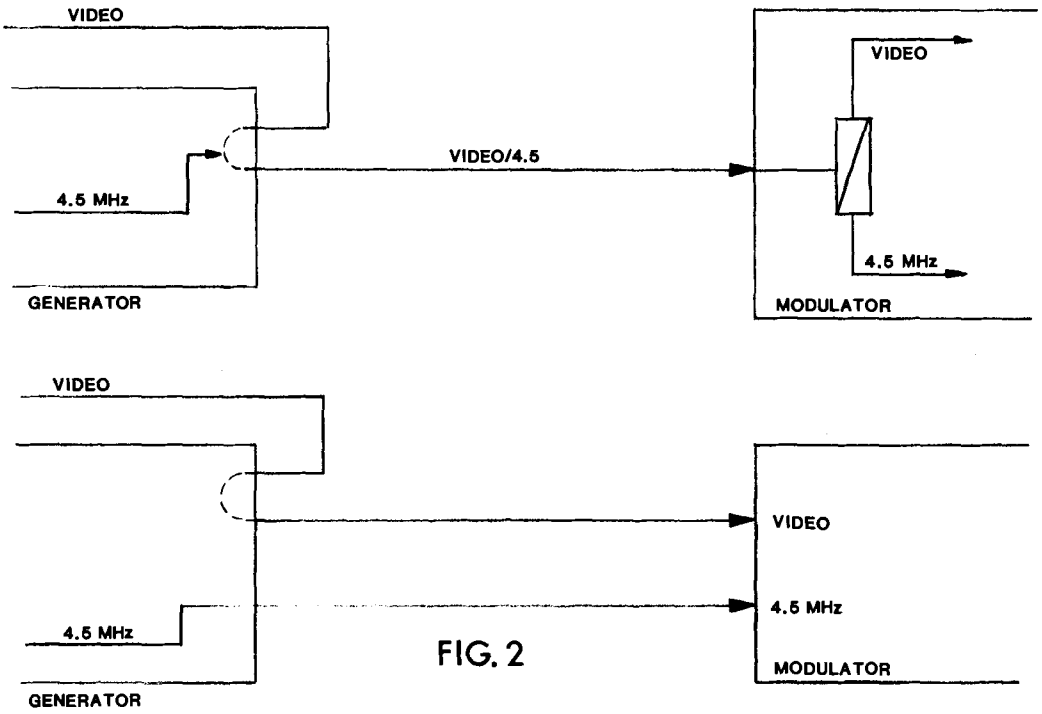

VIDEO
VIDEO/4.5
4.5 MHz
GENERATOR
VIDEO
4.5 MHz
MODULATOR
VIDEO
4.5 MHz
GENERATOR
VIDEO
4.5 MHz
MODULATOR

FIG. 2

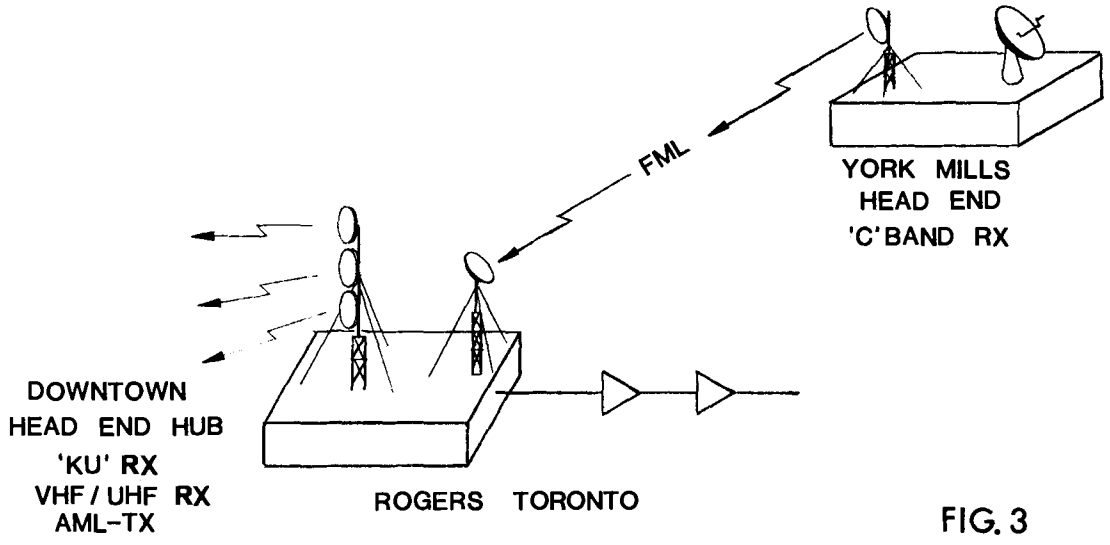

FML
YORK MILLS
HEAD END
'C' BAND RX
DOWNTOWN
HEAD END HUB
'KU' RX
VHF / UHF RX
AML-TX
ROGERS TORONTO

FIG. 3

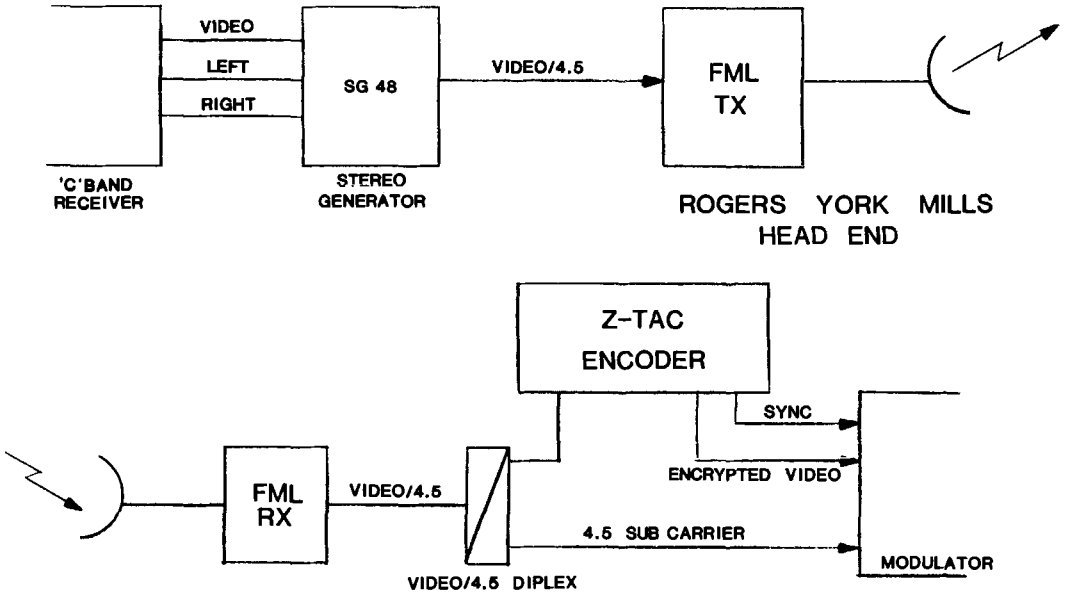

VIDEO
LEFT
RIGHT
SG 48
VIDEO/4.5
FML
TX
'C' BAND
RECEIVER
STEREO
GENERATOR
ROGERS YORK MILLS
HEAD END
Z-TAC
ENCODER
SYNC
ENCRYPTED VIDEO
FML
RX
VIDEO/4.5
4.5 SUB CARRIER
MODULATOR
VIDEO/4.5 DIPLEX
ROGERS DOWNTOWN HEAD END

FIG. 4

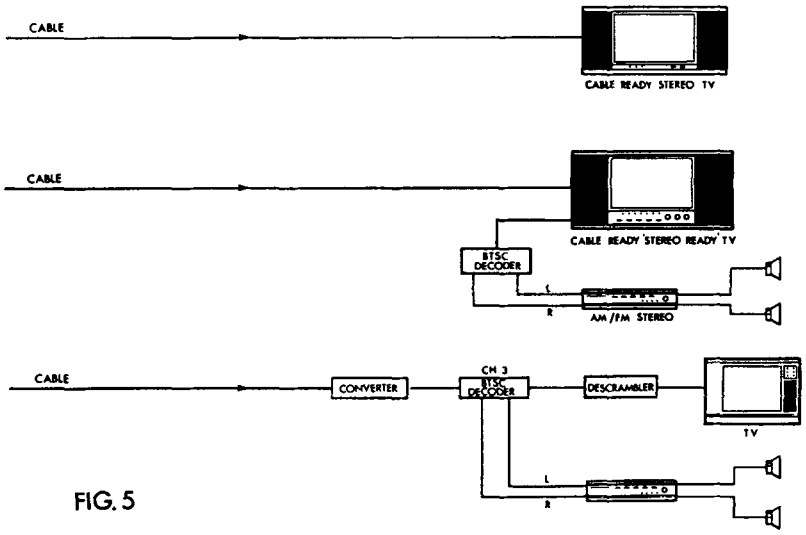

CABLE
CABLE READY STEREO TV
CABLE
CABLE READY STEREO READY TV
BTSC
DECODER
AM/FM STEREO
CABLE
CONVERTER
CH 3
BTSC
DECODER
DESCRAMBLER
TV

FIG. 5

## AUTHORS' VIEWS

QUESTION: What do you feel is the major unresolved problem with the implementation of BTSC on cable?

KARL POIRIER: Triple Crown Electronics Inc.

"Technical Instruction: This is possibly the most complex and foreign technology ever applied to the average CATV system. It embraces new technology, new equipment, new test procedures and new attitude. It is the responsibility of the 'experts' to pass this knowledge as quickly and effectively as possible."

WILLIAM (BILL) ARNOLD: Warner Cable, Texas

"In the decision to proceed with implementation of BTSC stereo, we anticipated a degree of subscriber education would be necessary; however, many of the subscriber comments led us to a more detailed analysis of the product delivered by the various services. Overall, the stereo product received from the music and premium services is 'acceptable', but our experience has indicated a need for the services to be more aware of the quality of their product; i.e. left/right balance, background 'garbage' and general tonal quality."

DAVID A. SEDACCA: Scientific-Atlanta, Inc.

"Headend operators must become familiar with BTSC stereo in the headend. They must learn the details that dictate how BTSC equipment may connect with their headend; then they must decide which options and signal paths will satisfy their needs for redundancy, switching, and control."

JOSEPH S. VITTORIO: General Instrument

"We feel that the major problem with BTSC today is that the measurement of BTSC signal performance in a cable TV environment has been minimal to non-existent in many cases. We feel this can be attributed to two basic problems:

1. Broadcast test equipment is too expensive for the average cable system to invest in ($35K for demodulation and $5K to $50K for instrumentation).

2. Lack of education and experience. Audio has always been something which came along with the video for free, and was generally ignored as long as it was listenable.

Stereo TV audio, however, requires care in handling and measurement. We encourage the SCTE, in conjunction with the major equipment suppliers, to develop a training program on BTSC signal handling and measurement."