CABLE STEREO QUALITY:
CAN CONSUMERS HEAR THE DIFFERENCE?

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ABSTRACT

Current consumer trends suggest that cable operators must find a way to provide cable subscribers with stereo. Of prime importance in the cable operator decision of how to carry cable stereo is determining how much quality consumers expect from cable stereo. In order to answer this question, ATC and Gillcable undertook a joint study to measure consumer perception of cable stereo quality.

The research results suggest that most consumers will not be able to detect quality differences among alternate stereo delivery systems. This is particularly true for the audio sources most commonly used in cable television programming.

The implication for the cable operator is that quality should be less of a factor in the decision of how to carry cable stereo than the economic and technical restrictions of the individual cable system.

INTRODUCTION

The growing trend for broadcast delivery of stereo television presents cable operators with the challenge of determining the best method for delivering cable stereo. Operators have a number of alternative delivery techniques available, and must choose the method that makes best use of scarce spectrum space and capital dollars while providing a secure signal and a level of audio quality consistent with consumer expectations.

In order to learn more about the relative qualities of cable stereo delivery alternatives, ATC and Gillcable undertook a joint effort to measure both the technical performance specifications of cable stereo equipment and consumer reaction to the relative listening quality of stereo delivered via cable. A discussion of the technical performance results is reported by David Large of Gillcable in a separate paper.

The purpose of this paper is to present the results of the consumer listening tests and to discuss the implications of those results for cable delivery of stereo television.

METHODOLOGY

The research is based on a series of twenty-nine group sessions with a total of 206 Gillcable subscribers 18 years of age and older. Subscribers were pre-screened for stereo equipment ownership and to ensure a 50-50 ratio of male and female participants. Respondents were asked to view TV monitors and listen to audio and then to fill out their responses in self-administered questionnaires. The questionnaires asked them to compare two audio selections and decide how selection "B" compared to selection "A" on a seven point scale from "a lot better" to "a lot worse." The sessions were conducted November 14 through November 23, 1985, in San Jose, California.

Participants viewed three selections of programming, each played twenty times through the various sound systems. The three programs, "Miami Vice" titles, a scene from "Beverly Hills Cop," and a high-separation, audio-only musical piece, were chosen for their varying degree of sound separation and stereo "effects." None of the selections included spoken dialogue.

Equipment used in the research attempted to replicate audio as delivered through a cable system. Figure 1 is a block diagram illustrating the equipment set-up used for the testing.

TEST RESULTS

Ten separate tests were conducted to evaluate consumer preference for alternative cable stereo delivery techniques. We asked consumers to compare the relative quality of:

1. Mono television to stereo television (mono signal).
2. Stereo television in mono mode to stereo television in stereo mode (stereo signal).
3. Separate speakers to in-set speakers (stereo signal).

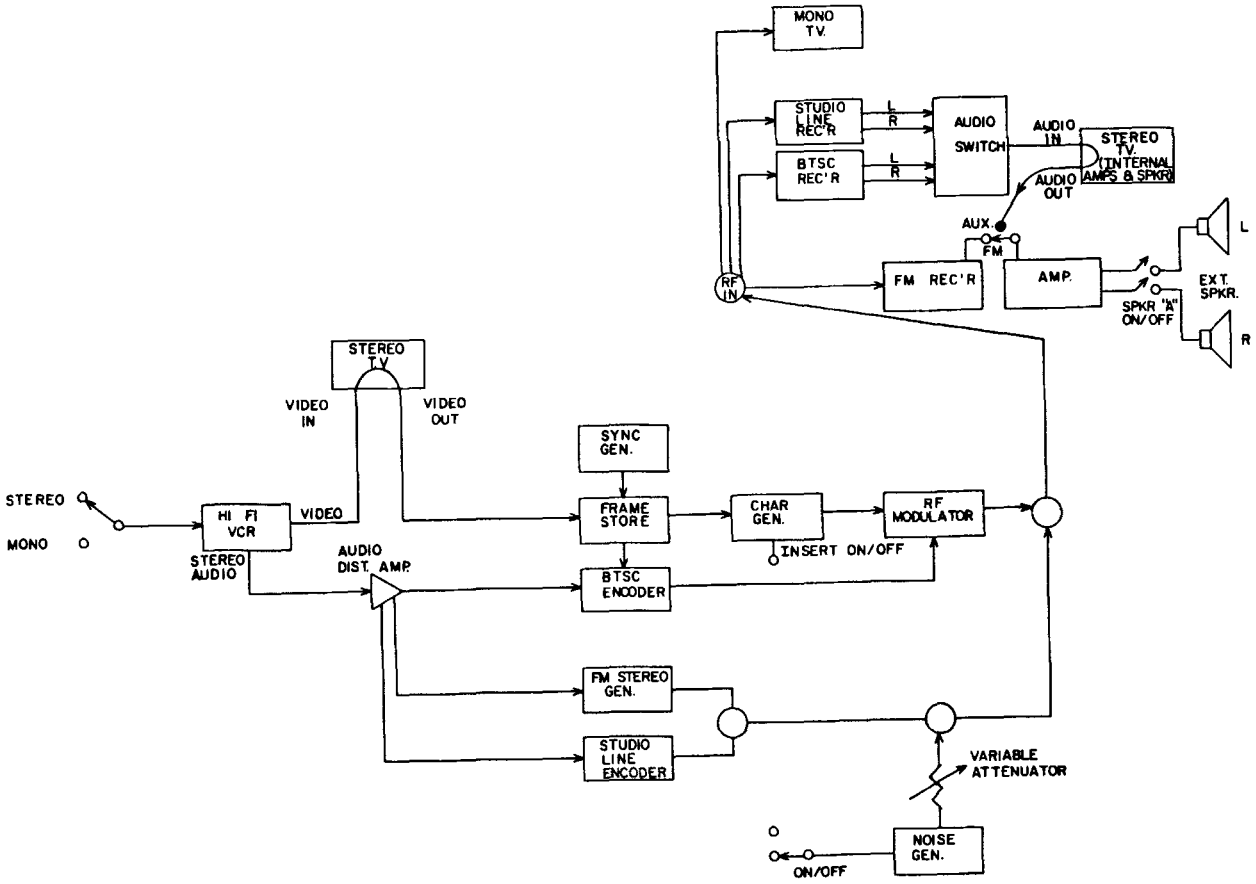

Figure 1. Test Equipment Set-up

4-6. "Clean" signal to degradation as represented by the addition of white noise from a noise generator through a variable attenuator set in increments of 15, 10 and 5 dB. The signal quality decreased as the attenuation decreased.

7. Stereo sound with character generator noise added, to stereo sound without character generator noise added.

8. FM stereo to BTSC stereo.

9. BTSC stereo to Studioline stereo.

10. Studioline stereo to FM stereo.

Evaluation of three of the above listed tests is not complete, and will not be discussed in this paper. In the cases of test six (signal degradation through a variable attenuator set at 5 dB), test seven (character generator noise), and test ten (Studioline stereo compared to FM stereo) difficulties in accurately assessing subtle differences in consumer perceptions require further work. We hope to have confirming tests completed prior to oral presentation of this research.

Program Sources

Three program sources were used throughout all ten tests. Results generated in other consumer listening testing have suggested that an individual's ability to discriminate between varying audio qualities is dependent on their familiarity with the musical format used in the test.[1,2] In an effort to cover all bases we selected programming from the movie "Beverly Hills Cop" to represent "movie" audio, a selection from "Miami Vice" titles to represent broadcast stereo, and an audio-only selection from Jean Michael Jarre's album "Oxygene" to represent very high quality audio without video distraction. The "Oxygene" music in particular has a great deal of stereo separation. All selections were recorded and edited in stereo using the VCR Hi Fi format. Miami Vice and Oxygene were recorded from Compact Disc. "Beverly Hills Cop" was recorded from a VCR Hi Fi cassette.

TEST RESULTS

The testing was divided into two sections: Consumer Reception Equipment and Cable Delivery Systems. Discussion of test results will be organized within these two sections. Because respondents perception of sound quality differed according to the music selection, results will be presented by audio source.

Consumer Reception Equipment

Table 1 presents the results of consumer ranking of the different reception equipment used in the test. In the comparison of a mono signal delivered via stereo TV to mono TV delivery (test 1), consumers clearly preferred the audio from the stereo television to that of the mono TV.

Respondents were less able to distinguish a stereo signal on a stereo TV from a mono signal on the same stereo TV (test 2). For the Beverly Hills Cop and Miami Vice program sources, no strong preference was expressed for the stereo mode, with over half of the respondents expressing no preference at all. Younger respondents (18-34) did indicate a stronger preference for the stereo mode than any other group, a finding consistent with the generally better hearing of younger people. Only in the case of the audio-only program source did most respondents indicate a preference for the stereo mode. The high degree of separation in this program source may have influenced consumer preference.

In test three, consumers were clearly able to distinguish between the audio from in-set TV speakers and separate speakers. Most respondents preferred the audio from the separate speakers. The test results seem to indicate that while consumers can clearly distinguish between a system with good quality speakers and amplifier and the audio from a single three inch speaker, they are less perceptive of the difference between a stereo signal and a mono signal when the reception equipment is the same. This is particularly true when Hi Fi VCR audio and broadcast television stereo are the program sources.

CABLE DELIVERY SYSTEMS

Signal Degradation

As expected, consumers were less able to detect differences between relatively subtle changes in the quality of the stereo signal. Table 2 presents the results of respondent sensitivity to incremental signal degradation.

Test four compares a clean stereo signal to one moderately degraded by insertion through a 15 dB attenuator. The majority of test participants could not distinguish between the two signals. In fact, over 80% said that the undegraded signal was either a little better, exactly the same or a little worse than the degraded signal. Of those respondents noting a difference, the majority preferred the clean (noise off) signal.

TABLE 1

CONSUMER PREFERENCE FOR RECEPTION EQUIPMENT

		Beverly Hills Cop	Miami Vice	Audio Only
The sound was better from:				
Test 1:	Stereo TV (mono mode)	76%	85%	72%
	Mono TV (stereo mode)	15	9	19
	No Difference Detected	9	6	9
Test 2:	Stereo TV (mono mode)	26%	50%	23%
	Stereo TV (stereo mode)	14	20	49
	No Difference Detected	60	30	28
Test 3:	Separate speakers	56%	60%	68%
	Stereo TV In-set speakers	36	35	26
	No Difference Detected	8	5	6

Table 2

CONSUMER SENSITIVITY TO SIGNAL DEGRADATION

		Beverly Hills Cop	Miami Vice	Audio Only
Test 4:	Signal Inserted through 15 dB Attenuator			
	The sound was better with...			
	Noise off	20%	35%	32%
	Noise on	15	18	25
	No Difference Detected	65	47	43
Test 5:	Signal Inserted through 10 dB Attenuator			
	The sound was better with...			
	Noise off	27%	40%	39%
	Noise on	17	26	22
	No Difference Detected	56	34	39

Table 3

CONSUMER PREFERENCE FOR DELIVERY SYSTEM

		Beverly Hills Cop	Miami Vice	Audio Only
The sound was better from:				
Test 8:	FM	39%	47%	40%
	BTSC	33	30	32
	No Difference Detected	28	23	28
Test 9:	Studioline	32%	38%	32%
	FM	28	32	28
	No Difference Detected	40	30	40

More people were able to detect a quality difference between a clean signal and one attenuated at 10 dB (test 5). Still, over 70% of respondents detected very little or no difference between the signals. In both tests four and five, respondents were less likely to perceive any difference when listening to "Beverly Hills Cop" than either of the other two program sources.

Delivery Systems

Table 3 presents the results of consumer ranking of preferences between FM and BTSC (test 8) and of preferences between Studioline and FM (test 9). In test eight, the majority of respondents preferred the FM source to the BTSC source, although almost one-quarter of the respondents could detect no difference and a full one-third preferred the BTSC format. The slight preference for FM may be explained by FM's higher separation compared to BTSC. Ability to distinguish (and prefer) separation is indicated by the more discriminating listening done on the high-separation, audio-only program source and by consumer preference for separate audio speakers.

In a comparison of the Studioline signal and FM (test 9), respondents had more difficulty detecting a difference between the two signals. Eighty percent of test participants ranked their answers in the middle categories of " a little better," "exactly the same," and "a little worse." Of those participants noting a difference, there was a slight preference for the Studioline signal.

CONCLUSIONS

Current retail trends, coupled with the apparent consumer preference for stereo television equipment, suggest that cable operators must quickly find a way to deliver stereo to cable subscribers.

While consumers appear to be able to detect audio quality differences among in-home television equipment, they are less able to detect audio quality differences among alternate cable stereo signals. This is particularly true when the audio program sources are broadcast television stereo or Hi Fi VCR stereo. Most cable television audio programming will not exceed the quality levels found in broadcast television or Hi Fi VCR audio. The implication for the cable operator is that quality of stereo delivery is not a primary factor in determining how to provide stereo audio to cable subscribers. Most cable subs will not be able to detect quality differences even between the highest quality out-of-band delivery technology (Studioline) and a FM delivery system. The decision on how to deliver cable stereo should focus on the technical parameters and the economic factors for the individual cable system and the amount of signal security required. Audio quality should be a secondary factor in the decision process.

REFERENCES

1 Center for Advanced Television Studies, M.I.T., "Audience Research Project Pilot Study of Audio Discrimination: Digital vs. Analog," July, 1984.

2 ATC Consumer Research Department, "Results of Analog vs. Digital Audio Listening Test," May, 1984.