January 27, 1994

Comments submitted to FCC Notice Of Proposed Rules on Consumer Electronics Compatibility

Ron D Katznelson

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of	)	
	)	
Implementation of Section 17 of the Cable Television Consumer Protection and Competition Act of 1992	)	ET Docket No. 93-7
	)	
	)	
Compatibility Between Cable Systems and Consumer Electronics Equipment	)	

COMMENTS OF
MULTICHANNEL COMMUNICATION SCIENCES, INC.

January 26, 1994

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SUMMARY

MCSI fully supports industry efforts to improve compatibility between cable systems and consumer electronics equipment by developing the Decoder and Access Control Interface standard that will also accommodate digital transmissions. However, based on histories of similar standard setting efforts that we review, we believe that the Decoder Interface standard setting process recently embarked on by the industry is very unlikely to result in any mass produced equipment with Decoder Interfaces before the year 2000. Although this approach may provide selective compatibility relief at a much later stage, we submit that the present rules proposed by the Commission are inadequate if the Decoder Interface requirement is the only regulatory measure the Commission is proposing in order to achieve ultimate substantial compatibility. Since the Commission is on record as encouraging "simultaneously clear signal" approaches, MCSI respectfully recommends that the Commission adopt additional rules that actually encourage cable operators to adopt such clear channel technologies. MCSI further recommends that the Commission take the necessary regulatory steps to ensure that the RF interface portion of the "cable-ready" equipment regulations will not be delayed due to protracted Decoder Interface development efforts.

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COMMENTS OF MULTICHANNEL COMMUNICATION SCIENCES, INC.

1 INTRODUCTION

Multichannel Communication Sciences, Inc. ("MCSI"), hereby submits these comments in response to the Federal Communications Commission's ("Commission") Notice Of Proposed Rule Making ("NPRM") in the above-captioned proceeding.

MCSI has an interest in the Commission's implementation of the Cable Television Consumer Protection and Competition Act of 1992 ("Cable Act")[1] in general and Section 17 in particular, because of its substantial involvement in the broadband communications industry. MCSI is the developer of the addressable broadband descrambling and access control technology that will enable cable TV and video dialtone service providers to eliminate incompatibilities between consumer electronics equipment and cable systems utilizing scrambled TV transmissions. Using advanced digital signal processing methods embodied in broadband "converter-less" addressable subscriber devices, MCSI's technology can restore all features and functions contained in TV receivers and video cassette recorders ("VCRs") by selectively providing each subscriber with all authorized channels simultaneously in-the-clear on their cable

1. Pub. L. No. 102-385, 102 Stat. 1460 (1992).

drop[2]. MCSI has recently demonstrated the operation of Broadband Descrambling prototype devices at the 1993 National Cable Television Association ("NCTA") Annual Convention and Exposition in San Francisco, CA (See Appendix D).

In the instant NPRM, the Commission seeks comments on regulations it proposes to adopt for assuring compatibility between consumer electronics equipment and cable systems. These Proposed Rules include measures that are intended to provide a certain degree of improved compatibility between existing cable and consumer equipment and also include provisions intended to achieve substantial improvements in compatibility through the introduction of new Component Decoders and new consumer electronics equipment equipped with the mating Decoder Interface. In many respects, the Commission's Proposed Rules follow the Supplemental Comments filed by the Cable-Consumer Electronics Compatibility Advisory Group ("CAG") in this Docket[3], to which MCSI previously had submitted a reply[4].

2 THE COMMISSION MUST NOT RELY SOLELY ON AN OPEN-ENDED DECODER INTERFACE DEVELOPMENT SCHEDULE TO ACHIEVE SUBSTANTIAL COMPATIBILITY

MCSI fully supports industry efforts to develop the Decoder and Access Control Interface standard that will accommodate digital transmissions. However, MCSI will show that the Decoder Interface standard setting process recently embarked on by the industry is unlikely to be concluded in the time period indicated by the Commission and would begin to provide

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2. *See* Exhibit A of MCSI's Comments on the Commission's earlier Notice Of Inquiry on *Compatibility Between Cable Systems and Consumer Electronics Equipment*, ET Docket No. 93-7. March 22, 1993. *See also* "Digital Broadband Descrambling Technology - A Compatible Access Control Solution to the Ever-Growing Consumer Electronics Interface Problem" by R. D. Katznelson, in *NCTA Technical Papers, 42nd Annual NCTA Convention*, San Francisco, June 6-9, 1993. pp 69-81.

3. Supplemental Comments of the Cable-Consumer Electronics Compatibility Advisory Group, in *Compatibility Between Cable Systems and Consumer Electronics Equipment*. ET Docket No. 93-7, July 21, 1993. (Hereinafter referred to as "CAG Supplemental Comments").

4. Reply Comments of MCSI, in *Compatibility Between Cable Systems and Consumer Electronics Equipment*. ET Docket No. 93-7, August 10, 1993. (Hereinafter referred to as "MCSI's Supplemental Reply Comments").

selective compatibility relief at a much later stage. Unfortunately, the Decoder Interface is the only regulatory measure the Commission is currently proposing in order to achieve substantial compatibility. Therefore, without detracting from the potential importance of this proposed rule for achieving substantial compatibility, we submit that the present rules proposed by the Commission are inadequate since they provide the Decoder Interface as the sole regulatory means of achieving substantial compatibility in the future.

2.1 The Decoder Interface Development Schedule Proposed by the Commission is Unrealisticly Short and Cannot be Achieved.

We believe that several reasons caused the Commission to underestimate the development schedule of the Decoder Interface: The NPRM states that the CAG has indicated that the EIA/NCTA Joint Engineering Committee ("JEC") will complete their work on the amended IS-6 plan and the updated Decoder Interface standard by the end of 1993[5]. Based on this reading, the Commission proposes to require that all consumer electronics equipment marketed as "cable ready", that is manufactured or imported after December 31, 1996, comply with a new "cable ready" standard which will include a Decoder Interface. While the Commission may be correct about the channelization and RF interface specifications schedule, we believe that the CAG's inconsistent and ambiguously stated timetable, understandably caused the Commission to misread the CAG schedule for the Decoder Interface and to believe the JEC updated Decoder Interface standard would be completed by the end of 1993. Since the CAG believes that the Decoder Interface specifications must include provisions for processing digital signals[6], the CAG proposed schedule for the development of the Decoder Interface must be read in that light. Page 11 of CAG's Supplemental Comments contains the following schedule:

> 1993: Define "cable-ready".
>
> 1994: Define [digital] transmission and tuner specifications.
>
> No later than 1995: Set target dates for standards for decompression and a standard security interface system.

The CAG then stated that "Once digital transmission standards and other aspects of the 'cable-ready' specification are completed, design cycles (normally two years) should permit the

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5. NPRM at Paragraph 28.

6. CAG Supplemental Comments at page 10.

availability of 'cable-ready', decoder-interface equipped TV's and VCR's"[7] (emphasis supplied).

Hence, even according to CAG's July 1993 statement, digital transmission standards would not have been completed (and indeed have not been completed) by the end of 1993. Therefore, the meaning of "Defining cable-ready" in 1993 is ambiguous, because no such definition is possible without first having finalized the Decoder Interface, which can only be finalized after digital transmission standards are specified and tested with the Decoder Interface.

Moreover, regardless of what the CAG may state, or the Commission may choose to believe, neither can predict with any assurance the time frame within which digital transmission standards for cable will be proposed, developed, tested and finalized[8]. The Commission is not proposing to institute a fast-track Rule Making process for digital transmission formats on cable. Rather, it will only "continue to monitor these developments to ensure that consumer interests are protected"[9]. (emphasis supplied). Furthermore, even after such digital transmission standards are adopted, no party to this proceeding can guarantee the length of time it would subsequently take to develop, specify, test, revise, retest and finalize all specifications required for the successful deployment of the modified Decoder Interface.

In order to convey some appreciation for the scope and the engineering development process involved in a development effort of a relatively simple Decoder Interface, Appendix A attached herewith describes the chronology and major milestones that actually took place in developing the ANSI/EIA-563 baseband Decoder Interface, often referred to as Multiport. As can be seen, hardware tests and product evolution led to major unforeseen changes and redesigns in a DRS signal line, AGC interface specifications, Y/C signals provisions and a data interface

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7. CAG Supplemental Comments at page 11.

8. We note that, as in any technological engineering development efforts, schedule slips for the development of digital cable transmission technologies have occurred and will likely continue to be encountered in the future. *See* "1994 Outlook: Fiber Optics Yes, Digital No" by P. Lambert and L. Ellis, in *Multichannel News*, November 29, 1993, p. 1. *See also* "Cable TV leader Tele-Communications Inc. will delay for a year the purchase of 1 million digital set-top boxes...", *The Associated Press Wire*, January 21, 1994.

9. NPRM at paragraph 34.

protocol in order to accommodate emerging IPPV functions.

Some may argue that Multiport's development schedule could have been shorter had there been full cable industry support. However, the record shows that while some cable industry entities may have changed their priorities around 1988 and have since then been somewhat reluctant to adopt an already developed Multiport, the cable industry fully supported the engineering development efforts from 1982 to 1988 (six years) by making available all necessary resources, engineering personnel, test facilities and equipment. It is evident that given the market conditions in the mid 1980's, in developing Multiport, both the consumer electronics and cable industries have worked diligently based on their then perceived benefits of using the Decoder Interface. The perceived benefits then are no less than those they may perceive today. Hence, despite the Commission's watchful eye, there is no basis in the record to assume that an equivalent effort today would take less than six years.

We understand that the JEC has developed a draft outline of a revised Decoder Interface which radically deviates from the baseband EIA-563 Multiport standard in several key ways including the introduction of an IF interface and other data busses. MCSI fully supports the JEC efforts in developing the Decoder and Access Control Interface standard that will accommodate digital transmissions because, like many other parties to this proceeding, MCSI believes that the alternative of adopting EIA-563 at this time is not in the public interest[10]. However, it should be clear that the mere outline of a Decoder Interface standard setting effort, or its subsequent paper design cannot serve as the basis for the Commission Rules on the Decoder Interface nor realistically trigger the start of the three year period, at the end of which all receiving equipment marketed as "cable-ready" must comply with the (yet undefined) Decoder Interface standards. If the Commission precipitately acts this way, (that is, in accordance with Paragraph 28 of its NPRM), it would be analogous to a hypothetical situation wherein the Commission would have

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10. We note that EIA-563 Multiport cannot support any digital transmission formats contemplated for cable service. Furthermore, it does not support several analog scrambling systems including Zenith's PM or Jerrold's scrambling systems that utilize audio subcarrier frequency offsets. Moreover, descrambling of 6-10 dB dynamic RF sync suppression has not been satisfactorily demonstrated using Multiport due to fundamental descrambling reference signal error sensitivities.

asserted these proposed rules in mid 1983, when a first outline of a Decoder Interface and a paper design were available[11]. It is instructive to follow this hypothetical retrospective situation to its logical conclusions based on the actual history of the development of Multiport as described in Appendix A. Appendix B contains such a hypothetical analysis in order to illustrate the impracticality of adopting Decoder Interface rules at this early stage where only untested paper designs are available. The important message conveyed by this hypothetical analysis, is that industry engineering development efforts such as those required in establishing digital transmission formats and the subsequent interface specifications cannot be accelerated significantly by regulatory fiats.

Unlike the EIA-563 Multiport baseband Decoder Interface, the Decoder Interface contemplated by the JEC contains new elements such as IF interfaces, provisions for operation with analog formats and digital formats that have yet to be specified, developed, operated with scrambling systems that have not been supported by the earlier Multiport standard. Consequently, additional technical issues related to the IF signal and its interface specifications, AFC and AGC functions in all signal formats and phase noise performance of the "cable-ready" tuner must all be resolved, and prototypes designed, built, tested, modified and retested. Such tests, in the laboratory and in the field, must be satisfactorily completed before the Commission can adopt a realistic Decoder Interface standard that will trigger the start of a time period after which all receiving equipment marketed as "cable-ready" must be compliant.

We concur with suggestions that the scope of a proceeding setting forth digital transmission standards for cable and its related access control interfaces is no less than the scope of the Commission's Advanced Television Systems ("ATV") effort[12]. One should note that ATV proponents, the Commission and its Advisory Committee on ATV are still working on the ATV transmission format some six and a half years after the Commission initiated its ATV

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11. "The Descrambler Interface, A Progress Report" by E. S. Kohn, in *NCTA Technical Papers, 32nd Annual NCTA Convention*, Houston, TX, June 12-15, 1983. pp 321-324. - A copy of this RCA proposal is attached to Appendix A.

12. Titan's Supplemental Reply Comments at page 10.

proceedings[13]. Additionally, considering that commercially manufactured ATV sets are still a few years from introduction, a total time period of six years to mass commercial introduction of Decoder Interface equipped consumer electronics equipment that is compatible with digital cable transmission standards looks overly optimistic.

MCSI submits that nothing in the record provides the Commission with any evidence, or any level of assurance that by December 31, 1996, it would be possible to introduce the intended mass produced Decoder Interface equipped television receiving devices and matching Component Decoders. Rather, the record shows that it will take no less than six years. *If the CAG or any other party believes that the JEC can finalize a Decoder Interface standard with which mass produced TV receiving devices and Component Decoders become compliant in less than six years, it should state the general distinguishing features of this standard setting effort over similar known efforts that provide assurances that competing vendors' interests and normal unforeseen technical circumstances in engineering development would not cause the usual schedule extensions in finalizing such an industry standard.*

In asserting that any realistic Decoder Interface development effort will take many years, we do not mean to discourage the Commission from directing the industry to pursue this path, which upon full deployment, may indeed lead to substantial improvements in compatibility. Rather, we ask the Commission not to place all its expectations for substantial compatibility improvements on the Decoder Interface process because the record shows that this approach will not produce any tangible results for a substantial number of cable subscribers earlier than the year 2000; and because even after that, there are no assurances that Decoder Interfaces will be available in any consumer electronics equipment other than the high-end models. Therefore, MCSI submits that the Commission must augment its proposed rules to better deal with the ever growing installed base of consumer electronics equipment that will never have a Decoder Interface. Some suggestions for such Commission action are contained in the following sections.

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13. Federal Communications Commission, *In the Matter of Advanced Television Systems and Their Impact on the Existing Television Broadcast Service and other matters*, MM Docket No. 87-268, FCC 87-246, Adopted: July 16, 1987.

3 THE COMMISSION SHOULD PROMULGATE 'CABLE-READY' RULES IN TWO PHASES

Currently, the rules proposed by the Commission will define "cable-ready" equipment as having both a Decoder Interface and improved standardized RF interface specifications required for direct connection of the receiving device to cable. In MCSI's Supplemental Reply Comments, we have already spoken to the different time scale within which RF interface improvements and Decoder Interfaces can be implemented[14]. We understand that there is a detailed agreement at the JEC on all pertinent RF interface specifications required for "cable-ready" Television receiving equipment. Unlike Decoder Interface specifications that are years away from finalization, these RF Interface specifications have been finalized in detail and can be incorporated through the normal product development cycle. The CAG states that such a cycle takes two years[15]. Hence, the Commission may reasonably require the First Phase of "cable-ready" implementation to take place by April, 1996. Such a phase (termed "Cable-Ready I") will correspond to requiring all consumer electronics equipment that is marketed as "cable ready" or intended for connection to cable service to comply with the RF interface specifications proposed by the JEC including tuner overload, image and adjacent channel rejection, spurious signal leakage, Direct Pickup rejection etc. In the second phase, "Cable-Ready II" with a Decoder Interface will be introduced. We believe there is no reason for the Decoder Interface development process to "hold hostage" the timely adoption of the already finalized "cable-ready" receiver RF interface rules. In this way, "Cable-Ready I" and its attendant benefits to consumers can commence several years before "Cable-Ready II" is finally adopted.

There are substantial benefits in introducing "Cable-Ready I" as soon as possible. These include:

- Over 60% of cable subscribers do not receive channels that are delivered in scrambled form. For these subscribers, "Cable-Ready I" is all that is required in order to restore full compatibility with their cable system. Furthermore, these subscribers may benefit much sooner from such compatibility improvement.

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14. MCSI's Supplemental Comments at page 2.

15. CAG Supplemental Comments at page 11.

- Subscribers who use a combination of a descrambler and a bypass switch or diplexer to receive clear signals directly on their TV or VCR while descrambling another channel with their descrambler, may be able to connect such "Cable-Ready I" set directly to the cable without experiencing interference or degradations associated with non cable-ready equipment.
- The incremental cost of "Cable-Ready I" equipment over today's equipment will be minor and will allow a large class of subscribers who do not require descrambling, a substantial savings by not having to purchase again more expensive Decoder Interface equipped "Cable-Ready II" devices when they become available.
- The early introduction of this type of "cable-ready" equipment will also facilitate the RF bypass measures that permit all unscrambled signals to be delivered directly to the TV or VCR. These bypass measures are an explicit statutory requirement of the Cable Act[16] and therefore is a proposed Commission rule[17]. When a bypass is effected, all signals appear at the input stage of the television receiving device and thus it should comply with the RF interface specifications.

The record is replete with evidence and irrefutable arguments showing that quite apart from the descrambling issue, a substantial improvement in compatibility can be accomplished by improved receiver performance via the adoption of RF interface specification regulations for "cable-ready" consumer electronics equipment. As evident from its Report to Congress, the Commission is aware of the fact that the majority of subscribers do not receive cable services that require descrambling.[18] Yet, in adopting its proposed "cable-ready" rules, the Commission proposes to follow the CAG's recommendations that will result in the inseparability of improvements in receiver RF interface specifications and the provision of a Decoder Interface. The Commission is also cognizant of industry estimates that peg the incremental cost to

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16. *See* §624A(c)(2)(B)(ii).

17. NPRM at paragraph 12.

18. The Commission is citing *TV Digest* survey that shows that only 37% of all subscribers use addressable descrambling equipment. *See* Federal Communications Commission, *Consumer Electronics and Cable System Compatibility*, Report to Congress, October 5, 1993 (hereinafter referred to as "Report to Congress"), at page 17.

consumers of providing the EIA-563 Decoder Interface at approximately $18[19]. While providing no analysis on costs and benefits, the Commission apparently believes that the incremental costs associated with the Decoder Interface that must be born by subscribers who do not need it (currently over 60% of all cable subscribers), are not significant and so the rules can require all cable-ready equipment to be equipped with the Decoder Interface. More importantly, we submit that there is no basis in the record for the Commission to presume that the incremental price of new receivers equipped with the new Decoder Interface will be near $18. Rather, we believe that the provision of new IF interfaces in addition to baseband interfaces and the additional special front end tuner requirements for digital transmission including more stringent phase noise and frequency response requirements, will result in significantly higher costs for the new Decoder Interface recommended by the JEC.

We therefore respectfully urge the Commission to move forward with "Cable-Ready I" rules but also withhold its blanket acceptance of the CAG recommendation on "cable-ready" regulations until it has sufficient cost information on the new Decoder Interface. The mere fact that the consumer electronics industry and the cable industry have reached a compromise accord at the CAG on the a priori inseparability of improved RF interface specifications and the Decoder Interface for "cable-ready" definition, does not mean that this exact definition best serves consumers' interests. We note that consumers were not represented at the CAG.

It is important also to note that most of the receiver RF interface specifications adopted by the JEC for recommendation to the Commission have been met by consumer electronics manufacturers for over a decade in consumer electronics products shipped to Canada. The Canadian RF Interface regulations for Cable Compatible Television Receiving devices and their measurement methods[20] are attached in Appendix C. It is also important to note that all television receivers offered for sale in Canada (and not only those that are marketed as "cable-ready") are required to meet such technical specifications by Part II of the Canadian General Radio Regulations. We believe the major difference between sets sold in the U.S. and in

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19. Report to Congress, at page 52.

20. "Cable Compatible Television Receiver Measurement Methods" , *Technical Bulletin TB-3*, June 1, 1982, Department of Communications, Canada.

Canada to be only related to additional testing performance verification and labeling requirements rather than a substantial construction difference. Therefore, we believe the burdens on consumer electronics manufacturers for introducing "Cable-Ready I" sets will be rather small when coupled with substantial benefits of early compatibility relief it is likely to bring to many of their cable subscribing customers.

Finally, we believe that to delay the introduction of the improved performance characteristics that achieve compatibility for subscriber devices that do not receive scrambled signals and to require that subscribers instead spend additional money on a Decoder Interface they do not need could not have been Congress' intent in enacting Section 17 of the Cable Act.

4 COMMISSION'S RULES (AND NOT JUST WORDS) MUST ENCOURAGE CABLE OPERATORS TO ADOPT 'SIMULTANEOUSLY CLEAR SIGNALS' TECHNOLOGIES FOR THE ACHIEVEMENT OF SUBSTANTIAL COMPATIBILITY

Both in its Report to Congress and in the NPRM, the Commission has expressed its support for technologies that provide subscribers with all authorized channels simultaneously in the clear. In its Report to Congress the Commission stated:

> "..the Commission continues to encourage the use and development of cable delivery methods such as traps, interdiction, addressable filters and other clear channel delivery systems that eliminate the need for any additional equipment in the subscriber's premises."[21] (emphasis supplied).

In the NPRM, the Commission stated that it believes that

> "..the most desirable solution in this matter is for cable systems to use technologies that provide all authorized signals in the clear. We therefore intend to continue to encourage the use and development of cable signal delivery methods such as traps, interdiction, addressable filters and other clear channel delivery systems that eliminate the need for any additional equipment in the subscriber's premises. We also intend to examine any future developments in clear channel technology as part of our monitoring activities in this matter. "[22] (emphasis supplied).

MCSI's Addressable Digital Broadband Descrambling technology ("DBD") is such a "clear signal technology". What the Commission means when it states it will continue to "encourage"

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21. Report to Congress, at page 65.

22. NPRM at Paragraph 33.

the use of such technology is unclear. We submit that if such "encouragement" is not embodied within Commission Rules, it is devoid of any real meaning. Thus far, nowhere in the Commission Rules can we find such "encouragement", as the rules fail to provide any incentives for cable operators to invest in deploying such technologies.[23]

4.1 SCATS Increments

MCSI has filed extensively in this Docket and in the Rate Regulation Docket (MM 92-266) urging the Commission to establish incentive rate increments, applicable under certain conditions for cable operators who employ addressable clear signal technologies. The proposed increments were not specific to DBD but also were meant to include interdiction, addressable filters or any other such system that does not frustrate other Cable Act provisions. Most recently, in its Petition for Reconsideration of the Commission's cable rate benchmarks[24], MCSI urged the Commission to establish incentive benchmark increments to the rate charged for Cable Programming Service tiers that are supplied simultaneously in the clear (SCATS increments[25]). In order to protect consumers, MCSI proposed that the numeric value of the SCATS increments in permitted charges would be set periodically by the Commission to a value no higher than the alternative average equipment charge increases to subscribers if such tiers of service were not SCATS and thus required the monthly rental of multiple set-top descramblers and related remote controls. It should be clear that according to MCSI's SCATS increment proposal, the mere offering of clear channels alone would not qualify for SCATS increments.

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23. One might argue that the Commission Rules could also achieve their goal if they were to produce disincentives for cable operators from making long term purchases of set-top decoders due to the Decoder Interface provisions of the rules. The fact is, that the Commission Rules produced exactly the opposite: Vendors and MSO's indicate that, spurred by re-regulation, set-top descrambler shipments will continue to surge in 1994 after doubling in growth last year. *See* "Re-regulation and DBS Fuel Addressable Surge" by P. Lambert, *Multichannel News*, January 10, 1994, p. 3.

24. MCSI's Petition for Reconsideration, Rate Regulation MM Docket No. 92-266, June 21, 1993.

25. See definition of Simultaneously Clear Addressable Tiered Service ("SCATS") in MCSI's Petition for Reconsideration at 4.

It is proposed[26] that in order for a service offering to qualify for the SCATS increment, access to such channels and tiers must be addressable and have no buy-through requirements of these tiers in order to purchase other services. In keeping with all provisions of the Cable Act, including the Tier Buy-Through Prohibition of Section 3, this qualifying condition provides an extra consumer protection measure, as it assures that subscribers purchase only what they want. Furthermore, MCSI proposed that such SCATS offering by cable operators should be on a voluntary basis.

No party to the cable Rate Regulation proceeding in MM Docket No. 92-266 or in the instant proceeding on compatibility, has raised an objection to MCSI's proposals described above. On the contrary: Several parties have expressed support for such incentive approach and urged the Commission to explore their implementation. These parties include consumer electronics manufacturers[27], Local governments[28], and a consumer coalition[29].

Unfortunately, to date, the Commission has not addressed the substance of MCSI's proposals, nor did it supply any analysis that could form a basis for their rejection. We respectfully request that the Commission consider these proposals, particularly in the context of providing the only substantial compatibility solution available for the ever growing installed base of consumer electronics equipment that has been sold and will be sold without the Decoder Interface past the year 2000.

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26. See MCSI'S NOI Comments and Reply Comments in this Docket.

27. *See* EIA/CEG Response to Petition for Reconsideration, MM Docket No. 92-266, July 21, 1993, at page 6. *See also* Reply Comments of Matsushita Electric Corp. of America, ET Docket No. 93-7, April 21, 1993, at page 14.

28. Comments of the State of New Jersey, Office of Cable Television, Board of Regulatory Commissioners, ET Docket No. 93-7, August 10, 1993, at page 7.

29. Response of the Home Recording Rights Coalition to Petition for Reconsideration, MM Docket No. 92-266, July 21, 1993.

4.2 A Need for Clarification

Apart from such considerations of an increment to the Benchmark for Cable Programming Services, MCSI expresses its understanding that the rate regulation as presently constructed do permit cable operators to charge separate equipment rates for DBD subscriber equipment used to provide regulated services in the same manner that operators may charge such equipment rates for set-top subscriber equipment used for the same purpose. The Commission's Tier-Neutral rate regulation Rules prescribe regulation of rates charged for subscriber equipment based on the scope contained in Section 76.923 (a):

> "The equipment regulated under this section consists of all equipment in a subscriber's home that is used to receive the basic service tier, regardless of whether such equipment is additionally used to receive other tiers of regulated programming service and/or unregulated service. Such equipment shall include, but is not limited to: (1) converter boxes; (2) remote control units; (3) connections for additional television receivers; and (4) other cable home wiring." (emphasis supplied).

Although the Commission states that separate charges can be applied only to equipment in the subscriber's home, Congress did not provide for such limitation when it enacted the Cable Act. Rather, Section 623(b)(3) of the Cable Act provides:

> "Equipment.--The regulations prescribed by the Commission under this subsection shall include standards to establish, on the basis of actual cost, the price or rate for--
>
> (A) installation and lease of the equipment used by subscribers to receive the basic service tier, including a converter box and a remote control unit and, if requested by the subscriber, such addressable converter box or other equipment as is required to access programming described in paragraph (8);
>
> (B) installation and monthly use of connections for additional television receivers." (emphasis supplied).

Thus, no statutory limitation for subscriber's equipment to be inside the subscriber's home exists. MCSI submits that although Broadband Descrambling devices may be installed on the side of subscriber homes at a point of entry or inside a nearby pedestal or on a pole, they may be provided as plug-in units during the subscription period required by the subscriber (much like a set-top device is provided to subscribers during the required subscription period). Hence, the utility and functionality of such broadband descrambling subscriber equipment is virtually identical to those of set-top descramblers. Therefore, MCSI believes that operators employing

these devices deserve equipment cost accounting and rate structure treatment at least as favorable as those afforded to operators utilizing set-top devices. Unlike other cable plant distribution components, DBD modules are installed for individual subscriber locations based on specific subscriber demands.

Therefore, we read the statute in Section 623(b)(3)(A) as essentially stating "installation and lease of the equipment used by subscribers to receive the basic service tier, including a converter box and a remote control unit and, if requested by the subscriber, such addressable converter box or other equipment [such as a Broadband Descrambler] as is required to access programming described in paragraph (8)".

For the Commission to arbitrarily treat Broadband Descrambling subscriber devices in a cost accounting manner that differs from that afforded set-top descramblers would result in unintended disincentives for cable operators to deploy broadband descrambling technologies that are far more responsive to subscriber needs and to Congress' intent of assuring compatibility as expressed in Section 17 of the Cable Act. Furthermore, such narrow reading of the Statute by the Commission clearly flies in the face of the Commission's pledge to "continue to encourage clear channel technologies".

Therefore, MCSI hereby respectfully requests that the Commission clarify its rate regulation rules in this proceeding to expressly provide that subscriber access control equipment installed external to the subscriber home be treated as if it were inside the home for purposes of determining monthly equipment charges.

CONCLUSION

For the foregoing reasons, MCSI respectfully recommends that the Commission adopt rules that encourage cable operators to adopt "simultaneously clear signals" technologies and that the Commission take the necessary regulatory steps to ensure that the RF interface portion of the "cable-ready" equipment regulations will not be delayed due to protracted Decoder Interface standard development efforts. MCSI respectfully urges the Commission to adopt regulations for cable services and equipment consistent with the Comments herein in order to assure compatibility between cable systems and consumer electronics equipment.

Respectfully submitted,

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APPENDIX A. ANSI/EIA-563 DECODER INTERFACE DEVELOPMENT CHRONOLOGY

The present EIA-563 Decoder Interface standard (known as Multiport) was developed over an 8 year period through joint industry efforts. In early 1982, the *R-4* Receiver Committee of the EIA Consumer Electronics Group had formed a Working Group on The Decoder Interface. Shortly thereafter, the EIA and the NCTA formed the Joint Engineering Committee on Cable Interface ("JEC")[30]. As described in RCA's Kohn 1983 paper attached hereto, the technical approach for implementing the Decoder Interface had to accommodate various scrambling formats and various TV receiver architectures in use at that time. RCA's baseband interface proposal was tentatively adopted. Sometime in 1984, it was determined that it was necessary to provide an additional signal line - the Decoder Restored Sync (DRS) line, in order to achieve proper descrambling functions in conjunction with the TV set. Through the cooperative efforts of consumer electronics manufacturers and cable scrambling vendors, the preliminary design and development of a tentative Decoder Interface Interim Standard, IS-15, took about two years.

As part of the standard finalization effort, the feasibility of the Decoder Interface was tested during the months of January, June and November of 1985 at American Television & Communications' (now Time Warner Cable) laboratories in Denver. The tests involved combining cable scramblers, modulators and modified TV sets from six TV manufacturers. The TV sets were equipped with Decoder Interfaces and were coupled to experimental baseband Component Decoders from four cable descrambler vendors through the Decoder Interface. Following the initial tests and a related discovery of fundamental AGC parameter problems with most tested systems, by June 1985 modifications to IS-15 were made by adding an AGC time constant control signal to the interface[31]. The IS-15 was released as an EIA Interim Standard on July 1986, over four years after the work began on this Decoder Interface.

Production prototypes of IS-15 Decoder Interface equipped TV sets and component decoders underwent three field tests in Denver between April 1986 and October 1987[32]. The tests involved six TV receiver manufacturers and four cable descrambler vendors. As this preproduction development work and testing was nearing completion, first announcements by two TV set manufacturers of their intent to ship certain high-end sets equipped with the Decoder Interface were made in mid 1987. However, the JEC recognized

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30. "The Descrambler Interface, A Progress Report" by E. S. Kohn, in *NCTA Technical Papers, 32nd Annual NCTA Convention*, Houston, TX, June 12-15, 1983. pp 321-324. *See also* "RF Cable/Decoder Interface Working Group Progress Report" by W. Ciciora, in *Communications Engineering & Design*, August 1985, pp. 14-29.

31. "IS-15 Points the Way to the Cable-Ready Set" by G. S. Stubbs, in *Communications Technology*, February, 1986, pp. 27-32.

32. "Supplemental Report on Interconnections in an IS-15 (Multiport) Environment", by J. Van Loan, in *Connecting Cable Systems to Subscribers' TVs and VCRs - Guidelines for the Cable Television Industry. Supplemental Reports*. NCTA, 1988. p I-68.

the immediate obsolescence risk of adopting IS-15 without adequate remote control consumer interface functions for Impulse Pay Per View ("IPPV"), or without an ability to pass Y/C Component Video signals. Thus, during the better part of 1988, the JEC continued to make modifications to the interface standard (designated as IS-15A) to include these functions. The IS-15A was released as an EIA Interim Standard in March 1989, seven years after the JEC began it Decoder Interface standard.

Based on orders placed by some cable MSO's in 1988, two addressable descrambler vendors started shipping component decoders in mid 1989[33]. Because only higher-end TV sets were shipped by various TV manufacturers with the Decoder Interface, a typical cable system had only tens of subscribers using premium scrambled services that were found to have Decoder Interface equipped TV sets[34]. A JEC cable industry executive, who was involved with IS-15A deployment efforts at that time, lamented about this situation by stating that the intersection of the set of subscribers who (1) purchased a new TV set in the last 18 month, (2) who spent extra money on a high-end set equipped with Multiport, (3) who are cable subscribers and (4) are premium service subscribers at that, combines to a scarcity level that makes rare birds mating efforts "a piece of cake" compared to that of Multiport.

In mid 1989, several cable MSO's began limited test marketing the Multiport Decoder Interface[35]. Joint merchandising of Multiport equipped consumer electronics and cable service was instituted by several MSO's and field reports from subscribers and operators were favorable[36]. On August, 1990, over 8 years after the JEC began its work the Multiport standard was finally released as ANSI/EIA-563. A summary of this development chronology is depicted in Figure 1 attached hereto.

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33. Video Technology Newsletter, Vol. 2, No. 7, April 17, 1989. *See also* "Multiport Testing Begins" by Roger Brown, in *Communications Engineering & Design*, August 1989, pp. 74-76.

34. Technology Section by Roger Brown, in *Cablevision*, July 17, 1989, pp. 48-50.

35. "A Multiport Solution" by T. R. Jokerst, in *Communications Technology*, August, 1989, pp. 26-28.

36. "Consumer Interface - Testing Multiport" by Carl Weinschenk, in *Cable Marketing*, August 1989, pp. 84-85.

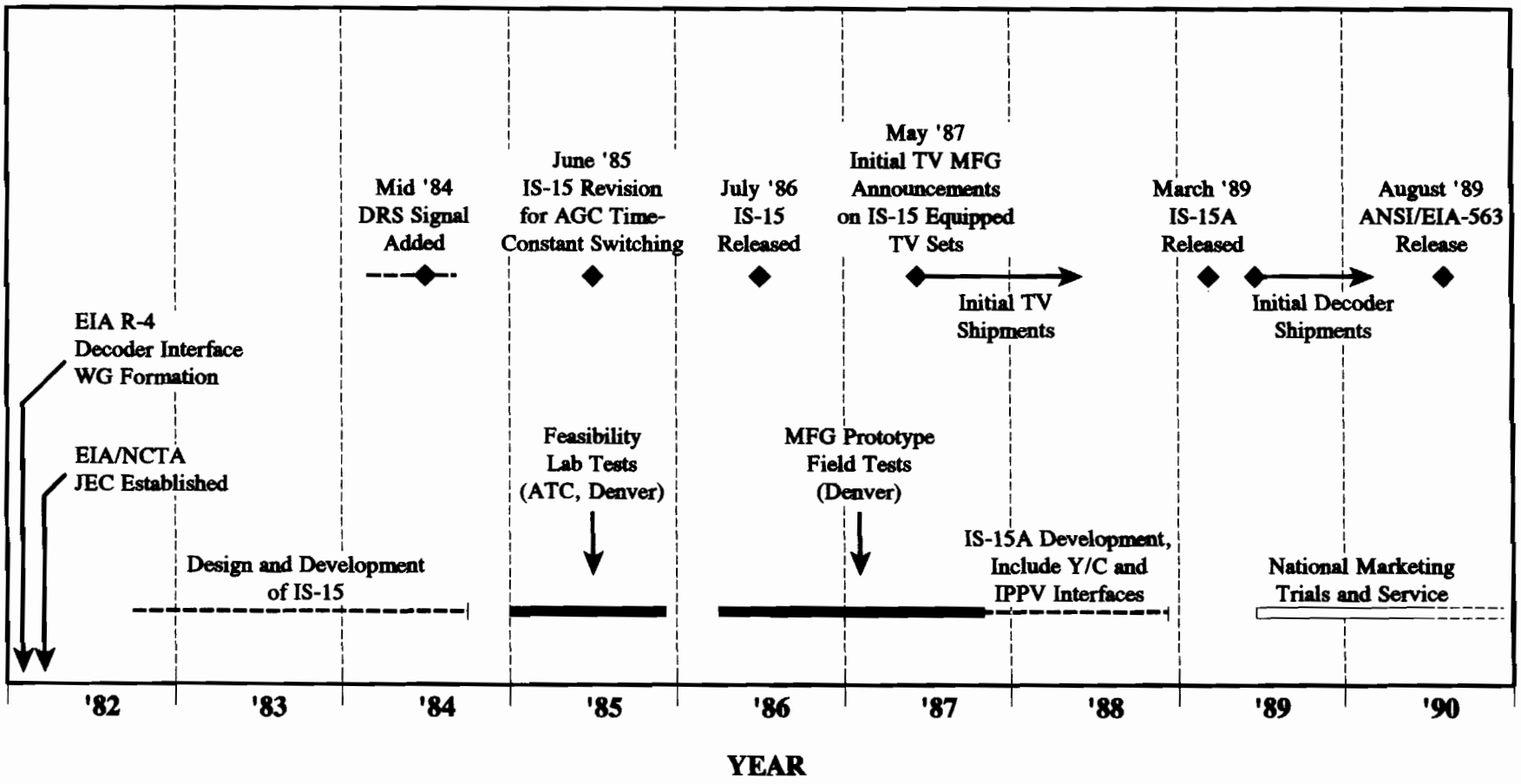
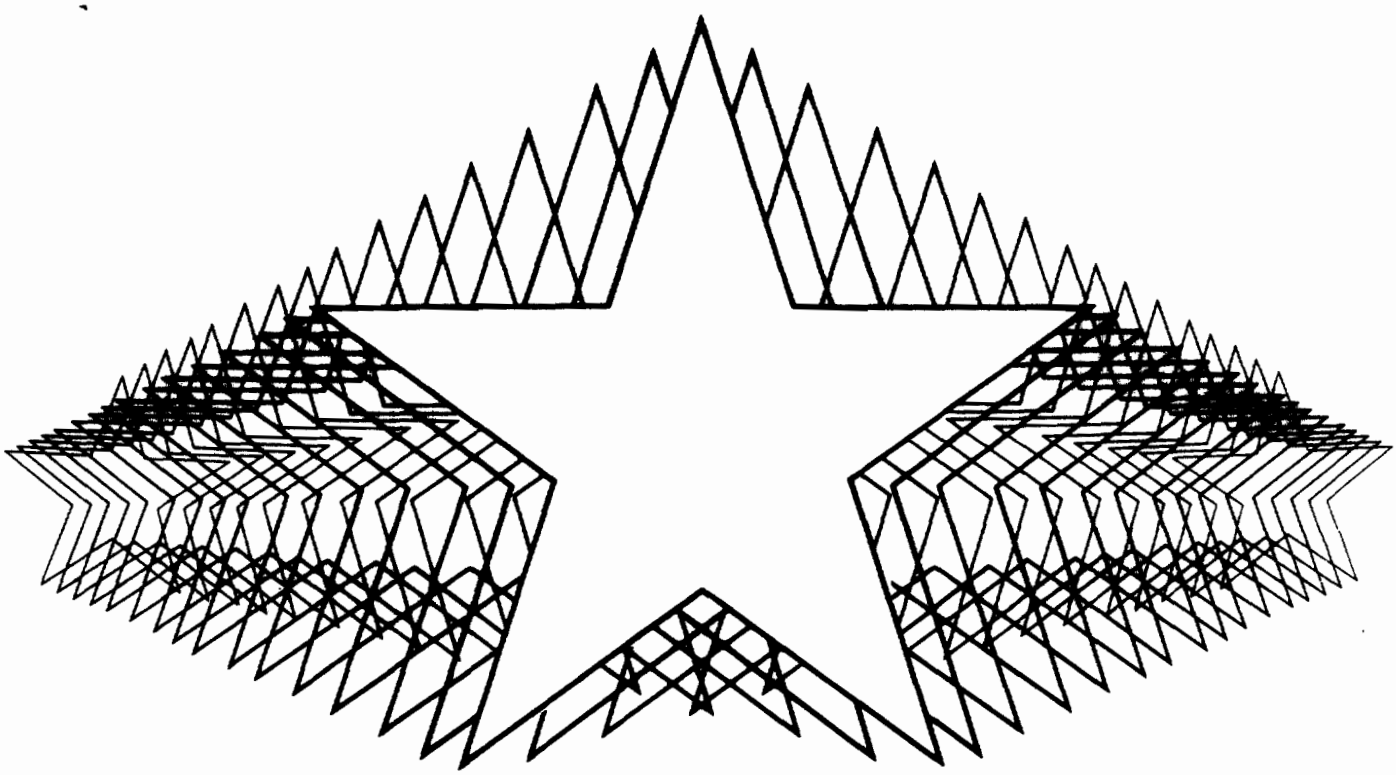


Figure 1. ANSI/EIA-563 Multiport Decoder Interface Development Chronology and Major Milestones

TECHNICAL PAPERS



Cable The Competitive Choice 83

32nd Annual Convention & Exposition

JUNE 12-15, 1983 • HOUSTON, TEXAS

National Cable Television Association

THE DESCRAMBLER INTERFACE, A PROGRESS REPORT

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ABSTRACT

The incompatibility between full-feature TV receivers and cable systems with scrambling has been discussed before in this forum, and is well known in the industry. TV receivers that tune the special cable channels are available, but their sophisticated tuning and remote-control features cannot be used in scrambled cable systems providing combined converter-descramblers. Last year, we proposed a standardized decoder interface for TV receivers, that would permit cable operators to supply relatively inexpensive decoder modules to subscribers for use with such receivers. The Electronic Industries Association and the National Cable Television Association have sponsored working groups to define such an interface. Considerations included which types of scrambling can be provided for without compromising cable security or unduly burdening the manufacturing cost of TV receivers. Connections useful for other video accessories as well as descramblers are obviously preferred. The problem is complicated by the numerous scrambling methods in use and being introduced. The progress of the industry working groups will be discussed.

Introduction

The problems of cable-ready TV receivers in scrambled cable systems are well known in the industry. I originally discussed the problem at the Western Cable Show in Anaheim, CA in December 1981, and again at ICCE in June 1982.[1] There, I showed that cable-ready receivers operate well in cable systems secured by the trapping or jamming of pay channels, but have a serious problem in cable systems secured by scrambling. The problem is illustrated in Fig. 1, which shows a typical converter-decoder supplied by the cable operator, used with a TV receiver. While the TV receiver may have remote control, and may have a very sophisticated tuner covering all the required cable channels, these features are wasted when the receiver is in a cable system requiring the converter-decoder to be used ahead of the receiver in order to descramble the premium channels. The duplication of the tuners and remote control equipment adds to the customer's cost, and can only be detrimental to the performance and to the operating convenience of the system. In the earlier work, I proposed the descrambler module that would plug into a standardized descrambler interface connector on the TV receiver. The module would be supplied by the cable operator, and would provide for the descrambling of those programs that the customer has ordered, just as the converter-decoder does now. The module would provide for recognition of program tags, and could be addressable if desired. I proposed the signals shown in Table 1 for use at the interface. This list was by no means intended to be the finished product. Rather, it was a starting point, including all signals thought to be available in TV receivers, that could be useful for interfacing minimum-cost descrambler modules for the various known scrambling systems. It was clear that a recommended standard along these lines would require a concensus among TV manufacturers, cable product manufacturers, and cable-system operators.

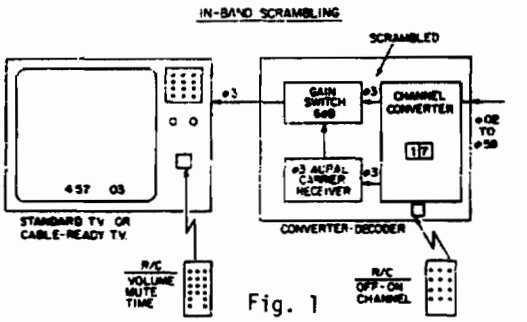

Fig. 1

Industry Activities

1982 has indeed been a year of intense industry activity in solving the compatibility problem. Early in the year, the EIA and the NCTA formed the Joint Commmittee on The Cable Interface, headed by Robert Rast. A working group on cable channel identification, also headed by Rast, succeeded in preparing a cable channel identification plan that will clear up much of the confusion that presently exists in cable-channel numbering. With that work complete, two new working groups have been established, one on The Cable Interface, headed by Walter Ciciora, and the other on Interface Alternatives, which I chair. The EIA receiver committee also has an active working group on The Decoder Interface, headed by James Hettiger. All of these groups are administered by Tom Mock of the EIA. While the job is by no means completed, a great deal of progress has already been made. The cooperation among the three industries involved has been very encouraging.

From: NCTA 32nd Annual Convention, Technical Papers, Houston, TX; June 12-15 1983.

Table 1

Possible connections at decoder inteface

1. Loopthrough of cable from tuner to IF amplifier.
2. Loopthrough of detected video signal with level and polarity specified.
3. Loopthrough of audio with level specified.
4. 4.5 MHz audio IF signal for data receiver.
5. Wide-band audio ahead of de-emphasis for off-air systems with multiplexed audio.
6. Loopthrough of cable from antenna terminal for out-of-band telemetry channel.
7. Power for decoder module.

General Considerations

Before deciding what signals to include at the interface, it is necessary to settle on which scrambling methods can and should be provided for. The most widely used scrambling methods presently are sync suppression of the pulsed and sine-wave types. However, it is the mood of the cable industry that these systems do not provide adequate security, and that within a few years, more sophisticated scrambling methods will be widely used. This is the same time frame required for a decoder interface, if approved this year, to become widely available. Thus, we have the following reasons for not providing for sync-suppression descrambling at the interface. 1) An interface providing for sync-suppression descrambling would make it too easy for the customer to use home-built or commercial pirate equipment to defeat the system. 2) It is not clear that cable operators will ever buy sync-suppression decoder modules, because in the time frame when the decoder interface becomes available, converters-decoder boxes for sync suppression are likely to be available as surplus, since many systems are expected to convert to more secure methods. There is also the matter 3) of whether the pilot signal required for pulsed sync-suppression descrambling, is really available in TV receivers without costly modification. The pulse amplitude modulation of the aural carrier in such systems has a bandwidth of over 1 MHz, and would be best handled in a TV receiver with a special AM receiver at 41.25 MHz, the sound IF.

Baseband Descrambling

The baseband video loopout is clearly the most important signal in the interface, and the most attention has been given to the problems in standardizing it. This loopout will provide for black-to-white inversion systems, time permutation systems, and any other baseband scrambling methods developed. It also makes available timing, tag and address information sent in the video signal during the vertical blanking interval. The vast majority of the committee members believe that this loopout should have standard 1-volt video, terminated in 75 ohms, thus maintaining compatibility with other video accessories. A video loopout with non-standard signal level and impedance has also been proposed in an effort to get decoder modules into the field more quickly and at lower manufacturing cost. This method, however, offers these advantages only with TV sets of a particular design. Most participants do not consider it a suitable standard.

A subtle, yet critical issue with the video loopout is the handling of the TV's automatic gain control (AGC). TV receivers, whether or not they employ AGC keying, usually rely upon peak of sync to establish the correct gain in the IF stages and in the tuner. A TV receiver whose AGC system is designed to give the correct amount of tuner and IF gain with standard video, will not operate correctly on sync-suppressed video. The video signal will be amplified too much, and the amount of gain will vary with scene content. To get correct operation with the sync-suppressed signal, it is necessary to do the sensing for AGC after the sync is corrected, hence, after the video loopout if a module is to be used. The AGC sensing could be done within the TV receiver using the signal returned to the TV receiver by the decoder module, as shown in Fig. 2. Buffering and isolation, not shown in the figure, may be needed. An AGC control voltage determined by the returned video signal can be looped back to the IF stages and to the tuner completely within the TV receiver. No separate AGC control voltage needs to be involved at the decoder interface. The decoder module is necessarily in the forward path of the TV receiver's AGC loop, but it has no major effect on the TV receiver's AGC loop characteristics, and the module manufacturer is not taking control of the receiver's AGC loop in the sense for which concern has been expressed by TV manufacturers. The decoder module is necessarily DC coupled, and it will probably require a trim pot for DC offset. A TV receiver built with this interface differs from current TV receivers only in that the standard terminated video loopout is provided, and that the DC sensing is done after the return of the loopout, instead of within the IF chips, as is current practice. This method has the advantage that the decoder module is minimally involved in the receivers AGC loop. A different proposed method would have the AGC sensing done in the decoder module, and a control signal returned to the TV's AGC system through a dedicated interface pin. The AGC issue has not yet been resolved.

The IF Loopout

The IF loopout was originally proposed for RF descrambling, where the pilot information is amplitude modulated on the aural carrier. More recently, it has been proposed for use with a baseband decoder module having its own IF stages

From: NCTA 32nd Annual Convention, Technical Papers, Houston, TX; June 12-15 1983.

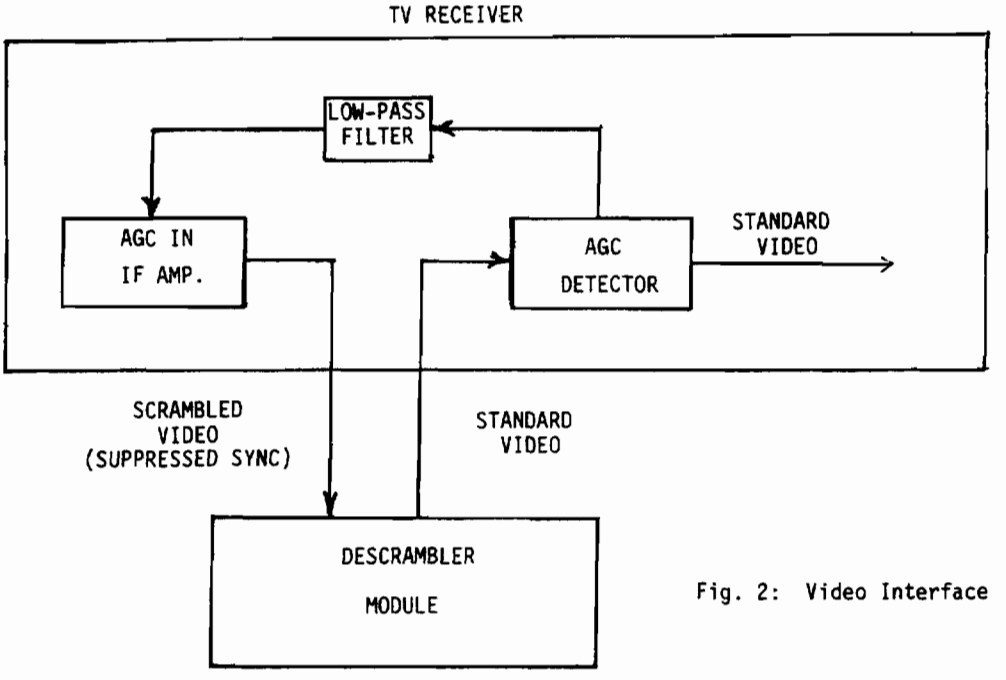

Fig. 2: Video Interface

and video and audio demodulators. This decoder would return baseband video and audio to the TV receiver, using the receiver only for its tuner and monitor functions. An IF loopout of this type has the problem of supplying correct AGC and AFT control signals to the tuner, since the internal IF amplifier will not be operating correctly. The IF loopout does not presently have a consensus going for it.

The Audio Loopout

Although there is presently very little scrambling of audio for pay-TV, cable operators are in agreement that audio scrambling will be an important part of their security in the years to come. There is a consensus that the decoder module should provide for audio descrambling.

Three types of audio connections have been considered: 1) baseband audio in and out, 2) wideband composite audio in and out, and 3) 4.5 MHz audio. The 4.5 MHz output from the TV receiver was intended for sync-suppression descrambler modules, and has been dropped from consideration. Wideband audio, taken ahead of deemphasis, is desirable as an output from the TV because it makes possible descrambling by the module, of audio, scrambled or encrypted through the use of subcarriers on the audio carrier. Good-quality wide-band audio will be readily available in a few years from TV receivers having multi-channel sound. Wide-band audio, ahead of de-emphasis, is not available in many current receivers. Even if it were made available, the intercarrier conversion, as it is done in current receivers, might impair the quality that signal. Wide-band audio, as an input to tne TV receiver, from the module, is probably not needed, as descrambler modules will probably not return composite stereo to the TV receiver when they can simply return right and left audio channels. Baseband audio inputs to the TV set are needed to return this decoded audio as baseband right and left channels. Right and left audio outputs from the TV set are useful because they permit modules, intended for video-only descrambling, to loop the audio back to the right and left inputs, with no additional switching complications. The decoder interface will probably be a multipin connector with automatic jumper switches for the video and audio loopouts.

Cable Loopthrough

Many addressable cable-systems have their address data on a separate carrier, outside of the TV channels. While the TV receiver cannot be expected to demodulate this data channel, the descrambler module can, if it is provided with a loopthrough of the cable. This cable loopthrough would be in addition to the multi-pin interface connector, where desired,and is shown in Fig. 3.

Power

The interface could be defined to include limited power supplied by the TV receiver to the descrambler module. Modules requiring higher power, or needing their out-of-band address receivers maintained continuously, can, of course, be provided with a separate power cord. Descrambler modules, however, lacking the tuners and IF circuits of baseband converters, will consume far less power than our current converter-descramblers. Inclusion of a power pin in the interface would encourage the development of low-power modules within a few years. A concensus does not presently exist for this feature.

From: NCTA 32nd Annual Convention, Technical Papers, Houston, TX; June 12-15 1983.

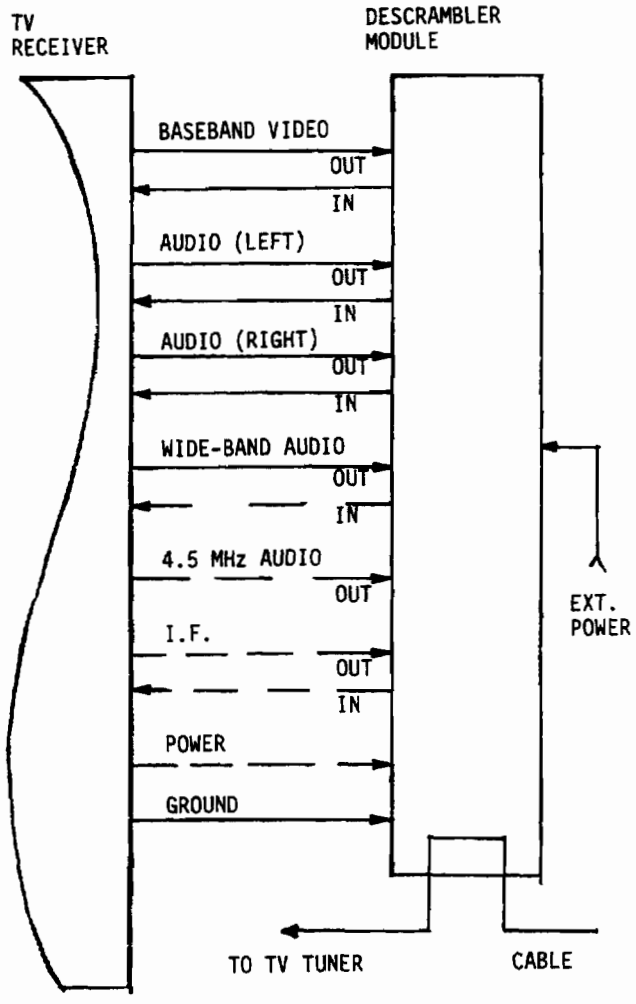

Figure 3: The descrambler module, showing the descrambler interface and other connections.

Conclusion

The problem of compatibility between full-feature TV receivers and cable systems has received considerable attention in the past year. Cable operators have announced a willingness to use the interface when it becomes available. Unsettled questions, of course, remain. Among them is the important question of isolation and safety. While work remains to be done, the progress to date has been very encouraging, and we have reasonable hope of seeing truly cable-compatible TV receivers within a few years.

References

1) E. S. Kohn, "Scrambling and Cable-Ready TV Receivers", IEEE Trans. on Consumer Electronics, CE-28, #3, 220-225, August 1982.

From: NCTA 32nd Annual Convention, Technical Papers, Houston, TX; June 12-15 1983.

APPENDIX B. - HYPOTHETICAL APPLICATION OF THE PROPOSED COMMISSION RULES DURING THE MULTIPORT DEVELOPMENT PERIOD

If the Commission, in 1994 acts in accordance with Paragraph 28 of its NPRM, and allows only three years for full market availability of Decoder Interfaced equipped "cable-ready" equipment, it would be equivalent to the hypothetical situation wherein the Commission would have asserted these proposed rules in mid 1983, when a first outline of a Decoder Interface or a paper design were proposed[37]. Based on the historical facts pertaining to the development of Multiport as described in Appendix A, it is instructive to follow this hypothetical situation to its logical conclusions. We therefore hypothetically assume that in 1983, the Commission would have required that receiving devices sold or imported after mid 1986 as "cable-ready" must have Decoder Interfaces. Referring to Figure 1 in Appendix A, we note that in 1985, during the tests at ATC's lab, it would have been discovered that AGC interface parameters needed modifications. This introduced substantial delays in the "planned" mid 1986 product introduction. No doubt, all parties would have had to come to the Commission and petition for extension of time. Both the consumer electronics and cable industries would have had very persuasive arguments, citing unexpected circumstances that require modifications and revisions in the interface. Elaborate technical exhibits describing the problems and their intended solutions would have been filed along with pledges to finalize the interface as soon as possible. An extension to mid 1987 would have been requested. Would the Commission have granted such request for extension of time? We believe it would have had no other choice.

At the beginning of 1987, the consumer electronics industry would have recognized that the benefits of component video Y/C interfaces were far too valuable to ignore and thus they should be incorporated in the Decoder Interface. On the cable side, the emerging Impulse Pay Per View ("IPPV") promise and the related successful experiences cause the industry to seek the proper modifications in the Decoder Interface for accommodating IPPV. Again, a trip to the Commission would have been in order and the industries would have filed jointly for yet another extension of time. The cable industry would have provided testimonials for the record on overwhelming subscriber acceptance of the convenience and utility of the IPPV feature. The cable industry would have supplemented the record with valid and persuasive economic facts and arguments which would have shown that without the IPPV feature in the Decoder Interface, cable companies could not offer IPPV capability to all subscribers uniformly across the system. This would frustrate their IPPV marketing efforts and the financial viability of these decoders. Finally, the cable petitioners would have provided assurances that the data protocol they have devised to support the IPPV feature would not have to be changed in the future, as it uses only 16 out of 256 possible codes, allowing for future expansion. The consumer electronics industry would have supported cable's arguments and would have organized a Y/C interface video quality demonstrations for Commission staff, while providing market statistics showing the projected growth of Y/C interface equipped devices, raising concerns that Decoder Interfaces without such Y/C interface would quickly become obsolete.

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37. "The Descrambler Interface, A Progress Report" by E. S. Kohn, in *NCTA Technical Papers, 32nd Annual NCTA Convention*, Houston, TX, June 12-15, 1983. pp 321-324. - A copy of this Decoder Interface outline is attached to Appendix A.

Faced with this correctly characterized prospect of a Decoder Interface at grave economic risk, would the Commission have granted this second extension of time for the introduction of the Decoder Interface? What would have been the public benefits in denying the Joint Petitioners' request? - Preventing another delay in a slow introduction of a Decoder Interfaces that ultimately might not be well received by the public or by cable operators. We believe the Commission would have perceived a lower risk to the public interest by granting the extension of time.

The important message in this hypothetical analysis, is that industry engineering development efforts such as those required in establishing digital transmission formats and the subsequent interface specifications cannot be accelerated by regulatory fiats.

APPENDIX C

CANADIAN REGULATIONS FOR RF INTERFACE SPECIFICATIONS OF CABLE COMPATIBLE TELEVISION RECEIVERS.

Government of Canada
Department of Communications

Gouvernement du Canada
Ministère des Communications

TB – 3

TECHNICAL BULLETIN

CABLE COMPATIBLE TELEVISION RECEIVER MEASUREMENT METHODS

RELEASE DATE: JUNE 1, 1982

TELECOMMUNICATION REGULATORY SERVICE

BT – 3

BULLETIN TECHNIQUE

MÉTHODES DE MESURE DES PARAMÈTRES DES TÉLÉVISEURS CÂBLOCOMPATIBLES

PUBLICATION: 1er JUIN 1982

SERVICE DE LA RÉGLEMENTATION DES TÉLÉCOMMUNICATIONS

CABLE COMPATIBLE TELEVISION RECEIVER MEASUREMENT METHODS

Effective July 1, 1979, the Minister issued new regulations governing the sale of broadcasting receiving apparatus. These regulations identify a number of parameters in order to ensure compatibility with the radio environment and cable TV systems. On this subject, Section 19 of the General Radio Regulations Part I stipulates that:

> "Before offering for sale for use in Canada any radio apparatus of the class described in subsection 18(1), the manufacturer or importer shall ensure that the apparatus or a production sample or other representative unit of that type of apparatus is tested in accordance with a procedure approved by the Minister to determine whether or not it conforms to the applicable technical requirements established by the General Radio Regulations, Part II."

Throughout the intervening period, the Department has reviewed and accepted test methods submitted by manufacturers on a case-by-case basis to ensure compliance with the technical requirements of the Regulations. The Department, up until now, had not formally approved any particular measurement method.

The measurement methods presented in this technical bulletin are those presently used by the Department in ascertaining compliance with the General Radio Regulations. This bulletin is not intended to serve as a complete engineering standard and may be subject to future revisions.

The methods described permit a certain flexibility in the measurement of parameters, available test equipment and the elimination of some of the ambiguities encountered in past reports.

It should be emphasized that the Department will accept other methods provided they are fully documented and that their results coincide with the methods described herein. Manufacturers and other interested parties are invited to submit suggestions on alternate methods to:

The Director,
Broadcasting Regulations Branch
Telecommunication Regulatory Service
Department of Communications
300 Slater Street
Ottawa, Ontario
K1A 0C8

Manufacturers are reminded that final responsibility for compliance with Part II of the General Radio Regulations rests with them, and that the measurement methods described herein are provided as guidelines only.

Dr. John deMercado
Director General
Telecommunication Regulatory
Service

Tuning - Offset Capability

Equipment Required

Spectrum analyser or frequency counter (50 - 1000 MHz)

The minimum accuracy of the frequency measuring device shall be within 50 kHz.

Method

(1) The receiver's 75 ohm input is connected to the spectrum analyser (via a suitable matching network if required).

(2) Ensure that the receiver is operating normally and that the AFT (or AFC) if provided, is disabled.

(3) The receiver is tuned to channel 2 and the fine tuning frequency range of the local oscillator determined. In borderline cases, a reading of increased accuracy may be obtained through the use of a frequency counter (and amplifier if required).

(4) The above measurements are repeated for an adequate number of channels to ensure that the measurements are significant.

Limits

General Radio Regulations, Part II states the following:

> "133(a) when the apparatus is adjusted to receive signals from a broadcasting receiving undertaking, it shall be equipped and have characteristics as follows:
>
> > (ii) the fine tuning control or automatic frequency control shall provide sufficient adjustment of the apparatus over a range of frequencies to ensure
> >
> > > (A) for the very high frequency channels, reception of input signals whose visual carrier frequencies are offset by up to $\pm$0.55 MHz from their nominal visual carrier frequencies, and
> > >
> > > (B) for the mid-band channels and super-band channels, reception of input signals whose visual carrier frequencies are offset by up to -1.31 MHz from their nominal visual carrier frequencies."

Noise Figure

The method described herein presents revised excerpts from "FCC OST Bulletin 50 - Measurement of UHF Noise Figures of TV Receivers" as applicable to cable compatible television receiver noise figure measurements.

Equipment Required

Solid state noise source (with power supply)

Automatic noise figure indicator or high sensitivity tuneable voltmeter (selection dependent on sensitivity required)

The measuring devices shall have a bandwidth of at least 1 MHz

Method

(1) The receiver to be tested and the equipment associated with the measurements of noise figures are placed in a shielded room or other environment with levels of radio frequency energy low enough to minimize effects on the measurements.

(2) Before testing, the television receiver and noise figure test equipment are subjected to a warm-up period of sufficient time for stabilization of factors which could affect the measurements. The supply for line-operated receivers is required to be 120V $\pm$ 5%, 60 Hz or as specified; that for battery-operated receivers is the voltage specified.

(3) The TV receiver noise figure is preferably measured by coaxially connecting an automatic noise figure indicating system to the tuner output. If this connection is not feasible the noise output is obtained through the use of a small loop, or other suitable probe, coupled to one of the intermediate frequency amplifier stages. The stage chosen is that which yields the adequate noise output without disturbing shielding or other circuit elements. In the event that this, too, is not a workable approach, an appropriate low capacitance probe is used instead of the loop. A low noise preamplifier is used between the noise output from the receiver and the input of the indicating instrument in order to obtain a sufficient level, if necessary.

(4) A solid state noise source is connected to the receiver's 75 ohm input (via a suitable matching network if required). Particular care is taken that the signal path from the receiver's external input to its tuner is not disturbed.

(5) Automatic gain control bias, preceding the noise output measurement point, is maintained at the level existing when there is no input signal with the receiver's 75 ohm input terminated in its nominal impedance. The receiver is otherwise operated so that the noise figure data are actually those inherent to it.

(6) An automatic noise figure indicator should be used in conjunction with the noise source (companion units) to determine the noise figure of the television receiver. The center frequency of the television receiver's nominal intermediate frequency band at the measurement point is used as the center frequency of the automatic noise figure indicator to which the receiver's noise output is connected.

(7) Local oscillator frequencies are adjusted to within $\pm$ 0.55 MHz of the desired oscillator frequencies for VHF and within the 0 to -1.31 MHz range for midband and superband.

(8) It must be ascertained that the noise figure contribution of the IF amplifier following the measurement point does not exceed 0.25 dB. This can be done by application of the equation

$$\Delta F = 10 \log\left[1 + \frac{F_2 - 1}{F_1 \; G_1}\right]$$

where ΔF = noise figure contribution of the IF amplifier following the measurement point in dB,

F_2 = noise figure of that IF amplifier as a power ratio,

F_1 = noise figure from receiver antenna input terminals to measurement point as a power ratio, and

G_1 = gain of circuit from receiver antenna input terminals to measurement point as a power gain.

Factor values in this equation may be calculated design characteristics or measured values. Resulting ΔF values exceeding 0.25 dB must be added to the value obtained at the measurement point for data submitted for certification. If ΔF does not exceed 0.25 dB, it may be neglected in the submitted noise figure data.

(9) Noise figure data in dB are to be reported as read from the noise figure indicating instrument. The only permissible correction factor is the impedance transformation loss. The required ΔF contribution must be given if they are part of the final submitted noise figure values.

(10) The above measurements are repeated for an adequate number of channels to ensure that the measurements are significant.

Limits

General Radio Regulations, Part II states the following:

"132(a) the noise figure for the radio apparatus shall,

(i) for channel numbers 2 to 13, not exceed 10 dB, and

(ii) for channel numbers 14 to 83, shall,

(A) if manufactured in or imported into Canada on or before October 1, 1981, not exceed 18 dB,

(B) if manufactured in or imported into Canada after October 1, 1981, and before October 2, 1984, not exceed 14 dB, or

(C) if manufactured in or imported into Canada after October 1, 1984, not exceed 12 dB,

"133(a) when the apparatus is adjusted to receive signals from a broadcasting receiving undertaking, it shall be equipped and have characteristics as follows:

(iii) the noise figure for any channel shall not exceed 10 dB except that, where the circuitry or configuration of the apparatus involves a double conversion of input signals, the noise figure may exceed 10 dB but shall not exceed 13 dB.

(b) when the apparatus is adjusted to receive signals from a broadcasting transmitting undertaking it shall conform to the requirements set out in section 132 except that the noise figure for channel numbers 2 to 13 shall not exceed 10 dB unless the circuitry or configuration of the apparatus involves a double conversion of input signals in which case the noise figure may exceed 10 dB but shall not exceed 13 dB."

Co-Channel Immunity

Equipment Required

Field strength meter

Adjustable dipole with frequency measuring ruler

RF amplifier

RF attenuator

Spectrum analyzer (50 - 250 MHz)

VHF multichannel antennas (2)

Multichannel RF generator (VHF channels 2 - 13) (optional)

Method

(1) A VHF multichannel receive antenna is placed in an environment permitting reception of off-air broadcast signals.

(2) The signal from the antenna is input to a broadband RF amplifier.

(3) The amplifier output signal is connected to the second VHF multichannel antenna in order to permit re-radiation of the broadcast signal.

(4) Utilizing a field strength meter and adjustable dipole, a 100 mV/m field is located at a distance of 5 - 10 meters from the re-radiation antenna. The antenna positions may have to be varied in order to prevent possible oscillations between re-radiation and pick-up antennas. The required field may be achieved by adjustment of the amplifier output level. (The F.S.M. reading is converted to mV/m by using the antenna correction factor for the corresponding frequency of the channel under investigation).

(5) The receiver under test is placed in the 100 mV/m field such that the antenna panel occupies the field. (The receiver must not block the antenna panel from the transmitted signal.)

(6) The feed from the multichannel RF generator or local cable system is connected to the spectrum analyzer (via a suitable matching network if required).

(7) The spectrum analyzer is tuned to the frequency of interest and the amount of attenuation required to produce levels of -20 dBmV and 0 dBmV determined.

(8) Ensure that the receiver is operating normally and that all customer switches and controls are adjusted for cable reception and normal viewing for the channel of interest.

(9) The signal feed is then connected to the receiver's 75 ohm input by means of a coaxial cable whose length equals an odd multiple of $\lambda/2$ for the channel under test.

(10) With an input signal level of -20 dBmV, an attempt should be made to identify the non-coincident sync interference. This will enable the tester to concentrate on the video interference only. (If observation of the non-coincident sync information is preferable, the input signal level may be adjusted to -37 dBmV).

(11) The input signal level is then increased to 0 dBmV and the receiver's picture display observed for any evidence of co-channel synchronous interference (-17 dBmV for non-synchronous interference)

(12) The above measurements are repeated for an adequate number of channels to ensure that the measurements are significant.

Limits

General Radio Regulations, Part II states the following:

> "133(a) when the apparatus is adjusted to receive signals from a broadcasting receiving undertaking, it shall be equipped and have characteristics as follows:
>
> > (iv) the apparatus shall be so shielded that there is no noticeable evidence of interference when
> >
> > > (A) the apparatus is in the field of a co-channel synchronous television signal having a measured field strength of 100 millivolts per metre, and
> > >
> > > (B) the signal level of the desired input signal is adjusted to 1 millivolt (0 dBmV) at the input terminals of the apparatus."

Signal Overload

Equipment Required

Spectrum analyser (50 - 1,000 MHz)

RF attenuator

RF amplifier

Multichannel RF generator or signal available from local cable system (minimum capability of VHF channels 2-13, and three adjacent mid band channels).

Method

(1) The feed from the multichannel RF generator or local cable system is connected to the spectrum analyser (via a suitable matching network if required).

(2) The spectrum analyser is tuned to channel 2 and the input signal amplified (if required) to produce a level of 14 dBmV at the frequency of interest.

(3) The adjusted signal feed is then connected to the receiver's 75 ohm input and the receiver tuned to channel 2.

(4) Ensure that the receiver is operating normally and that all customer switches and controls are adjusted for cable reception and normal viewing.

(5) The receiver's picture display is then observed for any evidence of overload.

(6) The above procedure is repeated for all available channels.

Limits

General Radio Regulations, Part II states the following:

> "133(a) when the apparatus is adjusted to receive signals from a broadcasting receiving undertaking, it shall be equipped and have characteristics as follows:
>
> > (vi) there shall be no overloading of the apparatus at any signal level below 5 millivolts (14 dBmV)."

Image Rejection

Equipment Required

VHF signal generator

Oscilloscope or Spectrum analyzer (optional)

RF attenuator

Method

(1) The feed from the VHF signal generator is connected to the receiver's 75 ohm input via the RF attenuator.

(2) The signal input level is reduced so as to operate the AGC in a maximum gain mode.

(3) The IF level is then measured at the IF detector point.

(4) The VHF signal generator is then adjusted to the image frequency and fine tuned to maximize signal at the IF detector point.

(5) The generator output level is adjusted so as to match the IF detector point amplitude level measured in (3) above.

(6) The image rejection is then determined from the difference in the generator output levels of (2) and (5) above.

(7) The above procedure is applied to all channels whose image frequency falls below 300 MHz.

Limits

General Radio Regulations, Part II states the following:

"133(a) when the apparatus is adjusted to receive signals from a broadcasting receiving undertaking, it shall be equipped and have characteristics as follows:

(vii) the image rejection shall be at least 60 dB for any image frequency below 300 MHz."

Internally Generated Interference

Equipment Required

Spectrum analyser (5 - 1,000 MHz)

Method

(1) The receiver under test and the equipment associated with the measurements are placed in an environment with levels of radio frequency sufficiently low so as to preclude any effects on the measurements.

(2) Ensure that the receiver is operating normally and that all customer switches and controls are adjusted for cable reception and normal viewing.

(3) The receiver's 75 ohm input is connected to the spectrum analyser (via a suitable matching network if required).

(4) The receiver is tuned to channel 2 and the spectrum searched for any internally generated signals.

(5) The above measurements are repeated for all channels.

Limits

General Radio Regulations, Part II states the following:

"133(a) when the apparatus is adjusted to receive signals from a broadcasting receiving undertaking, it shall be equipped and have characteristics as follows

(viii) the level of any local oscillator signal and of any signal of an undesired or spurious nature, generated within the apparatus and arriving at the cable input terminals of the apparatus.

(A) in the frequency range above 5 MHz and below 54 MHz, shall not exceed -50 dBmV

(B) in the frequency range from 54 MHz to 300 MHz, shall not exceed -26 dBmV, and

(B) in the frequency range above 300 MHz and below 1000 MHz, shall not exceed -10 dBmV."

APPENDIX D

Press Release Jerrold GI **General Instrument**

General Instrument Corporation
Jerrold Communications Division
2200 Byberry Road
Hatboro, Pennsylvania 19040

Contact:
Jim Barthold
Tel 215 956 6448

Ron Katznelson, MCSI
619-597-4004

MCSI to demonstrate digital broadband descrambling with Jerrold/General Instrument at NCTA Show

SAN FRANCISCO (June 7, 1993) ... Multichannel Communication Sciences, Inc. (MCSI) will give the first public demonstration of its Digital Broadband Descrambling (DBD) technology in the Jerrold exhibit at this year's National Cable Television Association show here this week.

The DBD technology is based on novel proprietary digital signal processing techniques developed by MCSI and is the first demonstrated method for simultaneously descrambling many individually selected cable TV channels at the subscriber location. At the same time it passes through other channels to the subscriber either unaffected or with further denial imposed for unauthorized channels. DBD access control devices can be installed at the subscriber's premises point of entry (such as the side of the home), the pole or pedestal or even by indoor set-back deployment.

Using DBD cable subscribers receive all authorized channels simultaneously in the clear, restoring the features of TVs and VCRs. Furthermore, the DBD devices pass into the home all other unprocessed channels, including digital compression signals, thereby allowing compatibility with future digital transmission said MCSI President Ron Katznelson.

Jerrold President Hal Krisbergh said MCSI's technology has some "interesting implications in light of increased demands for consumer friendliness."

One important aspect is that MCSI is offering an access technology, overcoming many of the shortcomings of interdiction. Because MCSI's signal does not travel in the clear, it is more secure than interdiction.

- more -

"At Jerrold we are always looking at new technologies that have the potential to improve the ease of using cable television," said Krisbergh. "By showing it in our booth, we hope to draw the attention of the entire cable industry to it and allow them to see yet another potential solution."

Katznelson said that the ability to show the technology in the Jerrold booth will give his company exposure to potential users of DBD.

"Digital Broadband Descrambling products will provide cable operators with sustainable differentiation over competitive Direct Broadcast Satellite (DBS) due to DBS' inherent reliance on a 'single channel at a time' set-top decoders and the inability to provide subscribers full consumer electronics compatibility or low-cost additional TV outlet service," said Katznelson, in offering yet another strength of the technology.

"Also," he concluded, "the addressable channel denial features inherent in DBD will allow system operators to implement program tiering into one or more expanded basic services without incurring the expenses associated with scrambling these channels."

MCSI is a San Diego, California based high technology company specializing in the development of broadband digital signal processing techniques for cable access control and for fiber optic transmission of television signals.

General Instrument Corporation is a world leader in broadband transmission, distribution and access control technologies for cable, satellite and terrestrial broadcasting applications, as well as in discrete power rectifying components.

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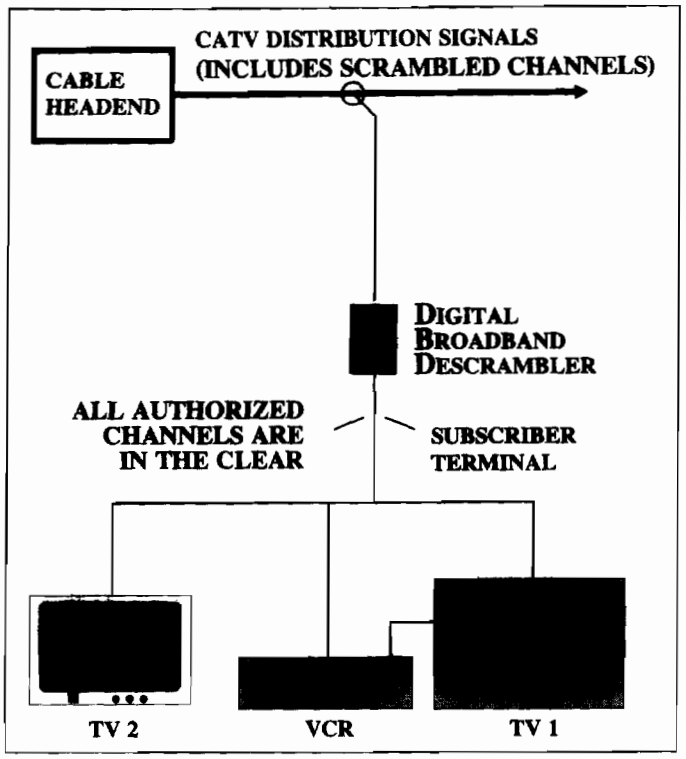
DIGITAL BROADBAND DESCRAMBLING

A SUBSCRIBER FRIENDLY TECHNOLOGY FOR THE 90'S AND BEYOND

- **All authorized channels supplied to subscriber terminals simultaneously and in-the-clear.**
- **Compatible with the most widely used cable scrambling formats and allows for a transition to enhanced security scrambling mode.**
- **Addressable local denial of selected expanded basic channels allows cost-effective tiering without having to scramble these channels.**
- **Simultaneously clear broadband service has been proven to generate significant pay lift.**
- **Provides cable operators with a key sustainable advantage over competitive multi-channel video providers who must rely on "single-channel-at-a-time" decoders.**
- **Coexistence compatibility with future digital transmission systems.**



Finally, there is a *cost-effective* technology that enables cable system operators to provide subscribers with a truly "subscriber friendly" signal security system, while increasing revenues and reducing operating costs associated with set-top descrambler churn. It is called *Digital Broadband Descrambling* ("DBD"), a proprietary digital signal processing based technology developed by Multichannel Communication Sciences, Inc. ("MCSI"). DBD products can simultaneously descramble a large number of scrambled TV signals, while at the same time leaving other channels unaltered or performing on-channel denial processing to securely deny these channels.

Unlike existing "single-channel-at-a-time" descrambling technologies, the DBD technology simultaneously provides subscribers with all of their authorized channels "in the clear", thereby enabling them to enjoy all the features of their cable ready TV's and VCR's.

All this is accomplished in a manner that is compatible with most of today's sync suppression scrambling formats, allowing cable operators who operate scrambled addressable systems to deploy DBD products through an economically graceful migration.

This "simultaneously clear addressable broadband" approach provides cable service to subscribers in a manner that is fully responsive to the Cable Act of 1992, while enabling operators to reduce service call costs associated with home wiring, TV tuning and set-top descrambler churn. A related proven benefit is the resulting Pay services subscription lift.

In addition, DBD devices can be employed to implement the tiering of Expanded Basic services without tier buy-through restrictions. Since DBD devices pass through all unprocessed channels to the subscriber unaltered, it can coexist with all future digital transmission schemes while eliminating their incremental costs required to receive scrambled analog TV signals.

Cable operators employing DBD technology will have a strong service differentiation over competitive video providers who will be unable to provide a consumer friendly interface with "set-top-less" broadband service to the home.

Digital Broadband Descrambling.
MCSI's proprietary DBD technology is based on a wide-band digital spectral processing system which provides for separate and independent signal processing functions in each 6 MHz CATV channel within preselected channel groups. Using digital broadband RF signal processing techniques, DBD devices simultaneously descramble a large number of channels, while at the same time process other selected channels to deny access to signals transmitted in-the-clear, or even further deny access to selected scrambled channels. While this "on-channel" processing is being done, all other unprocessed channels on the cable system are passed through to the subscriber unaltered by the DBD hardware.

The result is that the entire spectrum of channels is available to the subscriber, with authorized channels descrambled on-channel, and unauthorized channels passed through in their original scrambled form, or even further processed in the DBD subscriber unit to affect further denial beyond normal scrambling, i.e., to provide additional security. This additional denial feature also provides the operator with the ability to deny otherwise clear signals for cost-effective tiering of Expanded Basic channels without having to scramble these channels.

Compatible with Existing Scrambling Systems.
The MCSI descrambling technology can be implemented to descramble signals scrambled with either baseband sync suppression or the RF sync suppression scrambling methods. This compatibility allows for phased, cost-effective and backward-compatible migration from today's single channel set-top descramblers to multichannel Digital Broadband Descramblers.

Transition to Enhanced Scrambling.
Because of its inter-operability with set-top converter/descramblers, DBD technology can be phased-in without initial changes to the existing headend scramblers, controllers or their software. Since some of today's sync suppression cable scrambling schemes have been compromised by pirate decoders, DBD technology offers operators a chance to migrate to a new enhanced security multichannel video scrambling method. The MCSI method, called Random Video Folding, provides secure video inversion that is randomly dependent on video content.

Tiering.
The DBD device's ability to deny access to selected clear channesl allows an operator to protect multiple Expanded Basic tiers without the need to scramble those signals at the headend, and without having to equip the subscribers to highly penetrated Expanded Basic tiers with a descrambler. Hence, MCSI's DBD technology offers operators a much more attractive and flexible alternative for simultaneously clear service than cost intensive approaches such as Interdiction, or inflexible approaches such as traps.

Number of Processed Channels.
Because DBD signal processing functions can be implemented over the entire CATV channel range, the incremental cost for adding more controlled channels is quite low. With custom VLSI chips, the number of controlled channels can economically reach 72 or more.

Video and Audio Quality.
Broadband Descramblers do not employ single channel filtering or remodulation and therefore introduce virtually no artifacts or distortions in the video or the audio signals of descrambled and non-blocked channels. Therefore, the video and audio quality is significantly improved over current set-top devices. Also, functions such as MTS stereo are received without buzz or loss of performance introduced by today's set-top descramblers.

Configuration and Location.
The DBD devices (either single subscriber or MDU configurations) may be installed on the pole, in a pedestal, on the side of the home, or any other point of entry. Indoor single subscriber devices are also feasible. In addition to selective channel access control, each subscriber device is equipped with an addressable control enabling a full service disconnect function.

Projected Cost.
The average per subscriber cost of DBD devices is projected to be comparable to that using addressable set top devices.

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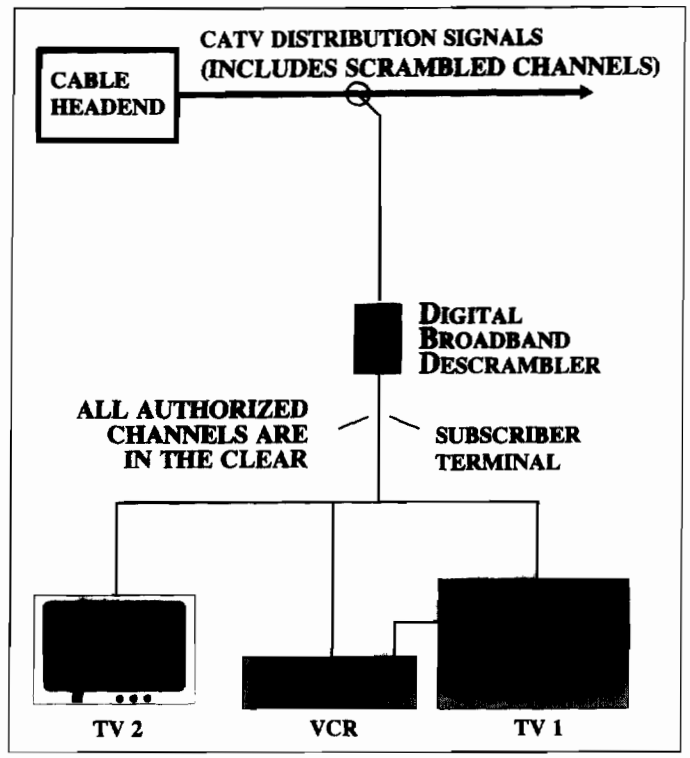

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