

## **1. Introduction and Summary**

Working Party 2 was established by the Systems Subcommittee to conduct tests of proposed systems and provide information to help the Advisory Committee in its recommendations to the FCC. The mission of the organization was described in the report submitted in March 1989 (SSWP2-0120, REV 17 Mar 89) and has not changed since then.

The officers (and affiliations) of SSWP2 are: Mark Richer (Public Broadcasting Service), Chairman; Walt Ciciora (American Television and Communications), Vice Chairman; George Hanover (Electronics Industries Association), Vice Chairman. The Secretary is Alan Godber (Consultant). Ralph Justus (EIA) and Tom Hankinson (Capital Cities/ABC) supported the Working Party as acting secretaries.

The active SSWP-2 Task Forces are: The Task Force on Field Test Procedures chaired by Jules Cohen (Jules Cohen and Associates) and the Task Force on System Specific Tests which up until recently had been chaired by John Watson (Group W). Mr. Watson is unfortunately unable to continue his role as Task Force Chairman. SSWP2 would like to recognize Mr. Watson's valuable leadership and contributions to the work of the Advisory Committee. Mr. John Henderson of Hitachi has agreed to assume the chairmanship of the task force.

SSWP2 has held a total of 39 meetings to date, all in the Washington, D.C. area. Average attendance for the meetings has been about 32.

The primary focus of SSWP-2's efforts since the Fourth Interim Report has been the development of System Specific Tests, development of test procedures specific to digital systems, management and oversight of the laboratory tests and planning for the Advisory Committee field tests.

The test laboratories have completed testing of the ACTV and Narrow MUSE systems. The DigiCipher System is currently being tested.

Future work of SSWP-2 will include:

Development of system specific tests as recommended by SSWP-1.

Management and oversight of the laboratory tests

Dissemination of Test Data as directed by SSWP-4.

Planning of the field test program including supporting the Advisory Committee and ATV System Proponents efforts to obtain the necessary resources.

## **2. Test Procedures**

### **2.1 General Test Procedure Documents**

Modifications to the basic Advisory Committee Test Procedures have been minimal. As expected (see Third and Fourth Interim Reports of SSWP-2), the complexity and innovative nature of both the proponent systems (and of the procedures necessary to test them), have required some modifications to the test plans. These modifications have all been properly documented.

In response to recommendations from the major national broadcasting organizations (SSWP2-0817), SSWP-2 agreed to delete certain objective tests which were not thought to likely contribute useful information to the FCC Advisory Committee in making its recommendation to the FCC regarding an ATV standard.

### **2.2 System Specific Tests**

The Test Management Plan calls for System Specific Tests. These tests are based upon analysis of the system by SSWP-1, which if appropriate, identifies specific areas of concern not addressed by the general test plans. The Working Party felt that System Specific Tests were critically important and requested that a second day per system be made available for this purpose. The Advanced Television Test Center(ATTC) agreed to support the additional day per system.

Under the leadership of John Watson of GroupW Broadcasting, the Task Force on System Specific tests developed test procedures for ACTV (SSWP2-0707), Narrow MUSE (SSWP2-0828) and DigiCipher (SSWP2-0848). Members of the Task Force also participated in the conduct of most of these tests.

### **2.3 Digital Specific Tests**

The entry of several digital systems into the Advisory Committee process presented some new challenges to SSWP-2. Modifications to the existing test procedures were made to ensure that the procedures adequately addressed the digital systems. In addition, new tests specific to the digital systems have been adopted (SSWP2-0847). The addition of these tests have required the Working Party and the ATTC to request additional financial support from the proponents who are providing digital systems for test. These organizations have in fact agreed to pay additional test fees to the ATTC for the Digital Specific Tests. CableLabs has agreed to conduct certain Digital Specific Tests during their existing test time.

### **3. Test Facilities**

Three organizations have made commitments to conduct the SSWP-2 laboratory test procedures. All three of the laboratories have filed management plans with SSWP-2. Descriptions of the organizations and status of the test facilities have been provide by the organizations as follows:

#### **3.1 Advanced Television Test Center (ATTC)**

The testing has been undertaken by ATTC in support of the ATV standards related work of the FCC and its Advisory Committee on Advanced Television Service. The Test Center was formed and is financed by a coalition of broadcasting companies and industry organizations. The sponsoring members of the Test Center are: Capital Cities/ABC, Inc.; CBS, Inc.; NBC, Inc.; Public Broadcasting Service (PBS); Association for Maximum Service Television (MSTV); Electronic Industries Association (ELA); and National Association of Broadcasters (NAB).

Testing of advanced television (ATV) transmission systems at ATTC began on July 12, 1991, in accordance with the schedule and the Test Plans approved by the FCC Advisory Committee at its April 1, 1991 meeting. This was the beginning of laboratory tests on six different ATV systems scheduled for testing through the FCC Advisory Committee, and expected to take approximately one year. Audio subjective listening tests are being conducted by the Westinghouse Science and Technology Center under contract with the ATTC.

Amendments to the Test Plans, and related changes to the Test Center's facilities and the testing schedule, have been implemented when necessary and through the procedures established in the Test Management Plan. These are highlighted below at the point the decisions were made. They include the addition of several new tests associated with the 'digital' ATV systems. As planned, the designs of these systems are being examined during their respective SS/WP-1 certification reviews, which are coming after testing started on the 'analog' systems. There were also deletions of a few tests which were not judged necessary to the process at this stage. The changes also include: decisions to use different Test Materials (pictures, test patterns, etc.) for some tests, in light of experience in actually conducting the tests; addition of one more 'system-specific' test day to each test slot; expansion of time necessary to run more UHF taboo tests (on the 'digital' systems); and, addition of more ATTC/proponent test results review time during a test slot.

These adjustments to the Test Plans have been accomplished with the help of SS/WP-2 Chairman Richer, and through the process of regular meetings of his Working Party, which include reports by the three testing laboratories and proponents. The details of each adjustment, as well as testing difficulties and corrections, are included in the record of the Working Party.

In addition to the active cooperation of the proponents and the Working Party, including its Task Force on System Specific Tests, some 150 volunteers, including many FCC staff, have already participated as 'Expert Observers' at ATTC. They have helped establish the range over which interference or impairment conditions affect a given ATV system's performance. Their contribution supports the conduct of tests which consume some 70% of the typical eight-week test slot.

Activity since the start of testing is highlighted below ("Current Status"), and the plans for laboratory testing are also noted ("Projected Schedule"). The records of ATTC's testing will contain only the data from each test, as requested by the FCC Advisory Committee, which will analyze the information and evaluate the results for each system, and among systems. The Test Center itself does not interpret the results or address the relative merits or performance of ATV systems.

### **Current Status**

The first system--ACTV: Advanced Compatible Television from the Advanced Television Research Consortium (ATRC)--moved into ATTC on June 20, 1991. After it was set up by its proponent and upon completion of the interface check to ensure the proper signal connections, the testing period ran from July 12 to September 15, 1991.

The nature of this enhanced NTSC system, and its NTSC-compatible elements, called for a week's longer test period than for other systems. In addition, during this test slot, some changes were made to the Test Materials used in certain tests; and, re-running the affected tests added two days. Also, a second system-specific test day was added at this point to each test slot.

During the course of this test slot, where the new multi-format taping techniques were first being used, some tape editing problems were encountered. Together with the large number of taped interference condition tests required for this system, this led to difficulties in completing all editing ratings tapes as scheduled. Also, a misadjustment in ATTC hardware in part of the taping chain affected many of the tape recordings of the test results, which took time to analyze and correct. Corrective measures were worked out and implemented on basic received quality tapes (impairment tapes were not corrected); but the delays in delivery of some ratings tapes to

ATEL/Canada slowed the start and completion of their work. Nevertheless, at ATTC, testing started on the second system as scheduled.

The draft report of testing on ACTV was circulated to the proponent late last month, and, together with the proponent's comments and the reports of the other laboratories, it will be released as soon as the draft reviews are complete.

The second system--Narrow-MUSE from NHK/Japan Broadcasting Corporation--moved into ATTC on August 28, 1991. After set-up and interface, testing began on September 20 and concluded on November 18, 1991.

Before testing began modifications were made to the Test Center's RF (radio frequency) Test Bed and to the electric power supply in the Proponent Equipment Rooms in keeping with the operating requirements of this and all future systems. These requirements were disclosed in September 1991, and reflect changes from the assessments reported by proponents earlier. Without affecting the testing schedule, these changes were made by ATTC to address the necessary new margins for proper and safe testing.

During the course of this test slot, a further change in test materials was adopted. This required extra time in order to redo the affected tests, and to add in a number of 'benchmark' tests in order to relate the results using the changed test materials to those obtained with the test materials used on the first system. (The 'benchmark' tests must be conducted on all other systems, too.) In addition, the large amount of taping and editing continued, but the flow of ratings tapes to ATEL/Canada improved.

The draft report of testing on Narrow-MUSE will be circulated to the proponent by early next month, and, together with the proponent's comments and the reports of the other laboratories, it is expected to be released later in March.

The third system--DigiCipher from the American Television Alliance (ATVA)--moved into ATTC on November 26, 1991. After set up and interface, testing began on December 10, 1991 and is expected to be completed in late February.

During the course of this test slot, testing continued through the holiday period with a minimum break, so that the regular test plan was completed as planned, by February 5. Two further tests which will affect the schedule, however, have been set for this and all the other 'digital' systems. One set of further tests addresses expanded UHF taboo testing. The other is the set of eleven new tests added to address 'digital specific' elements of each system. Both have required further changes to the ATTC facilities, but the latter are

of such technical complexity that they interrupted testing and have just now been implemented. Therefore, the new digital-specific tests began when testing on this ATV system resumed from February 12.

The draft report of testing on DigiCipher will be circulated to the proponent in early April, and, together with the proponent's comments and the reports of the other laboratories, it is expected to be released in May.

### **Projected Schedule**

The fourth system--DSC-HDTV: Digital Spectrum Compatible HDTV from Zenith/AT&T--moved into ATTC February 10-12, 1992. After set up and interface, testing is expected to start in early March and run through April. The draft report on this system is planned for June.

The fifth system--AD-HDTV: Advanced Digital HDTV from ATRC--is expected to move into ATTC in April and testing is planned to run approximately May -June. The draft report on this system is planned for August.

The sixth system--ATVA-Progressive from ATVA--is expected to move into ATTC in June and testing is planned to run approximately July -August. The draft report on this system is planned for September.

These estimates are based on current test plans and reflect test running times based on experience to date. They may, therefore, be affected by any future changes, including the conduct of the expanded UHF taboo testing which is expected to take differing lengths of time on each of the next three systems to be tested.

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The Test Center and its staff appreciate the help of the FCC and its Advisory Committee's leadership, and the regular involvement of the Chairman of SS/WP-2 and his Working Party in managing the challenges and demands of the laboratory testing process.

Peter Fannon, ATTC

## **3.2 CableLabs**

### **BACKGROUND**

Cable Television Laboratories, Inc (CableLabs) is a research and development consortium of cable television system operators representing more than 85% of the cable television subscribers in the United States and 45% of subscribers in Canada. CableLabs has undertaken to perform the portion of the ATV tests that are specific to the interests of the cable television industry and those system specific tests that are more easily accomplished on the cable test bed.

### **Current Status**

CableLabs completed preparations for testing in time for the scheduled start date of 1991 July 12. The cable portion of the tests are normally scheduled to take place approximately the fourth week of a given proponents test schedule and require five working days to accomplish.

Modifications to test procedures, test equipment, and the computer control system have been accomplished to meet the changing requirements of System Subcommittee Working Party 2 Test Procedures. These changes have been necessary due to changes in proposed systems, detailed analysis of the systems and experience gained during proponent tests. The long down time between cable only tests has made it possible to accomplish the modifications while the ATTC is performing the terrestrial tests on the proponents.

The CableLabs portion of the tests on the first system -- ACTV: Advanced Compatible Television -- began on 1991 August 19 and were completed on August 23. Subsequent to the completion of the tests non-expert viewing tapes were made for evaluation at the Advanced Television Evaluation Laboratory (ATEL), in Ottawa. The non-expert video tapes have been evaluated by ATEL. The draft CableLabs report was circulated to the proponent last month. The final reports from the three laboratories along with the proponent's comments, will be released later this month.

The CableLabs portion of the tests began on the second system-- Narrow MUSE from NHK/Japan Broadcasting Corporation -- began on 1991 October 16 and was completed on October 22. The computer program used to automate the testing had been modified after the ACTV system to incorporate recommended changes in the procedure.

The tests were completed in the time allocated, non-expert tapes produced for and shipped to ATEL for evaluation. The CableLabs report is presently being drafted and will be circulated to the proponent early next month. The final CableLabs report, along with other test laboratories reports and proponent comments, is scheduled to be released in late March.

The third system --DigiCipher from the American Television Alliance (ATVA) -- underwent CableLabs testing between 1992 January 27 and January 31. The non-expert tapes are now being prepared for ATEL and are expected to be shipped by February 17.

It was necessary to perform a number of digital specific tests during the test period and, for the first time, a data transmission channel was tested. Characteristics of the digital transmission system, familiarity with procedures, plus improvements to the computer control program resulted in some tests being performed faster than previously experienced. This allowed completion of the digital specific tests within the 5 days allocated for CableLabs tests.

The draft report of the DigiCipher system is expected to be distributed to the proponent in early April and the final report, together with the other laboratories reports and proponent responses, should be released in May.

### **Projected Schedule**

The CableLabs schedule is dependent on the ATTC schedule as the tests are performed partway through the proponent test period at the test center. The CableLabs tests for the remaining systems will be performed within the test schedule prepared by ATTC with the draft reports being circulated to the proponents about a month after the completion of the tests. The co-operation experienced between ATTC and CableLabs has helped ensure that testing and report generation at both laboratories has gone as smoothly as possible.

CableLabs and its staff appreciate the help of the FCC Advisory Committee leadership and especially the regular guidance and involvement of the Chairman of SS/WP-2 and his Working Party in meeting the demands of testing these new systems.

**Brian James, CableLabs**

### **3.3 Advanced Television Evaluation Laboratory (ATEL)**

#### **Background**

The Advanced Television Evaluation Laboratory (ATEL) is a facility of the Department of Communications (Canada), which is managed by the Broadcast Technologies Research Branch of the Communications Research Centre. The ATEL's activities in the advanced television testing program are supported by the department as well as by the Canadian Broadcasting Corporation, Leitch Video International, Rogers Engineering (Canada), Tektronix (Canada), Telesat Canada, and Advanced Broadcasting Systems of Canada (ABSOC).

#### **Current Status**

The Advanced Television Evaluation Laboratory (ATEL) completed preparations for testing in time for its published start date of 12 August 1991.

ATEL's tests of the ATRC ACTV system were begun 3 September 1991, three weeks later than expected, due to difficulties experienced at ATTC in preparing the necessary subjective testing tapes (see ATTC report). Of the 14 subjective tests required, 12 were completed by 25 October 1991 and 2 were deferred, pending necessary re-work at ATTC. These tests were completed successfully in make-up sessions on 16-17 January 1992 and 5-10 February 1992. ATEL's report for the ATRC ACTV system will be ready by 21 February 1992.

Tests of the NHK Narrow-MUSE system were begun 4 November 1991, following a 5-day postponement resulting from the implementation of necessary test-bed modifications at ATTC. Of the 13 subjective tests required, all were completed by 3 February 1992. During the course of testing, two interruptions were encountered, one of 15 days resulting from necessary re-work at ATTC occasioned by changes in testing procedures and one of 2 days to accommodate make-up sessions for a deferred ACTV test. ATEL's report for the Narrow-MUSE system will be ready by 28 February 1992.

#### **Projected Schedule**

The conduct of tests at ATEL is contingent upon the timely completion of preparatory work at ATTC and CableLabs. Based on the information currently available and assuming 7 tests for the ATVA DigiCipher system and full testing for each of the other three systems that remain to be tested, ATEL's projected schedule is as given below. (ATEL, of course, will make all reasonable efforts to capitalize upon any opportunity to accelerate this schedule).

<b>SYSTEM</b>	<b>START</b>	<b>FINISH</b>	<b>REPORT</b>
ATVA-DigiCipher	FEB 1992	MAR 1992	APR 1992
Zenith/AT&T DSC-HDTV	Mar 1992	MAY 1992	JUN 1992
ATRC ADTV	JUN 1992	JUL 1992	AUG 1992
ATVA-Progressive	AUG 1992	SEP 1992	OCT 1992
		[Final Report	Nov 1992]

### **Additional Commitments**

The ATEL remains committed to the following, additional testing activities:

1. subjective tests of co-channel interference (NTSC-to-NTSC). These will be done at the earliest opportunity following receipt of the necessary testing tapes from ATTC.
2. a reasonable amount of follow-up subjective testing (e.g., direct comparisons among systems) should this seem necessary.

Paul Hearty, ATEL

#### **4. Field Tests**

The FCC Advisory Committee has been aggressively planning the field tests since spring 1990. Early in this process, the goals of the field test were defined:

“The primary goal of the field testing program is to verify the performance and operability of the selected system(s) under real world conditions. In addition, this testing phase should be used to point out flaws not uncovered through laboratory testing. The intent of the field testing is not to provide comparative data. The large number of uncontrolled variables inherent in field testing would indicate that quantitative analysis and decision-making in this environment would be subject to strong criticism of poor science and might lead to invalid conclusions”

The Advisory Committee does not plan to field test all of the systems currently scheduled for laboratory tests. Its goal is to field test a single system. A contingency plan for the case that the selected system fails in the field will be developed.

The Task Force on Field Testing chaired by Jules Cohen has developed and approved the test procedures manual for the field test program (SSWP2-0601). While it is understood that these procedures will be refined as we move closer to the actual field tests, it is a good basis to plan the tests. The FCC Field Operations Bureau has made some suggestions regarding receive site selection which will be incorporated in the next revision of the test procedures.

Charlotte, North Carolina has been selected as the site for the Advisory Committee field tests. Charlotte provides both a variety of terrain and available spectrum (SSWP2-0770). The FCC has approved Charlotte as the field test site (SSWP2-0831). The site allows for nearly full-power testing on UHF and VHF. The top position of a 1400 ft tower is available for the UHF antenna. The VHF antenna can be mounted at 1200 ft on the tower. The building and tower are being provided to the project courtesy of Providence Journal Broadcasting and the University of North Carolina Public Television Network.

Several manufacturers have agreed to provide the antennas, transmission lines, transmitters and most RF hardware for the tests. Most NTSC and ATV audio and video equipment are expected to come from manufacturers, networks, stations and ATV proponents. A source for a field measurement truck is still under consideration. The building for the transmission facility will require some minor refurbishing. Personnel to conduct the field tests will include representatives from the ATV proponent and the FCC.

The remaining costs of the field testing have been estimated to be about one million dollars. The proponents have agreed to provide the necessary funds for the field tests. The FCC Field Operations Bureau has also agreed to support the field tests. This support will include personnel and possibly a test vehicle.

The cable industry, through CableLabs has committed to provide the resources necessary to conduct the cable portion of the field tests.

### **Field Test Organizations**

The Public Broadcasting Service (PBS) will manage and conduct the field tests. It will be responsible for overall coordination of the Field Test program. Mr. Edmund Williams has been hired by PBS to act as Field Test Manager. PBS will work closely with the FCC to assure that the tests are conducted properly. The FCC Field Operations bureau will provide operational support.

MSTV will provide technical support and assistance to PBS in the preliminary analysis of the test results from the over-the-air (broadcast) part of the field tests.

CableLabs will assist PBS in conducting the cable portion of the Field Tests. CableLabs will coordinate this activity with the PBS Field Test Manager. CableLabs will be the primary organization to analyze the cable portion of the field tests.

All aspects of the management and conduct of the field tests, and the analysis of test results, will be subject to a technical oversight committee which will be selected and chaired by the Chairman of the Advisory Committee.

**FEDERAL COMMUNICATIONS COMMISSION  
ADVISORY COMMITTEE ON  
ADVANCED TELEVISION SERVICES**

**WORKING PARTY 3: ECONOMIC ASSESSMENT  
OF  
SYSTEMS SUBCOMMITTEE**

**FOURTH REPORT**

**JANUARY 1992**

**LAURENCE J. THORPE, CHAIRMAN  
VICE PRESIDENT, PRODUCTION TECHNOLOGY  
SONY ADVANCED SYSTEMS**

**SHELLIE ROSSER, VICE CHAIRPERSON  
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**RICHARD GREFE, VICE CHAIRPERSON  
VICE PRESIDENT  
NATIONAL ASSOCIATION OF PUBLIC TELEVISION  
STATIONS**

**Phase 2: February 7, 1989 - March 14, 1990**  
Six WP-3 Meetings  
Third Interim Report FCC ACATS March, 1990

**Phase 3: March 14, 1990 - January 31, 1991**  
Five WP-3 Meetings  
Fifth Interim Report FCC ACATS April, 1992

**Phase 4: January 31, 1991 - January 31, 1992**  
Four WP-3 Meetings  
Fifth Interim Report FCC ACATS April, 1992

This fourth report describes a year of relatively low activity. SS WP-3 had, by the beginning of 1991, gone as far as was possible in developing system block diagrams describing both a local TV station conversion to an ATV simulcast system and a total network ATV infrastructure. Spread sheets have also been prepared to allow either total system to be cost analyzed - given the existence of realistic pricing for each component of these systems.

The dearth of details on any of the new (especially the very new all-digital) ATV encoder-decoder systems precluded our beginning any form of detailed cost analysis on these key elements of hardware. On this basis, SS WP-3 made the decision to spend the greater part of 1991 refining the models for the growth curves describing the onset and subsequent market penetration of an ATV service to the U.S. homes. A two-pronged approach was used to do this:

#### **ATV Broadcast Origination:**

SS WP-3 worked in conjunction with IS WP-2 (Transitions scenarios) to get a better grasp of how ATV was likely to begin within the U.S. broadcasting system. The time-line PERT chart developed by IS WP-2 was critical to studies on precisely how the process would actually begin in the 1990's and how quickly the growth might be. SS WP-3 had previously concluded (from our earlier work) that the broadcasters will convert to ATV in a sequence of phases according to the following series of steps:

- Network Pass Through

## **1.0 INTRODUCTION**

The FCC ACATS Systems Subcommittee formed Working Party 3 in January 1988 and tasked us with the following:

**Establish estimates of the costs associated with the distribution of ATV by various systems, with inputs from the Planning and Implementation Subcommittees. An assessment of the technological viability and economic feasibility of each system will be established.**

In this Fourth report to the Systems Subcommittee we will summarize the work of the past twelve months (since our January 1991 Third report). We will also outline the activities planned for this final phase of our work as we attempt to identify the costs associated with each of the ATV proponent systems.

The work of SS WP-3 during 1991 saw a close liaison with Working Party 2 of the Implementation Subcommittee (Transition Scenarios) and with the newly resurrected (under new chairmanship) Working Party 5 of the Planning Subcommittee (on Market Penetration). Both of these Working parties are critical to our applying a macro economic perspective to the cost analysis we make on the various ATV systems. Models are being developed for penetration scenarios - both for broadcast stations conversion to ATV and for consumer ATV receivers. Manufacturing volume for both will be deduced from these models to allow appropriate economies of scale to be factored into the cost estimates at various points of time following initiation of the ATV service in the U.S.

## **2.0 BACKGROUND:**

This is the fourth report of SS WP-3 - and represents our formal input to the Fifth Interim Report of the FCC ACATS. A summary of our four work phases to date (- and how they relate to the various Interim Reports) are as follows:

**Phase 1: February 24, 1988 - February 7, 1989  
Eleven WP-3 Meetings  
Second Interim Report FCC ACATS April, 1989**

- Local Commercial Insertion
- Local Program Playback
- Local Program Origination
- Full HDTV Operation

It was concluded by WP-3 that the first two steps in fact would suffice to allow a critical measure of the cost of implementing ATV - in that this small initial service would entail the broadcasters acquisition of the key elements of a given ATV proponents' system. This, in turn, will allow a realistic assessment of each ATV proponent hardware and associated support system. **Figure 1** outlines the minimum system that would facilitate a local TV station acquiring a network ATV feed (by satellite or alternative feed), inserting a local commercial (assumed to be a recording of an HD production made elsewhere), and retransmitting this ATV signal and an NTSC signal via the simulcast dual terrestrial transmission system.

#### **ATV Receiver:**

The more complex ATV receiver penetration scenario is being studied within joint meetings being held between SS WP-3 and PS WP-5 (market penetration). The basic assumptions underlying the very pessimistic growth scenarios of WP-5's work of three years ago are being re-examined in light of more recent understandings and global HDTV developments. The new studies by WP-5 will include an examination of;

- Impact of HD VCR in propelling the penetration of ATV receivers
- Availability of programming to support any level of penetration
- Effect of a pro-active cable industry activity in providing ATV delivery to the home.

#### **ATV BROADCAST ENCODERS:**

A significant element common to all of the ATV transmission proponents is the highly sophisticated ATV Encoders that

radically transform the input component video signals to the highly compressed signal format - and the subsequent modulation system required to allow transmission via the 6 MHz terrestrial channel. These units are clearly complex and they are expensive - as evidenced by the hardware that has emerged for the current ATTC testing. How closely these prototype ATV encoders represent the final embodiment of systems manufactured for sale to broadcasters is simply not yet clear. Design refinements continue.

SS WP-3 has developed a model for a growth curve representing the volume of ATV encoders required to support the growth of U.S. broadcasters and cable operators conversion to ATV. This optimistic curve is shown in **Figure 2** and it assumes:

- FCC decision on ATV standard - mid 1993
- Final standard documentation - end 1993
- First small quantity of ATV encoders - 25 being assumed to be reasonable (probably from one or two manufacturers only, initially) - available end 1994
- Key volume points of 100, 400, 1600 were chosen as important to key decisions regarding additional manufacturers becoming involved, commitment to second generation designs (based on field experiences with first 25 units), commitments to higher degrees of LSI designs to achieve more compact and cost effective units.
- A final number of 10,000 has been chosen also for the "high volume" cost analysis - based on a significant participation downstream of cable operators and more encoders being used per television station (as the conversion to full HDTV capabilities takes place).

A letter was prepared by SS WP-3 and mailed to all ATV proponent organizations on December 1991 formally requesting their appointment of a key expert representative to a new Cost Analysis Specialist Group (within WP-3). This Specialist Group will begin a series of meetings in 1992 to examine each proponent system hardware in detail. By having all ATV proponents represented within this Specialist Group a measure of fairness (via peer scrutiny) will be ensured. The letter outlined

to the proponents the basic modus operandi to be followed and it asked for their comments on this.

A second letter from SS WP-3 was distributed to the ATV proponent system representatives attending an IS WP-2 meeting on January 9, 1992. This letter was also in the form of preparation for the activities of the new Specialist Group - and it asked a series of specific questions relating to our proposed methodology to gamer suggestions for refining the same.

### **ATV Receiver Costs Task Force:**

In September 1991 Ralph Justus (of EIA CEG) accepted the chairmanship of a new ATV Receiver Costs Task Force formed by WP-3. The charter established for this group was as follows:

- 1) develop a list of assumptions regarding ATV receiver specifications and performance;
- 2) gather generic cost information on television components and manufacturing processes;
- 3) gather ATV system information as it relates to receiver design and, as needed, solicit (via questionnaire) directly from system proponents specific additional information;
- 4) meet as a Task Group with the proponents for detailed discussion, as needed; and,
- 5) assemble the Task Group's best collective cost estimates and report these to SS/WP-3.

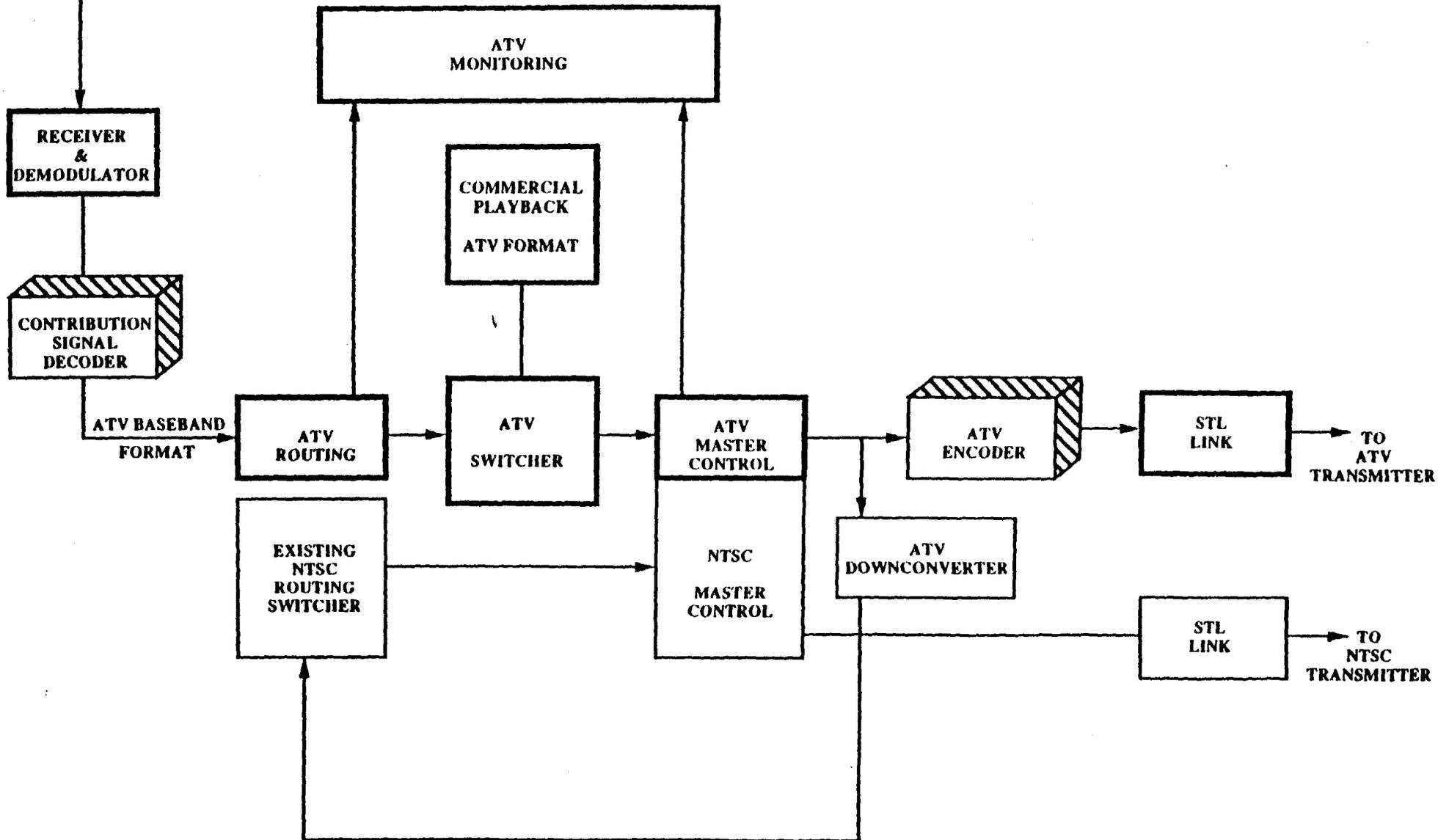
The Task Force has held a series of phone teleconferences to date. They have assembled and reviewed our past ATV receiver costing efforts (and other material including IS WP-2 implementation assumptions). They have drafted some ATV Receiver Strawman assumptions and prepared a generic block diagram of an ATV receiver. This Task Force includes key expertise from AT & T, ATSC, General Instruments, Hitachi, Samsung, Thomson CE, Philips CE, and Zenith.

A high level of activity is expected of this Task Force in the ensuing months.

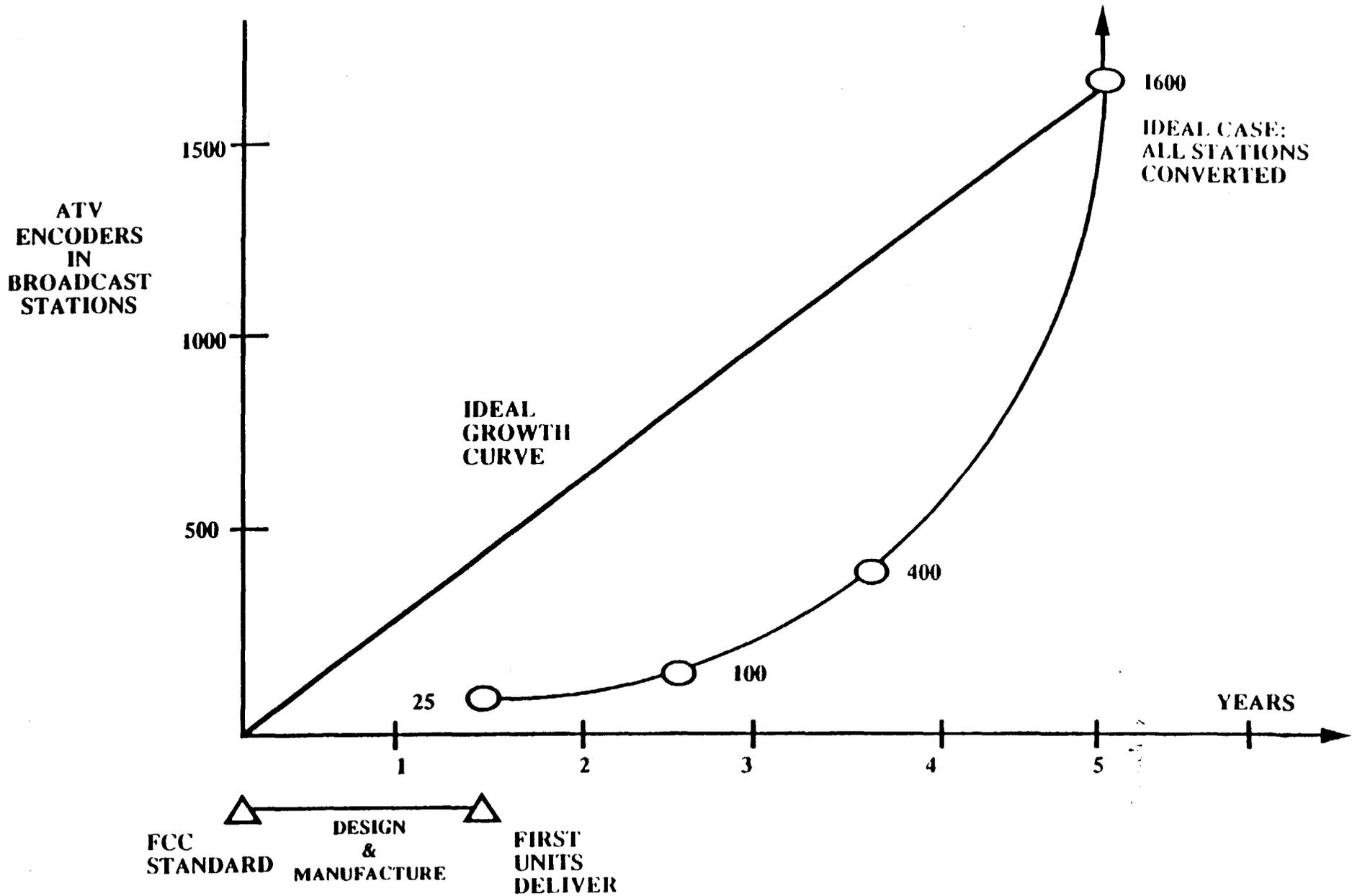
Because of the extremely high cost sensitivity of a consumer ATV receiver a very close attention to detail will be required if a truly comparative assessment of each proponent's receiver is to be made. The Receiver block diagram developed reflects this detail (Figure 3). The current complexity and IC technology, in particular, will be closely scrutinized - particularly as it might manifest itself in specialized packaging that impacts costs. The various approaches to Demodulation, Error correction, image decoding, audio and ancillary data decoding will all be examined from the viewpoint of number of IC's, complexity and gate count, interconnection etc.

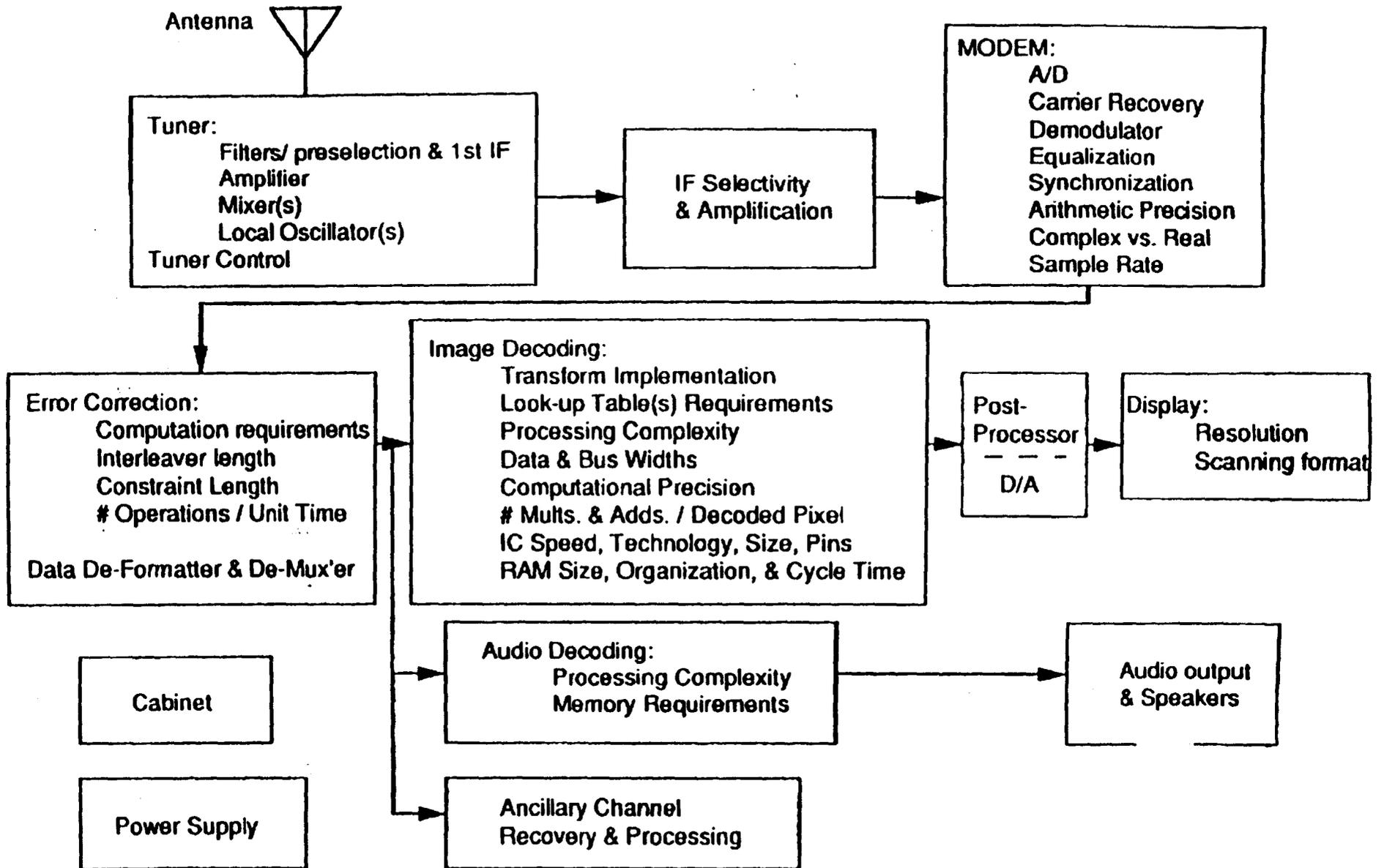
LT/aib  
FCC/ACATS

# ATV SATELLITE CONTRIBUTION FEED



# ATV NETWORK PASS THROUGH





**RECEIVER BLOCK DIAGRAM**

SS/WP4-0082  
07 Feb 1992

**FCC ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE  
SYSTEMS SUBCOMMITTEE  
WORKING PARTY ON SYSTEM STANDARDS (SS/WP4)**

**PROGRESS REPORT  
(SUBMISSION FOR THE FIFTH INTERIM REPORT)**

**Executive Summary**

During the previous reporting period, the Working Party developed a process for recommending a system for an ATV service. The Working Party also agreed to an outline for the SS/WP4 final report. These two documents provided a framework for the activities of SS/WP4 during this reporting period.

The Working Party has refined the Recommendation Process and the final report outline. A list of ten Selection Criteria have been identified with target levels of performance. The Working Party has agreed on the treatment of test data and re-affirmed that consensus should be used to prepare recommendations.

The schedule developed by the Working Party calls for adoption of reports on each system about eighteen weeks after tests begin on that system. This has not been possible because data has not yet been made available to the Working Party.

The Advisory Committee should consider the appointment of a special panel with the responsibility of formulating recommendations for the Advisory Committee.

**I. Organization**

The Chair of SS/WP4 is Dr. Robert Hopkins, Executive Director of the Advanced Television Systems Committee. He is assisted by three Vice-chairs: Dr. Hugo Gaggioni of Sony Advanced Systems, Mr. Bruce Sidran of Bellcore, and Mr. Louis Williamson of American Television and Communications. Mr. Gerald Robinson of Scientific Atlanta serves as the Secretary.

The Working Party formed a new task force during this reporting period — the Task Force on Data Analysis. Mr. David MacCarn of WGBH-TV serves as its Chair. The task force is responsible for the analysis of data resulting from tests of the proposed ATV systems.

Mr. Victor Tawil of MSTV and Mr. Lynn Claudy of NAB serve as Co-chairs of the Task Force on Report Drafting. Mr. Sidran served as the Chair of this task force from its formation until the most recent SS/WP4 meeting when he resigned because of the burden of other obligations. The Working Party expresses its gratitude to Mr. Sidran for his many contributions.

During this reporting period, a joint meeting was held with SS/WP2 to discuss the reporting plans of the testing laboratories. Presentations were given by the Advanced Television Test Center (ATTC), Cable Television Laboratories (CableLabs), and the Advanced Television Evaluation Laboratory (ATEL). The two working parties received information regarding the volume of the data which would be reported after testing each of the proposed systems, the time required to prepare the reports, and the general form of the reports. At the subsequent SS/WP4 meeting it was agreed that the work of the Task Force on Data Format was complete and that the task force could be disbanded. The Working Party expresses its gratitude to the persons who participated in the work of the task force and especially to its Chair, Dr. Gaggioni.

Altogether, the Working Party has held thirteen meetings. Average attendance has been 26 persons. A total of 119 persons have attended at least one meeting of SS/WP4, three-quarters of whom (89) have attended three or fewer meetings. Eleven persons have attended more than half of the SS/WP4 meetings.

## II. Accomplishments

### Agreement on Recommendation Process

During the previous reporting period, the Working Party developed a process for recommending a system for an ATV service. A diagram of the Process is shown in Appendix I. The Selection Criteria constitute the key issues that must be examined in order to recommend an ATV system. Each of the proposed systems will be measured against the Selection Criteria and compared with one another in these key areas to determine which system could offer a superior service. The Process has provisions for review or reconsideration as new information becomes available.

### Agreement on Ten Selection Criteria and Associated Target Values

The Working Party has agreed to a list of ten Selection Criteria. The list is shown in Appendix II. The ten criteria fall into three categories: Spectrum Utilization (Coverage Area and Accommodation Percentage), Economics (Cost to Broadcasters, Alternative Media, and Consumers), and Technology (Audio/Video Quality, Transmission Robustness, Scope of Services and Features, Extensibility and Interoperability Considerations).

Target values of the Selection Criteria have been developed to represent the level of performance aspired to in an advanced television system. They are shown in Appendix III.

#### Agreement on an Outline for the Final Report

The outline for the SS/WP4 final report is shown in Appendix IV. The first six chapters will include background information and contributions from other working parties. Chapters seven through nine will contain the substantive work of SS/WP4. The remainder of the final report will contain conclusions and other information regarding work which must be done in the future.

The Recommendation Process prescribes the manner in which chapters seven through nine will be written. The first block, "Determine Selection Criteria for an ATV Service," will be the content of chapter seven. In this chapter, the Selection Criteria will be defined and their importance in the selection of an ATV system will be explained. The methods used to measure the proposed systems against the Selection Criteria will be described.

The second block of the Recommendation Process, "Analyze Systems and Select Those Which Satisfy the Selection Criteria," will be the content of chapter eight. Each system will be analyzed in chapter eight according to the Selection Criteria. The analyses related to the Spectrum Utilization and Technology criteria will be based upon the test data. The analyses related to the Economic criteria will be based upon information which the Working Party has requested from SS/WP3.

The next three blocks, "Determine and Compare Significant Differences," "Identify Superior System(s)," and "Recommend Single System for an ATV Service," will be the content of chapter nine. The proposed systems will be compared and recommendations will be delineated in chapter nine.

#### Agreement on Treatment of Test Data

The Working Party has agreed on the manner for treating the test data for the proposed systems. The data will be divided into three categories: data intrinsic to the Selection Criteria, data loosely associated with the Selection Criteria, and all other data.

The first category of data is data which is critical to the selection of a recommended system. Data related to Spectrum Utilization (Coverage Area and Accommodation Percentage) will be referred to PS/WP3 for analysis. Data related to Technology (Audio/Video Quality, Transmission Robustness, Scope of Services and Features, Extensibility and Interoperability Considerations) will be analyzed by the