

## CABLE TELEVISION INSPECTIONS BY FOB FIELD ENGINEERS

Presented by

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### ABSTRACT

Engineers with the Federal Communications Commission's Field Operations Bureau have responsibility for inspecting cable television systems. This paper discusses the considerations of selecting a system for inspection, the organization and responsibilities of FCC field units, some of the general technical procedures followed, recent inspection findings and inspection follow-up. Also, the cable operator's responsibilities in assisting with the inspection are outlined.

### INTRODUCTION

The FCC Field Operations Bureau (FOB) is responsible for Commission engineering activities performed in the field, including enforcement, interference suppression and communications user liaison. Working with CATV systems is nothing new to the bureau. Our first experience was obtained in the fifties in radiation leakage complaints involving TV interference to nonsubscribers. At that time, restrictions were specified in Part 15 of the FCC Rules and Regulations (Radio Frequency Devices).

After the adoption of signal quality specifications, Part 74 and later Part 76 of the Rules and Regulations, our FM/TV Enforcement Units routinely began making complete system performance measurements. Other field facilities began random inspections for a one-year period during 1975, gathering data from performance measurements conducted by system operators and also began and have continued, making other inspections for cause. More recently, several select field facilities have concluded a survey to determine the extent of cable television leakage radiation. The findings of this survey will be used to assist in analyzing cable TV's potential interference to aircraft radio systems.

### FOB ORGANIZATION

The Field Operations Bureau is composed of six regions, consisting of 31 district and limited offices, 13 monitoring stations and 5 special enforcement facilities, each staffed with electronic engineers and technicians. The regional

boundaries and location of individual facilities are shown on Illustration 1.

There are also four FM/TV/CATV enforcement units that specialize in technical analysis of FM broadcast, television broadcast, and cable television systems. The home bases of these units are as follows:

Eastern FM/TV/CATV Unit - Norfolk District Office

Southern FM/TV/CATV Unit - Powder Springs, GA Monitoring Station

Central FM/TV/CATV Unit - Kansas City District Office

Western FM/TV/CATV Unit - San Francisco District Office

Each of the FM/TV/CATV units is approximately a \$100,000.00 package consisting of a 2.5-ton truck, sophisticated test equipment and trained engineer specialists. See Illustrations 2 and 3.

An average FOB inspector begins his career with the Commission soon after receiving a BS degree in Electrical Engineering. Others are hired after working in related fields in private industry. The first assignment is a six-month comprehensive training course that provides a broad overview of the bureau's responsibilities and methods of accomplishing those responsibilities. A duty station is next assigned and career development continues through on-the-job training until journeyman level is obtained, usually in three years. The inspector is a generalist working with marine, land mobile, broadcast, aviation, citizens, cable television and other services. After obtaining journeyman status, a speciality such as an FM/TV/CATV unit might be selected or a senior engineer classification obtained.

### CABLE SYSTEMS SELECTED FOR INSPECTION

The bureau has limited resources that can be devoted to cable television enforcement. Therefore, most cable systems selected for field inspection are selected for some specific cause such as the following:

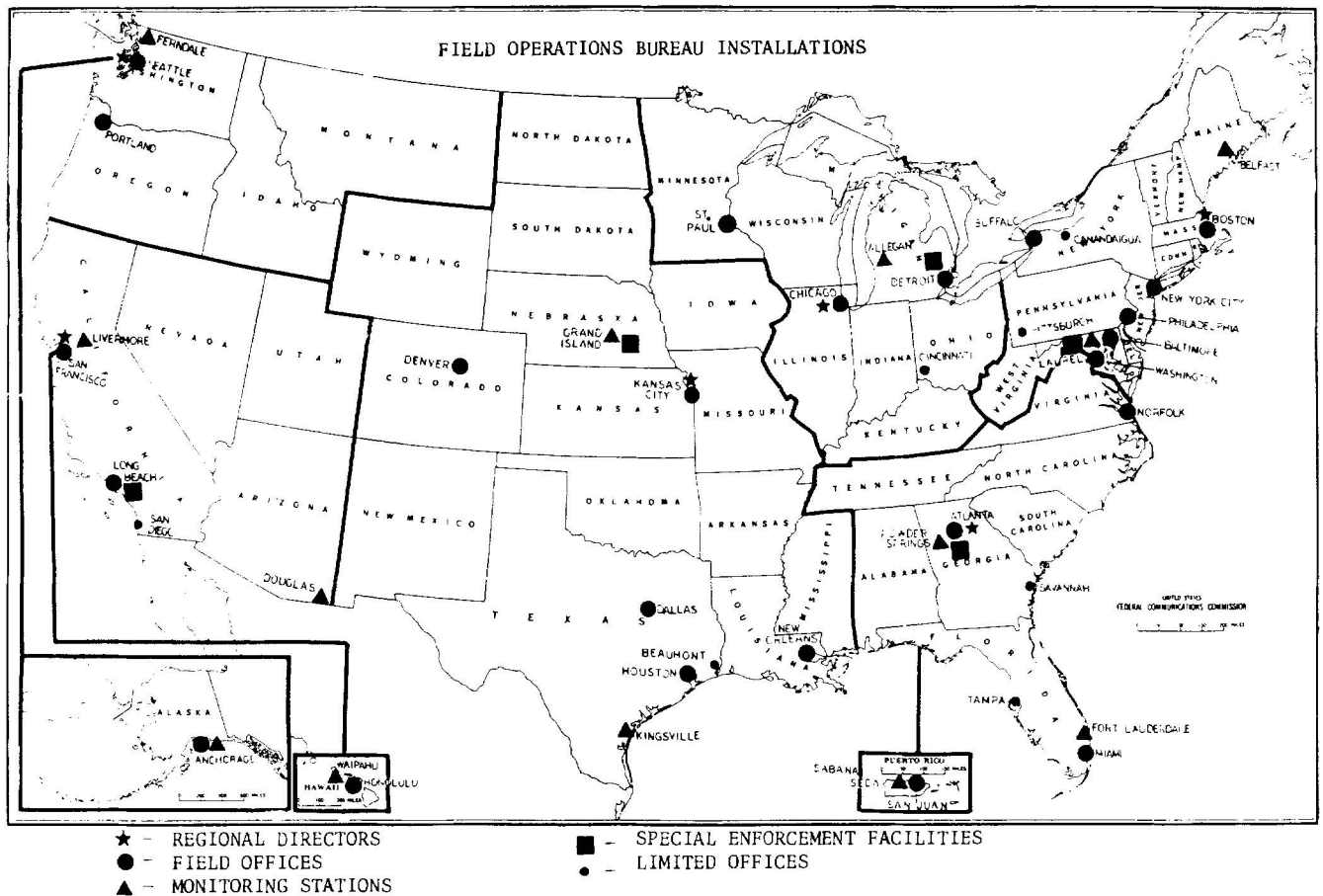


Illustration 1. Map Showing Location of FOB Field Installations



Illustration 2. Exterior View of FM/TV/CATV Unit

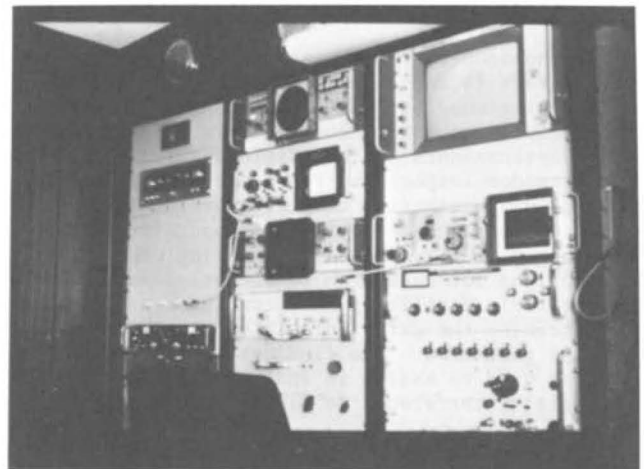


Illustration 3. Test Equipment Rack in FM/TV/CATV Unit

- 1) Subscriber complaints that are not resolved by the cable operator. 1/
- 2) Signal quality controversies between cable operators and television station operators where conflicting technical reports have been filed with the Commission.
- 3) Gathering background or evidentiary material for use by another bureau or office.
- 4) Although the majority of cable television inspections performed by FOB fall into one of the above categories, a few are based on random selection.

It might be well to note that FOB should not be thought of as a substitute for a private consultant. We provide independent findings for enforcement and to resolve conflicts on which a Commission decision depends but we do not provide findings in lieu of normally expected submissions from a cable operator.

#### CONDUCTING THE INSPECTION

Since inspections are usually for "cause" the tests and measurements performed vary according to the particulars of the individual case. A subscriber complaint of poor picture quality that goes unresolved usually requires conducting the complete technical performance measurements specified in Section 76.605 of the Rules. Additionally, using a television receiver of known characteristics connected to the subscriber tap the picture quality of each received channel is subjectively evaluated and rated according to modified TASO 2/ procedures. Remember the Rules require that "the signal shall be carried without material degradation in quality (within the limitations imposed by the technical state of the art)." 3/ We feel this TASO evaluation provides the best determination of "material degradation."

Occasionally, a cable operator and a television station operator become deadlocked in fixing blame for degraded signals at cable subscriber taps. Here again a complete set of cable technical performance measurements as outlined in

1/ Subscriber complaints are filed with the local engineer-in-charge or the cable bureau in Washington. First action on the complaint is a request to the cable operator to investigate, take corrective action if necessary, and report back.

2/ Ratings range from 1 (Excellent) to 6 (Unusable). See Engineering Aspects of Television Engineering, Report of the Television Allocations Study Organization (TASO) to the Federal Communications Commission, March 16, 1959.

3/ 47 CFR 76.55.

Section 76.605 of the Rules are conducted and the television station's off-the-air signal receives a detailed waveform analysis to determine compliance with Part 73 of the Rules. Clarity and picture fineness are measured by having the television station transmit a standard resolution test slide and then simply counting lines of horizontal resolution at various points along the signal path, i.e., television transmitter output, cable headend, and cable subscriber taps. Acceptable high quality television pictures should contain over 325 to 350 lines of horizontal resolution. Subjective TASO picture evaluations are also made at various points. 4/

Signal carriage disputes often center around a television station's field strength 5/ over a community or at a cable headend location. FOB determines the contour over a community by the spot sampling technique outlined in the TASO report. Using this method a rectangular grid is positioned on a city map with the number of intersections adjusted to equal three times the square root of the city population in thousands. Cluster measurements are then conducted at each intersection and the median value determines the signal grade. At the headend, the signal grade is determined by making measurements at five random locations within 100 feet of the cable system receiving antenna. For safety and convenience all measurements are made at ten feet and corrected to thirty feet.

The illustrations listed above are typical of FOB cable inspections. Every effort is made to conduct all relevant measurements and this may require that the FOB engineer spend from one-half day up to one week working at the cable system. The inspector is equipped with all necessary test instruments and independently performs most measurements. The cable operator is expected to cooperate, as needed, in supplying test taps, access to the headend, required records and details of the plant layout. Most systems find it convenient to assign a technician to accompany the inspector full-time but this is at the cable system's option.

#### RECENT INSPECTION FINDINGS

Recent inspections show that nearly all cable systems checked by FOB are in violation of one or more of the Commission's technical regula-

4/ This procedure is outlined in the Initial Decision released August 21, 1973, in Docket No. 19479, Meadville Master Antenna, Inc.

5/ Sharply defined field strength boundaries determine a station's Grade A and B contours.

<u>Channel</u>	<u>Grade A (dBu)</u>	<u>Grade B (dBu)</u>
2 - 6	68	47
7 - 13	71	56
14 - 83	74	64

See 47 CFR 73.683.

tions. 6/ In Table 1, the "frequently" and "occasionally" violated rules are listed. This may serve as an indication of where greater preventive attention might be warranted.

Table 1

Frequently Violated Rules

76.601(c)	- Yearly performance tests
76.605(a)(2)	- Visual carrier frequency tolerance
76.605(a)(4)	- Signal level at subscriber tap
76.605(a)(5)(i)	- Ratio of adjacent channel signals
76.605(a)(6)	- Ratio of aural to visual signals
76.605(a)(7)	- Low frequency hum
76.605(a)(8)	- In channel frequency response
76.605(a)(12)	- Radiation

Occasionally Violated Rules

76.307	- System available for inspection
76.55(a)(1)	- Material degradation
76.605(a)(3)	- Aural carrier frequency tolerance
76.605(a)(5)(ii)	- Ratio of nonadjacent channel signals
76.605(a)(9)	- System noise
76.605(a)(11)	- Terminal isolation

As part of the survey mentioned earlier, dealing with leakage radiation and possible adverse affects on aeronautical transmissions, FOB has just concluded tests on 65 cable plants. Eighty percent of the systems had one or more leaks of at least 50 mV/m at 10 feet. Seventeen percent of the leaks were above 350 mV/m at 10 feet and one leak measured 5600 mV/m at 10 feet. These findings indicate leakage radiation exists in seemingly significant quantities. A second phase to the study is being implemented to determine the actual affect on aircraft communication and navigation devices.

FOLLOW-UP ACTIONS

Rule violations that are noted during an inspection are brought to the cable operator's attention during a wrap-up session immediately following the completion of all measurements and later by written correspondence. A reply to the written correspondence is requested within 10 days indicating what corrective action is being taken to remedy the discrepancy. The inspecting engineer reviews the reply, provides comments as appropriate and forwards the complete inspection package to Washington headquarters.

6/ Admittedly, the sample is biased because of the selection process and the statement should not be applied to systems in general.

In Washington, FOB personnel review the inspection package for accuracy and to determine what further action, if any, appears warranted. If a violation remains uncorrected, evidence indicates repeated or flagrant violations, unusual problems are evident or special interest was previously expressed, the package is coordinated with cable bureau for follow-up.

On February 21, 1978, a bill was signed by the President amending the Communications Act of 1934, to, among other things, broaden Commission administrative forfeiture procedures to include cable television systems. Procedures for implementing this new authority are being developed at this time. The amendment provides for a maximum cable forfeiture of \$2,000 per violation per day with a total penalty not to exceed \$20,000. Under the new law, a violation has occurred when any person has:

- "A) willfully or repeatedly failed to comply substantially with the terms and conditions of any license, permit, certificate, or other instrument or authorization issued by the Commission;
- "B) willfully or repeatedly failed to comply with any of the provisions of this Act or of any rule, regulation, or order issued by the Commission under this Act or under any treaty, convention, or other agreement to which the United States is a party and which is binding upon the United States;
- "C) violated any provision of Section 317(c) or 509(a) of this Act; or
- "D) violated any provision of Section 1304, 1343, or 1464 of title 18, United States Code...."

Further, in determining the amount of such a forfeiture penalty, the Commission or its designee shall take into account the nature, circumstances, extent and gravity of the prohibited acts committed and, with respect to the violator, the degree of culpability, any history of prior offenses, ability to pay, and such other matters as justice may require.

This new legislation should provide great flexibility in administering the cable enforcement program. However, I would like to stress that good cable service is the goal and penalties against a cable operator should be thought of as a final method of achieving that goal. I would think the average cable operator will never be faced with a Commission penalty for technical problems.

One notable exception to the general policy procedures for implementing administrative action, is the authority delegated recently to local engineers in charge to require a cable system that causes harmful interference to radio communications involving the safety of life and protection of property to cease operations as necessary to eliminate the interference. 7/ The authority is used with discretion and only with substantiated safety and property protection interference problems. Every effort is made to minimize any social, economic or technical effects on the system and system subscribers. For example, it may only be necessary to remove one specific carrier frequency. Similarly, the system operator is expected to react in an urgent and responsible manner when he becomes aware of any harmful interference.

#### CONCLUSIONS

The Field Operations Bureau's cable television inspection program has been operational for several years. Principal goals of the program are complaint resolution, detection of rule violations and engineering data collection. Since very limited resources are available, the program concentrates on problem areas.

We hope that responsible cable operators will welcome a system inspection by FOB engineers. It is an excellent opportunity for exchanging ideas and isolating and resolving technical problems.

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7/ 47 CFR 76.613

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Federal Communications Commission. Docket No. 19479, File No. SR-76177. Initial Decision of Administrative Law Judge, Herbert Sharfman, Issued August 16, 1973, Washington, D.C.: FCC, 1973.