SECTION VIII

Criteria for C.A.T.V. use of HF Band

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"THE EVALUATION OF INGRESS AND EGRESS

PROBLEMS IN THE C.A.T.V. SUB LOW FREQUENCY SPECTRUM"

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8.0 INTRODUCTION

The potential interference between HF signals which may be carried on C.A.T.V. systems and off-air HF signals is of concern to users of the HF band, C.A.T.V. systems, and licensing bodies.

The major criteria which must be considered when analyzing an HF C.A.T.V. system are described in the following discussion. No attempt is made to suggest guidelines which should be used when designing the system or approving a certain system design.

8.1 SYSTEM TOPOGRAPHY AND SPECIFICATIONS

There are two basic system topographies for HF return systems, namely segmented and unsegmented. The segmented network is superior for thermal noise, ingress, and HF electrical noise protection, as the central receiving point only receives from one small area of the system at a time. Such problems tend to be more severe on an unsegmented network. Block diagrams of a segmented and unsegmented system are shown in Fig. 8.1 and Fig. 8.2 respectively.

Intermodulation distortion tends to become more severe as the number of carriers increases (i.e. higher amplifier output power). Systems which can turn most carriers off at any one time gain an advantage in intermodulation distortion.

Carrier to noise ratio and carrier to intermodulation distortion ratio are the basic specifications of a return HF C.A.T.V. system. These specifications must be adequate for the specific application. It should be noted that, since A.G.C. is difficult to introduce in return C.A.T.V. systems, a relatively large tolerance for thermal swing must be introduced.

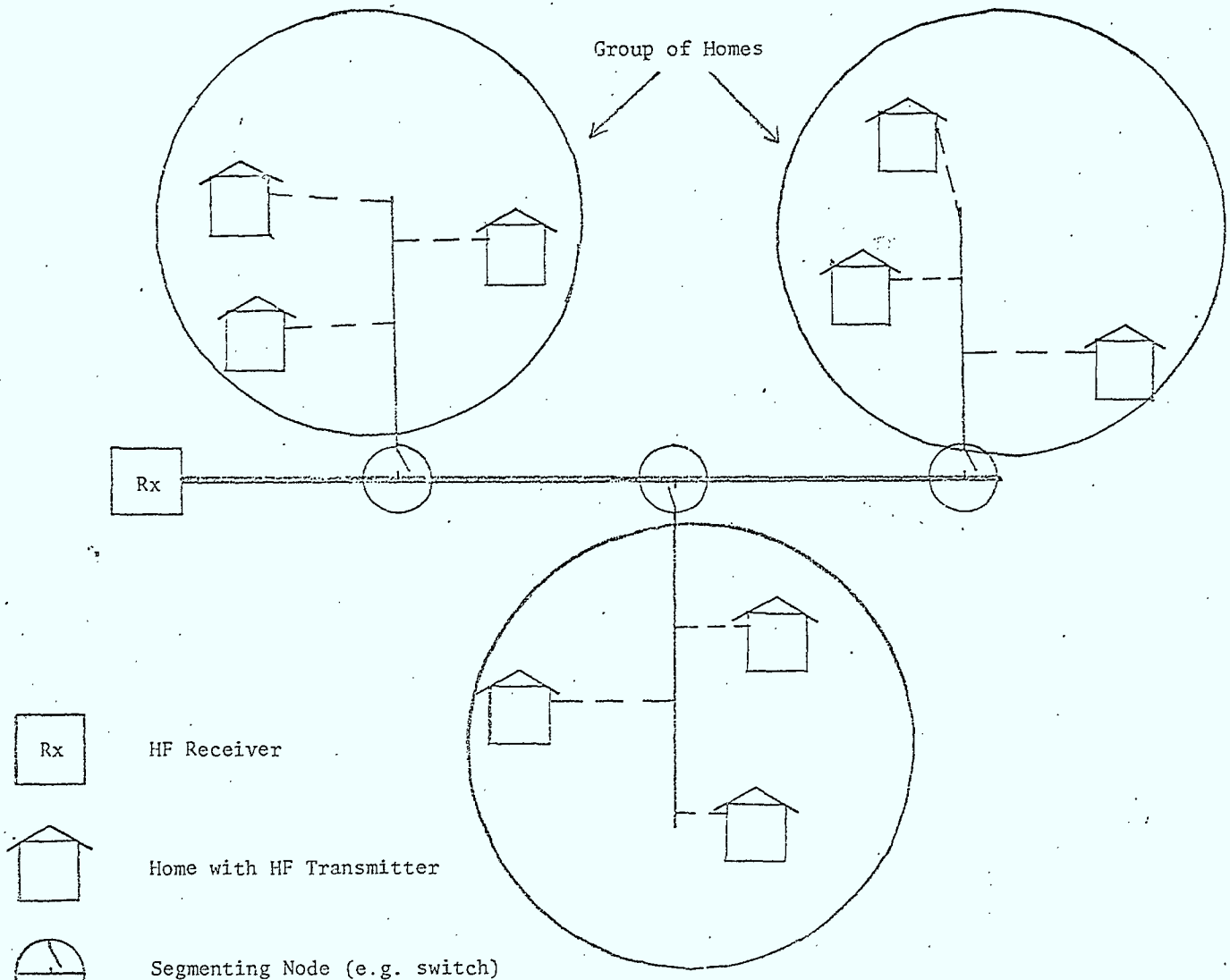


Fig. 8.1 Segmented System

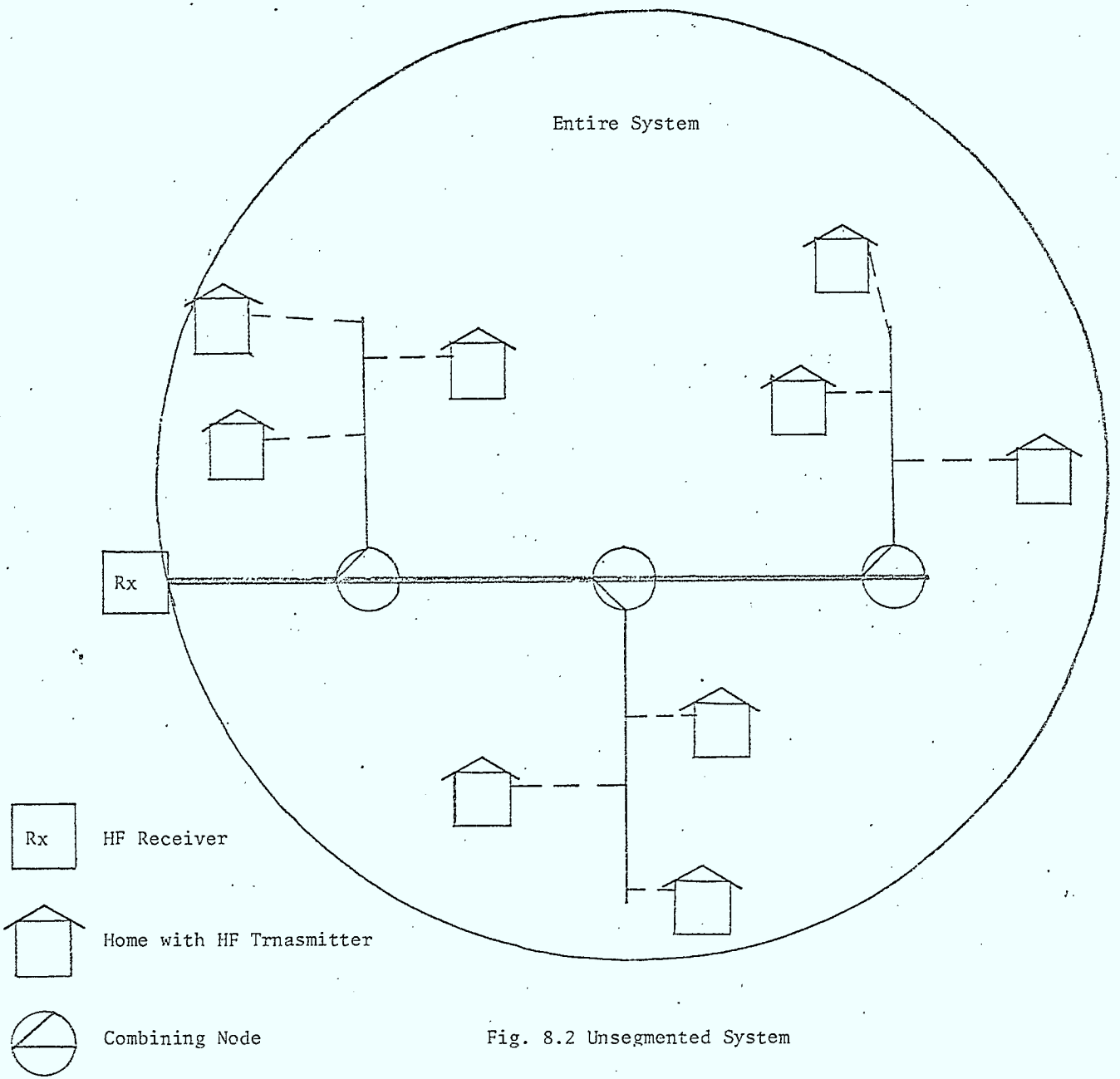


Fig. 8.2 Unsegmented System

8.2 TYPE OF SIGNAL

The return spectrum may be used for a variety of signal types (e.g. 6 MHz channel VSB modulated television signal, 20 KHz spaced digital channel (AM or FSK), etc.) The necessary specifications for most commonly used signal formats can be easily found from existing work. The specifications necessary for the type of signal will dictate the overall network specification.

The types of signal formats commonly used in HF C.A.T.V. systems are shown in Fig. 8.3.

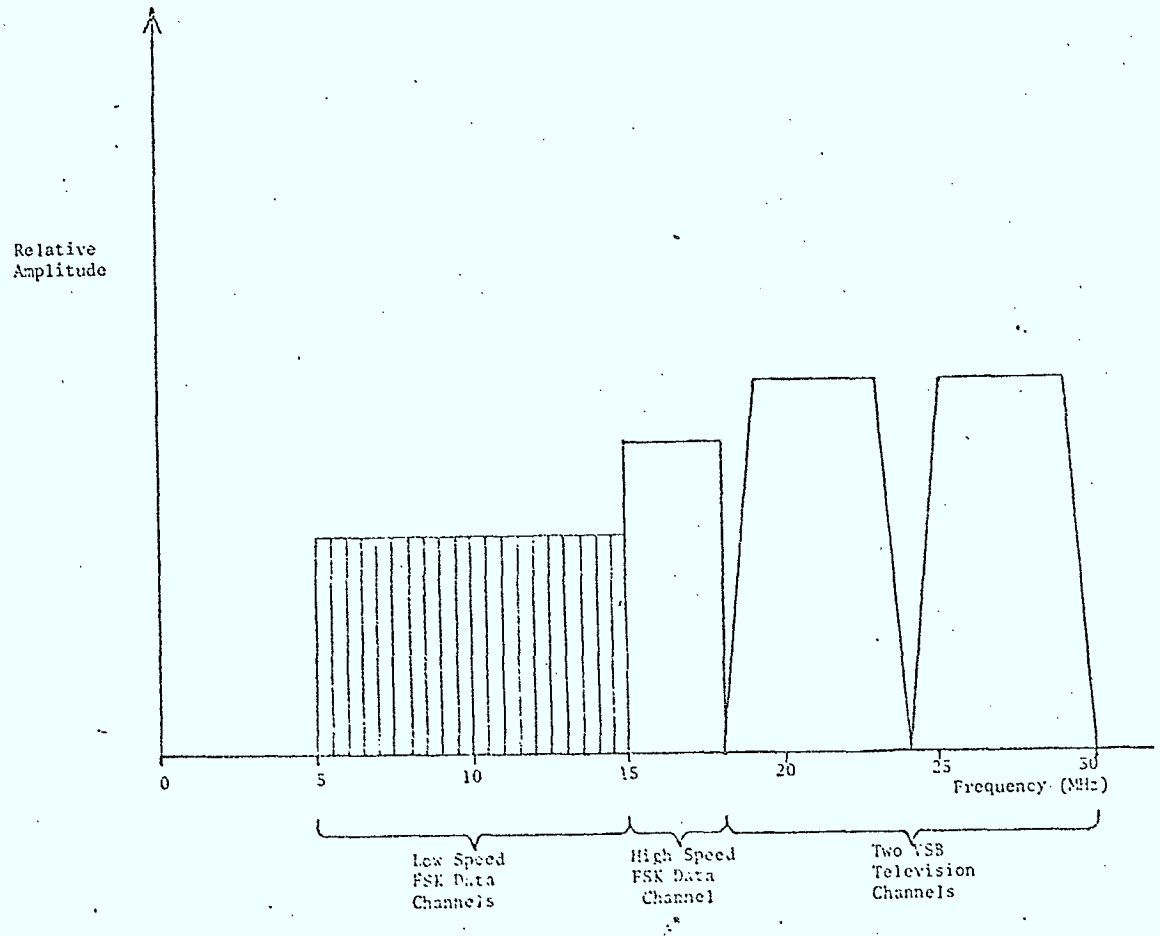


Fig. 8.3 Typical Signals Carried on HF C.A.T.V. Systems

8.3 FREQUENCY ASSIGNMENT

Ingress interference will be more severe as field strengths in the band of interest are increased. Similarly if C.A.T.V. signal levels are high and external field strengths are low, egress from the C.A.T.V. system will tend to interfere with the external signal. Interference can be reduced by increasing C.A.T.V. system shielding at critical points (points of maximum and minimum signal level). Shielding can only be improved to a certain level without great expense. If this level is inadequate, frequency coordination may be necessary.

Services using the HF band and their frequencies and Effective Radiated Powers are shown in Table 8.1.

TABLE 8.1

Uses of HF Band*

Service	Frequency Range (MHz)	Effective Radiated Power (dBW)
HF Amateur	1.8 - 30	30
HF Communications	1.6 - 30	40
General Radio	27 - 27.5	11

* Electromagnetic Compatibility Advisory Bulletin
Immunity of Electrical/Electronic Equipment Intended to Operate in the Canadian Radio Environment (0.014 - 10,000 MHz)
Release Date: Sept. 1, 1977

8.4 C.A.T.V. SIGNAL LEVELS

The C.A.T.V. system will be most effected by ingress where a) signal levels are at a minimum or b) shielding is at a minimum. Egress problems will tend to occur where a) signal levels are at a maximum or b) shielding is at a minimum.

Signal levels are at a minimum

a) at distribution amplifier inputs and

b) at trunk amplifier inputs

Signal levels are at a maximum

a) at distribution amplifier outputs

b) at trunk amplifier outputs

c) at HF transmitter outputs

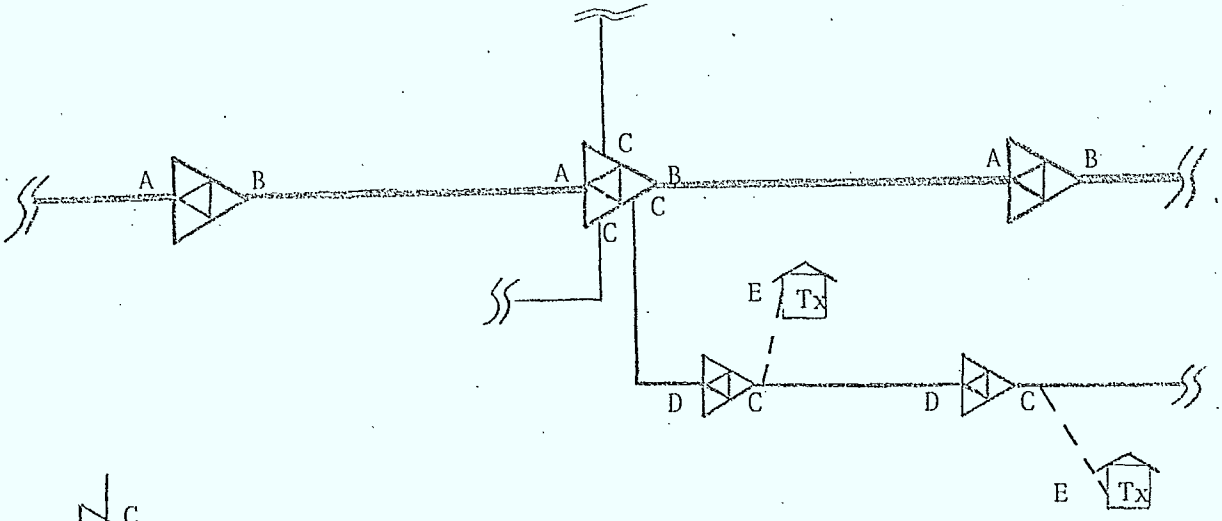
Shielding is at a minimum

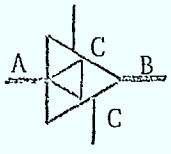
Points where signed levels are at a maximum and minimum are shown in Fig. 8.4

a) on drop wire and connectors*

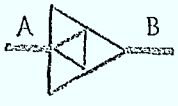
b) on distribution and trunk connectors

*Note that ingress on drop wires causes less system problems on return signals than may be anticipated due to loss through multitap spiggot (average 20dB).

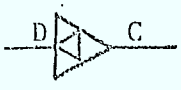




Trunk/Distribution Amplifier



Trunk Amplifier



Distribution Amplifier

A - Trunk Amplifier
VHF Input
HF Output

B - Trunk Amplifier
VHF Output
HF Input

C - Distribution Amplifier
VHF Output
HF Input

D - Distribution Amplifier
VHF Input
HF Output

E - HF Transmitter Output

HF Transmitter

Fig. 8.4 Typical C.A.T.V. System Showing Points of Maximum and Minimum Signal Levels

8.5 EQUIPMENT TYPES

Active equipment which does not create excessive noise in the HF band must be used. Also the system must be constructed of material with adequate shielding. Drop wire, F connectors, and distribution and trunk connectors and splices seem to cause most ingress and egress problems. Amplifier and passive equipment housings must also have adequate shielding. Depending on the environment, the corrosion resistance of this equipment must also be considered or "routine" maintenance of the plant will involve replacement of hardware. This corrosion resistance might be achieved by protecting connectors and splices (e.g. boot and silicon on F connectors, heat shrink or tape on splices). Varying degrees of corrosion resistance will be required in different environments.

8.6 MAINTENANCE AND INSTALLATION PRACTICES

Proper installation and maintenance practices are at least as critical as component selection in the construction of a well shielded C.A.T.V. system. Proper installation practices vary with different pieces of hardware.

Critical items for installation include connectors and splices and grounding of drop wire.

Maintenance practices which are used to test ingress and egress signals should be adequately sensitive to receive signals which may cause problems in the system. Radiation monitoring and/or ingress monitoring can be used. (See Section 7).

8.7 SERVICES IN C.A.T.V. SYSTEM AND OFF-AIR

The acceptable level of ingress or egress may depend on the reliability necessary for the service to be offered. Vital services require high reliability and must be less susceptible to interference due to ingress or egress than entertainment or other more usual services. Acceptable shielding levels for a C.A.T.V. system may vary for identical signal formats if the content of the signal is different.

Some services using the C.A.T.V. HF spectrum which have been proposed are listed in Table 8.2. A possible assignment of necessary protection from interference is shown.

TABLE 8.2

HF C.A.T.V. Services

Service	Required Protection from Interference		
	HIGH	MEDIUM	LOW
Medical Alert Monitoring	✓		
Smoke Detector Monitoring		✓	
Intrusion Alarm Monitoring		✓	
Community Television Programming			✓
Business Data	✓		
C.A.T.V. Network Control Signals	(As high as maximum service carried on network)		
C.A.T.V. Status Monitoring		✓	

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O'ROBKO, GERRY
--The evaluation of ingress and egress problems in C.A.T.V. sub low frequency spectrum: criteria for C.A.T.V. ...

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