

Cable TV Scrambling Techniques
CABLE TV SCRAMBLING TECHNIQUES by The Mad Phone-man

There are 4 major methods of pay-channel security and each has different consequences for cable ready receivers. The 4 systems are jamming, trapping out-of-band scrambling and in-band scrambling.

Jamming:

A jamming signal is placed between the picture carrier and the aural carrier of the secured channels. The cable operator supplies a filter for each customer for each paid channel. This type of security is easily defeated by homemade notch filters.

Trapping:

In these systems frequency filters are installed in line with the cable drops on telephone poles. The traps are removed for customers paying for the premium channels. Cable-ready TV's work fine in these systems.

Scrambling - The gated Sync Methods:

Scrambling in the cable TV business still generally means pulsed sync suppression. In its simplest form, amplitude of the picture carrier is reduced by 6 db during the horizontal blanking intervals and sometimes during the vertical blanking intervals. The resulting video signal has sync tips between the black and white levels. Sync separators in the set cannot operate properly with this signal, nor can AGC and color circuits, so the picture is scrambled. The decoder compensates by attenuating the signal during the time in which the transmitted signal was not attenuated. In order to accomplish this, the logic controlled gain switch must get timing information. In-band systems transmit pulses as amplitude modulation of aural carrier or a separate carrier in out of band systems.

Out of band scrambling:

The usual setup is that the decoder is connected directly to the cable ahead of the channel converter. Decoding is done at the pay channel frequency. The decoder is likely to be in a separate box, added to an old system to provide pay channels. The box consists of a simple receiver (90-120mhz) for the out-of-band data carrier and a broad band 6db gain switch. There is provision for several scrambled channels, each which has a different data carrier. This system is directly compatible with cable ready receivers. Without the cable converter, the decoder is connected to the TV. Tuning and remote features of the TV are preserved with the only inconvenience being the need to operate the switch on the decoder when changing to and from any scrambled channel. Out-of-band systems tend to last until the operators using them rebuild to provide for a large increase in the number of channels.

In Band Scrambling:

In this system any number of the available channels can be scrambled. Because the data carrier for each scrambled channel is its own aural carrier, only one data receiver, at the aural carrier frequency (eg. ch 3) is required. The decoder detects the presence or absence of data automatically switching itself in or out. The converter-decoder box can be hardwired to decode just the channels ordered, using a prom like device. Alternatively, the transmitted channels can be "tagged" by time division multiplexing binary tag (program identification) data with the sync data on the aural carrier. The decoder boxes can be wired for "tiers" (groups of programs the cable operator sells together) rather than fixed channels, giving the operator more flexibility. The decoder boxes can be "addressable". These boxes have a separate out of band data channel for data from the head end. Each box has a serial number burned into its logic or otherwise available to its logic circuitry, and its channel or tier authorization stored in volatile ram. A computer at the headend periodically addresses all decoders in the system individually and loads each with the channel or tier capacity ordered by the customer. The need for house calls is reduced, PPV (Pay per view) is possible, and missing boxes can be turned off, rendering them useless for premium channel viewing. Some but not

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all of these features can be programmed into out-of-band systems.

Aside from their ability to generate sync pulses, thus foiling the scrambling system, cable ready TV's have presented another difficult problem for in-band systems. Because the decoder operates at the converted channel, a channel converter is required ahead of it. Whether the TV receiver is cable-ready or not, it operates only at the converted channel, wasting the tuning and remote control features.