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# NASA TECH BRIEF

## Manned Spacecraft Center



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### Electronic Device Increases Threshold Sensitivity and Removes Noise from FM Communications Receiver

#### The problem:

One factor substantially affecting the performance of a frequency-modulation communication system signal is the operation of the demodulator in the receiver. As the received signal becomes weaker, a

filter is held at the last previous non-click value during the occurrence of the click impulse.

#### How it's done:

The FM demodulator output, consisting of the signal and the noise, is split into two separate

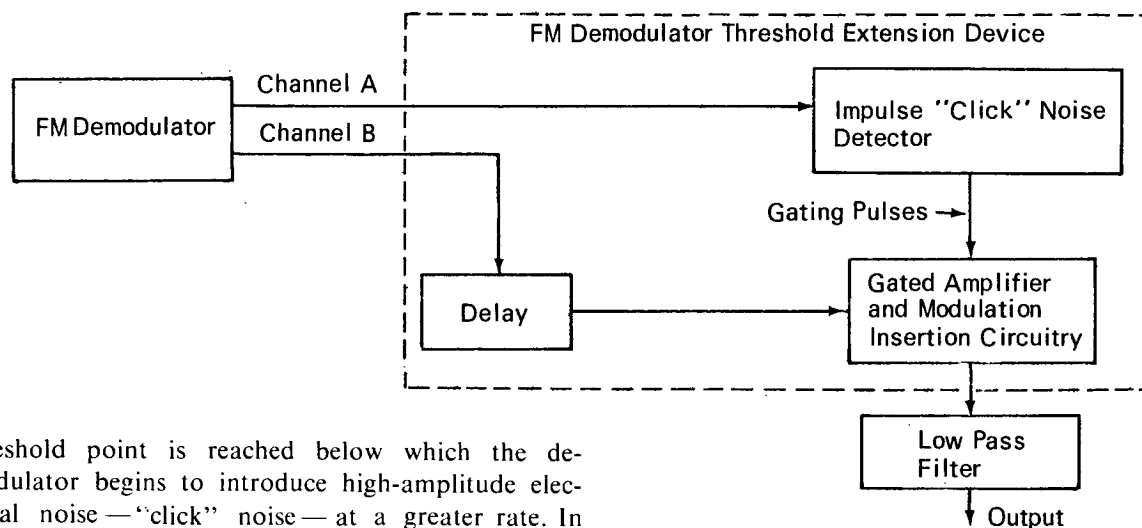


Figure 1.

threshold point is reached below which the demodulator begins to introduce high-amplitude electrical noise—"click" noise—at a greater rate. In addition, the form of the "click" noise is of a much noticeable and objectionable nature.

#### The solution:

A threshold extension device connected between the output of the demodulator and the output filter minimizes "click" noise. The device consists of a click-eliminating signal transfer channel with a follow-and-hold circuit and a detector for sensing the click impulses. A gated output from an amplifier switches the follow-and-hold circuit to the hold condition, whereby the signal to the output

channels (see Figure 1). The first channel (A) is fed to a series of impulse noise detection circuits which detect the presence of high-amplitude impulse noise—the primary contributor to the degraded performance of the FM system. Channel B (identical to channel A except for a preset time delay) is applied to the gated amplifier. The positive gating pulses from the noise detection circuits turn off channel B whenever a noise impulse occurs. This electronic action creates a "hole" in the channel

(continued overleaf)

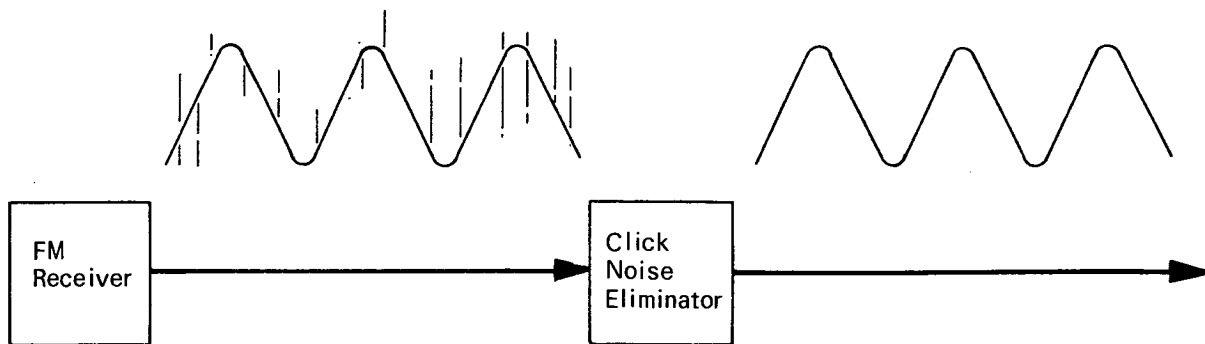


Figure 2.

B output which is smoothed over by additional circuitry. The output of the gating amplifier is fed to a low-pass filter for additional smoothing of the output modulation during the turn-off time. The apparent effectiveness of the threshold extension device is shown by the waveforms in Figure 2. The final output consists of signal plus low-level noise without the high amplitude impulses normally present.

**Note:**

Requests for further information may be directed to:

Technology Utilization Officer  
 Manned Spacecraft Center, Code JM7  
 Houston, Texas 77058  
 Reference: TSP71-10091

**Patent status:**

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Patent Counsel  
 Mail Code AM  
 Manned Spacecraft Center  
 Houston, Texas 77058

Source: Frank J. Loch of  
 Manned Spacecraft Center, and  
 William M. Conrad of  
 Philco-Ford Corp.  
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