Quarterly Progress and Status Report

FM-modulation unit for tape-recording

Garpendahl, G.

journal: STL-QPSR
volume: 1
number: 2
year: 1960
pages: 019-019

http://www.speech.kth.se/qpsr
IV. THESIS PROJECTS COMPLETED DURING THE PERIOD

A. FM-MODULATION UNIT FOR TAPE-RECORDING

A modulator-demodulator system for tape-recording of signals down by zero or near zero frequency without phase distortion has been designed. The system is intended to be used together with standard laboratory tape-recorders.

The modulator unit comprises a carrier signal which is modulated max. 40%. The frequency of this carrier is selected according to the particular tape speed, 60, 30, 15, 7 1/2, 3 3/4, and 1 7/8 i.p.s. of the tape-recorder. At present only 15 i.p.s. and lower speeds are used. The carrier oscillator is a screen-connected phantastron multivibrator.

The demodulator consists mainly of a pulse-counting discriminator. After limiting and pulse-shaping, the signal is passed to a monostable flip-flop, the output of which is integrated in a low-pass filter. The filter, which also sets the bandwidth of the system, is an 18-dB/octave active RC-filter with minimum overshoot characteristics. The cutoff frequency must be selected according to the tape speed at replay (not necessarily the same as at recording). Tape speeds and corresponding cutoff frequencies of the built-in filter are given in the table below. The bandwidth may be extended about an octave with external, steeper filters.

Overall distortion is always less than 1%. The D.C. level drift is almost entirely due to the wow of the tape-recorder.

<table>
<thead>
<tr>
<th>Tape speed, i.p.s.</th>
<th>60</th>
<th>30</th>
<th>15</th>
<th>7 1/2</th>
<th>3 3/4</th>
<th>1 7/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier frequency, kc/s</td>
<td>54</td>
<td>27</td>
<td>13.5</td>
<td>6.75</td>
<td>3.38</td>
<td>1.69</td>
</tr>
<tr>
<td>Cutoff frequency at -3 dB, c/s</td>
<td>5000</td>
<td>2500</td>
<td>1250</td>
<td>625</td>
<td>312</td>
<td>156</td>
</tr>
<tr>
<td>Signal-to-noise ratio, dB</td>
<td>47</td>
<td>43</td>
<td>39</td>
<td>41</td>
<td>41</td>
<td>37</td>
</tr>
</tbody>
</table>

G. Garpendahl