

# Oscillograms

## A Collection of Examples

### Introduction

The intention of this document is to show some typical applications of Digital Oscilloscope. It is no way a complete discussion on this subject. Send any comments, ideas, and suggestions to the author:

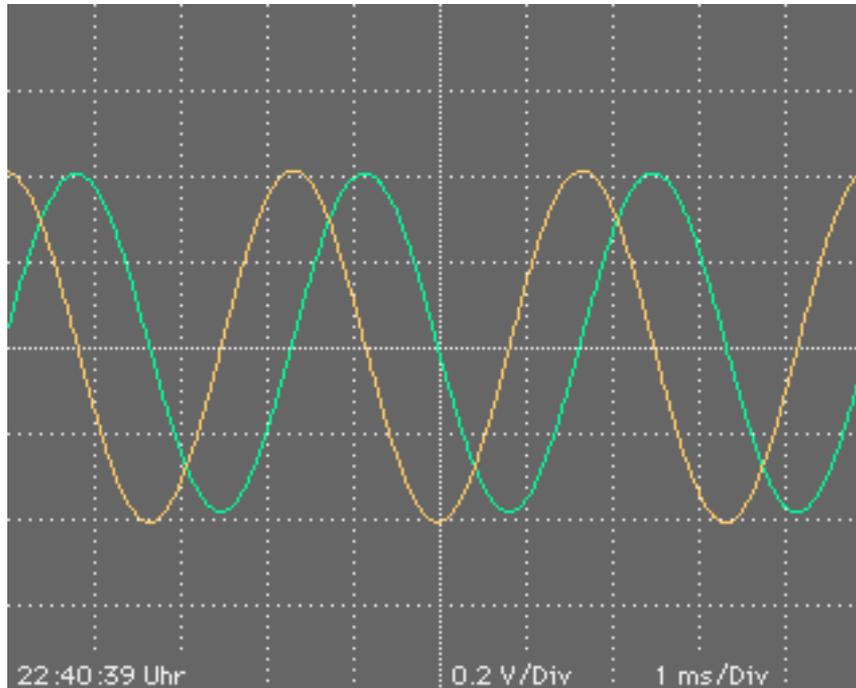
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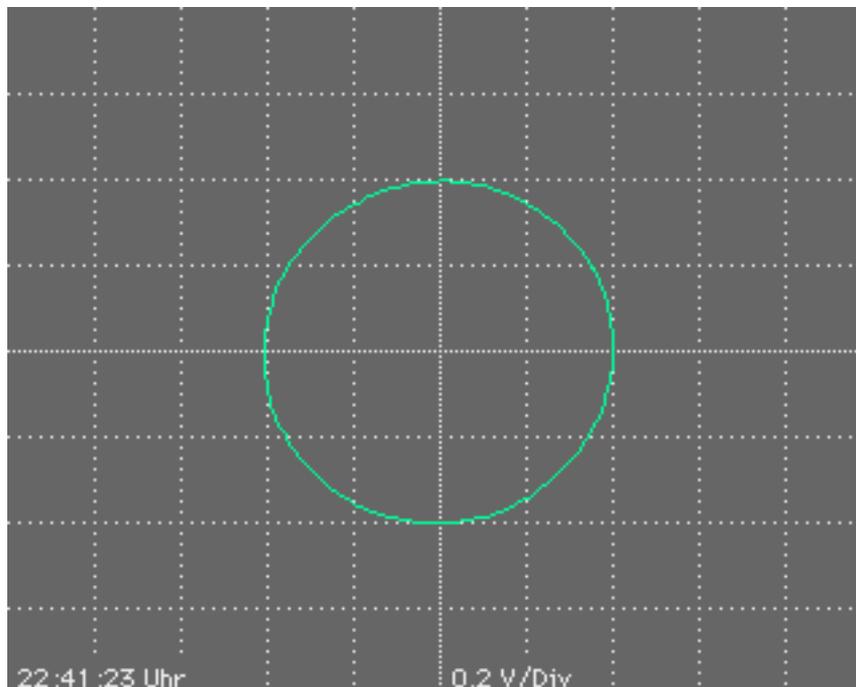
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## Examples

Figures 1 to 4 present the signals from a sine wave generator. Phase shift is achieved a resistor-capacitor network. Figures 1 and 3 show the amplitude over time, figures 2 and 4 show the plot of the two channels' amplitude (Lissajous figures).

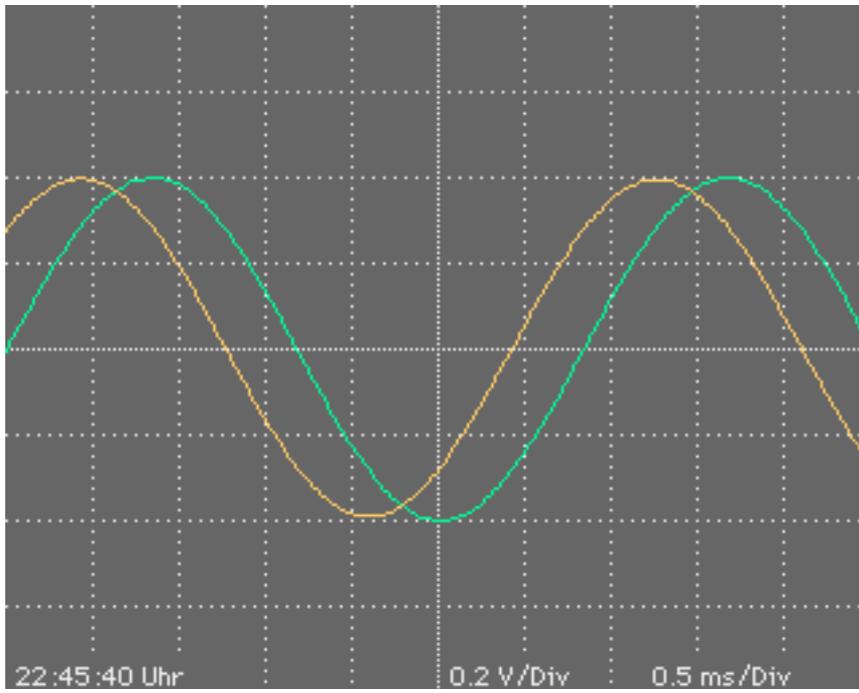


**Figure 1** Sine waves with phase shift of 90 degrees

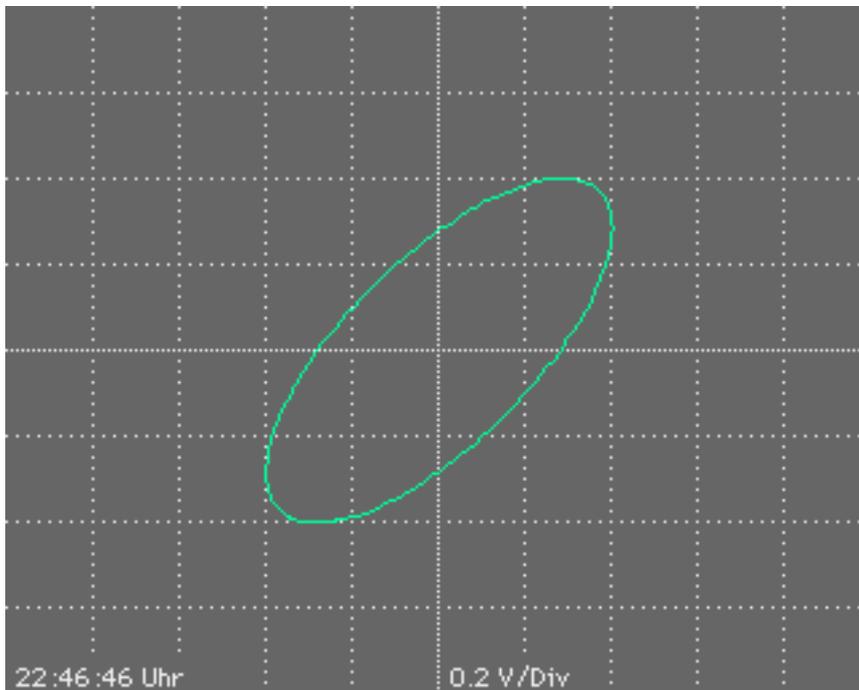


**Figure 2** X-Y plot from the sine waves in figure 1

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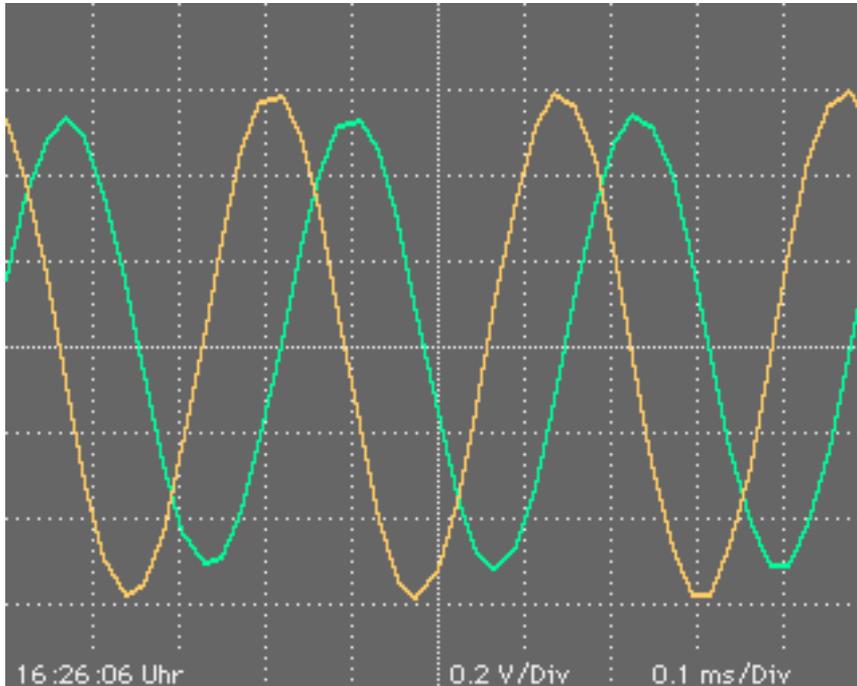


**Figure 3** Sine waves with phase shift of 45 degrees

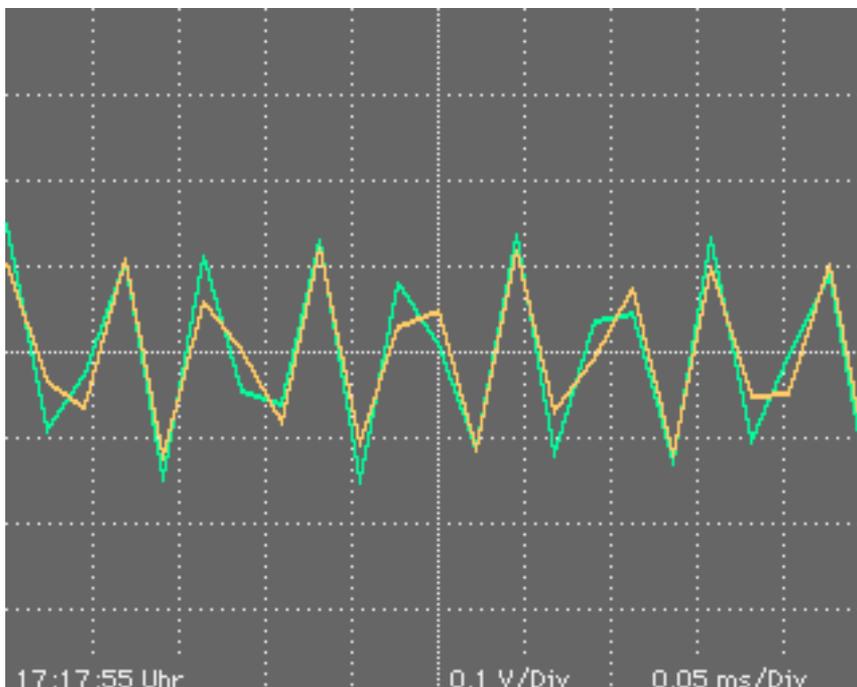


**Figure 4** X-Y plot from the sine waves in figure 1

Figure 5 and 6 show the signals from a stereo tape recorder. The improperly adjusted playback head causes a phase shift between left and right channel (figure 6). Figure 7 shows that the 18 kHz signal cannot be resolved sufficiently due to the given sampling rate of 44.1 kHz.



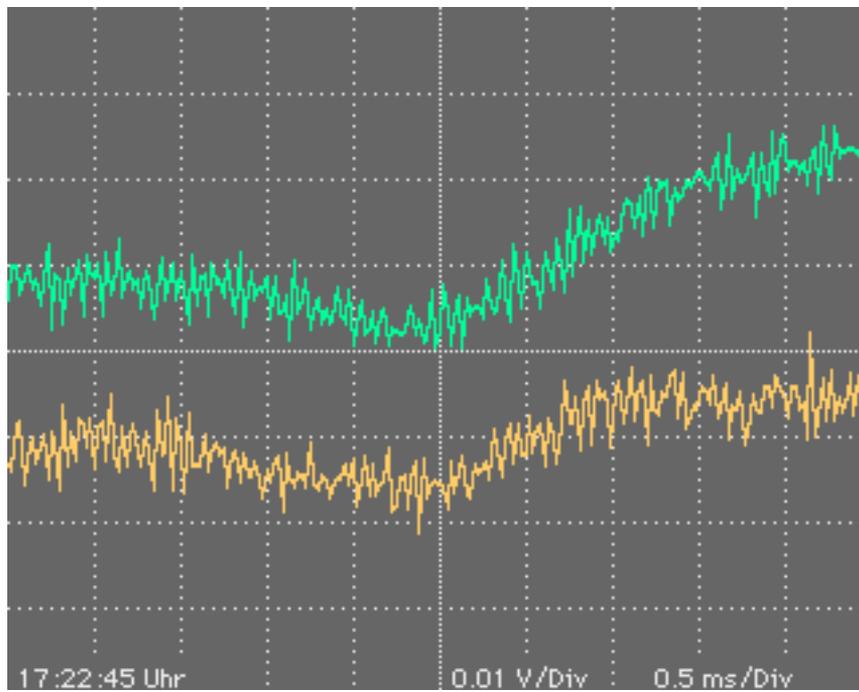
**Figure 5** Phase shift caused by an improperly adjusted playback head



**Figure 6** Tape recorder playing an 18 kHz sine wave

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Increasing the amplification tape noise can be made visible (figure 8).



**Figure 7** Tape noise

The output from the frequency meter can be used to control tape speed. The reference signal is 3,150 Hz.

| Index | Time | Frequency | Level |
|-------|------|-----------|-------|
| 1     | 0.5  | 2879.098  | 77    |
| 2     | 2.0  | 3142.927  | 77    |
| 3     | 3.4  | 3143.570  | 78    |
| 4     | 4.8  | 3143.570  | 78    |
| 5     | 6.3  | 3142.999  | 77    |
| 6     | 7.7  | 3143.284  | 76    |
| 7     | 9.2  | 3142.785  | 76    |
| 8     | 10.6 | 3141.570  | 76    |
| 9     | 12.1 | 3142.070  | 76    |
| 10    | 13.5 | 3142.570  | 78    |
| 11    | 14.9 | 3142.641  | 77    |
| 12    | 16.4 | 3143.428  | 78    |
| 13    | 17.8 | 3144.427  | 77    |
| 14    | 19.3 | 3144.499  | 77    |
| 15    | 20.7 | 3144.713  | 77    |
| 16    | 22.1 | 3144.928  | 77    |
| 17    | 23.6 | 3143.999  | 77    |
| 18    | 25.0 | 3143.213  | 77    |
| 19    | 26.5 | 3142.427  | 77    |
| 20    | 27.9 | 3142.356  | 77    |
| 21    | 29.4 | 3141.927  | 78    |
| 22    | 30.8 | 3142.641  | 77    |
| 23    | 32.2 | 3143.856  | 77    |
| 24    | 33.7 | 3144.999  | 77    |
| 25    | 35.2 | 3145.071  | 77    |
| 26    | 36.6 | 3144.642  | 78    |
| 27    | 38.0 | 3144.571  | 78    |
| 28    | 39.5 | 3143.999  | 78    |
| 29    | 40.9 | 3142.927  | 78    |
| 30    | 42.4 | 3143.141  | 78    |
| 31    | 43.8 | 3143.213  | 79    |
| 32    | 45.3 | 3143.428  | 79    |
| 33    | 46.7 | 3144.143  | 78    |
| 34    | 48.2 | 3144.643  | 79    |
| 35    | 49.6 | 0.000     | 0     |
| 36    | 51.0 | 0.000     | 0     |

**Table 1** Tape speed control