# Implementing
# DIN Sync / SYNC24 / Roland Sync

Technical Report

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# 1 Introduction

When I came across the task to implement a DIN Sync Master for the midiclock$^+$ I couldn't find any reliable source of information about the nescesary timings and pulse diagrams.

The paper at hand summarizes my findings with a Roland TB-303, TR-606, TR-707 and TR-909 in the lab and should enable the reader to sync any DIN Sync device up to 300 BPM by following the instructions.

Many Thanks to Alexander Kowalski for lending out his equipment and to the DIY-SYNTH list for suggestions.

# 2 Playback Control

Originally, playback control on a DIN Sync slave was pretty basic: you could only (Reset-)Start and Stop the machines.

The service manual of the TR-808 [1] suggests to always toggle the `clock` signal with a duty cycle of 50% and (Reset-)Start/Stop playback with the `start` line. The drawback of this scheme is that it doesn't enable the musician to *pause* and *continue* playback without a restart of the pattern.

The approach presented here is to interrupt the generation of clock pulses to *pause* the sequencer and leave the `start` line unchanged in it's high state.

A signal implementation chart of all playback control functions can be seen in table 1.

| | **Action** | `start` | **delay** | `clock` |
|---|---|---|---|---|
| | initial state | low | - | low |
| 1 | PLAY | low->high | >9ms | toggle |
| 2 | STOP/PAUSE | high | - | low |
| 3 | CONTINUE | high | - | toggle |
| 4 | STOP/PAUSE | high | - | low |
| 5 | PLAY | high->low | >9ms | low |
| | | low->high | >9ms | toggle |

Table 1: Signal pattern for *Start*, *Pause*, *Continue* and *Stop*

Although there are vague citations around the web from the TR-808 service manual about DIN Sync timing, start problems with a TR-909 were experienced while testing the implementation. The pattern lagged behind from time to time by one clock cycle.

# 3 Start Lag Circumvention

It became apparent that the start lag on the TR-909 was caused by the interrupted clock cycles before changing the `start` line from low to high to start the machine.

The solution to circumvent the start lag is pretty simple: just send a couple of clock ticks right before starting the machine while `start` is still low. One clock tick seems to be enough to warn the CPU of the TR-909 that something will happen soon with playback transport.

Figure 1 shows the waveform of the `start` and `clock` lines for a *Play* event after powerup (Tab. 1, #1). Figure 2 depicts the lines for a *Play* after a *Stop/Pause* (Tab. 1, #5).

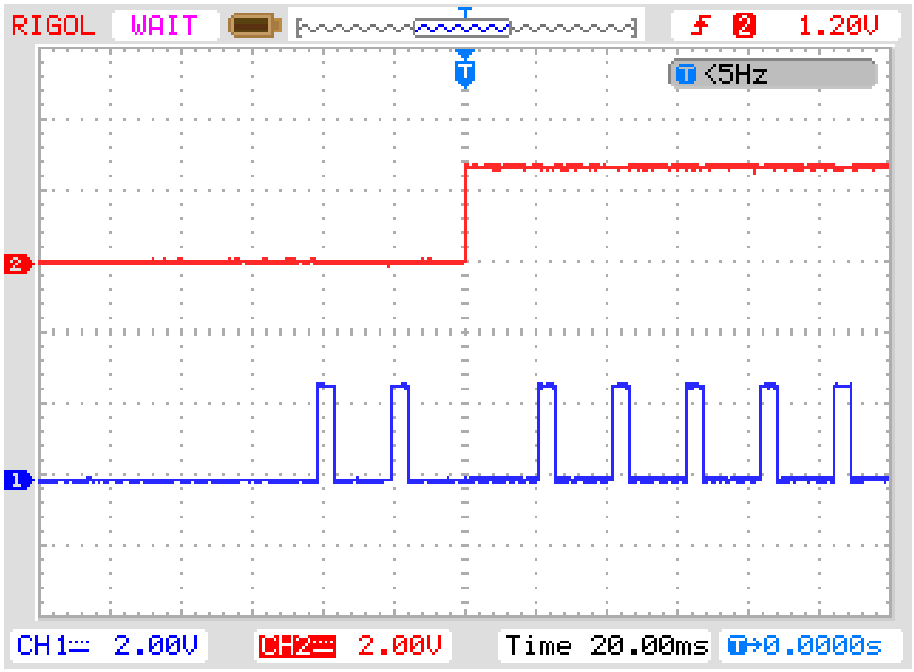


Figure 1: Signal scheme for a Powerup Start. Red: Start signal. Blue: Clock signal

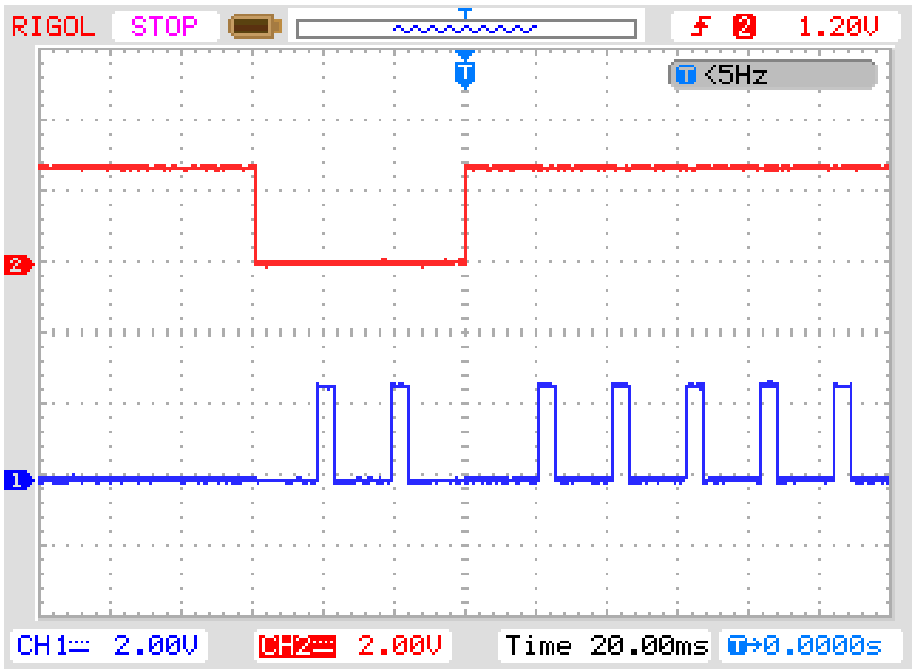


Figure 2: Signal scheme for a Stop-Start. Red: Start signal. Blue: Clock signal

# 4 Conclusion

It is possible to implent *Pause/Continue* functionality in a master clock for old DIN Sync machines by stopping the `clock` pulses while keeping the `start` line high.

To nevertheless ensure a good startup for all machines even when no clock ticks were sent before, at least one clock cycle must be send right before pulling the `start` line high to prepare the CPU of the slave.

Moreover, a duty cycle of 50% doesn't seem to be nescessary, all tested machines were able to sync properly to clock ticks with a positive width of $5\,ms$ to up to $300\,BPM$.

# Appendix

## Devices used during the Test

| **Machine** | **Remark** |
|---|---|
| Roland TB-303 | |
| Roland TR-606 | |
| Roland TR-707 | |
| Roland TR-909 | Rom Version 4 |

Table 2: Devices used to verify DIN Sync scheme

# References

[1] Roland. *TR-808 Service Notes*. `http://fa.utfs.org/diy/rolandtr808/roland_TR-808_service-manual.pdf`; 1981.