



Wake no shake (WNS)

DRAFT

Introduction

Wake No Shake (WNS) is used to start incremental encoder systems with minimal shake movement. The algorithm complements two existing options (INITMODE=0,1) by improving initialization time, travel distance during init and dynamic behavior for low damping systems. Typically the WNS doesn't require tuning however if necessary there are a few parameters which can be used to tune the mechanism.

- The algorithm will need to run at the first Enable after power-up.
- Tuning may be necessary once at the configuration stage of the system.

Typical applications

low cost rotary systems with no comutation hall signals or linear systems with no absolute position sensing.

UCB1 Existing options

Hard start (INITMODE=1) – aggressive shaking of the system.
Soft start (INITMODE=0) – long duration and long travel required.

New method (INITMODE=2)

Minimal motion, short duration, high reliability.

Tunable properties

IENCSTART – level of current to be used also used in INITMODE=0,1
INITGAIN – compensate for extereme mechanical dynamics.
INITTIME – allow for a longer initialization time for slow systems.

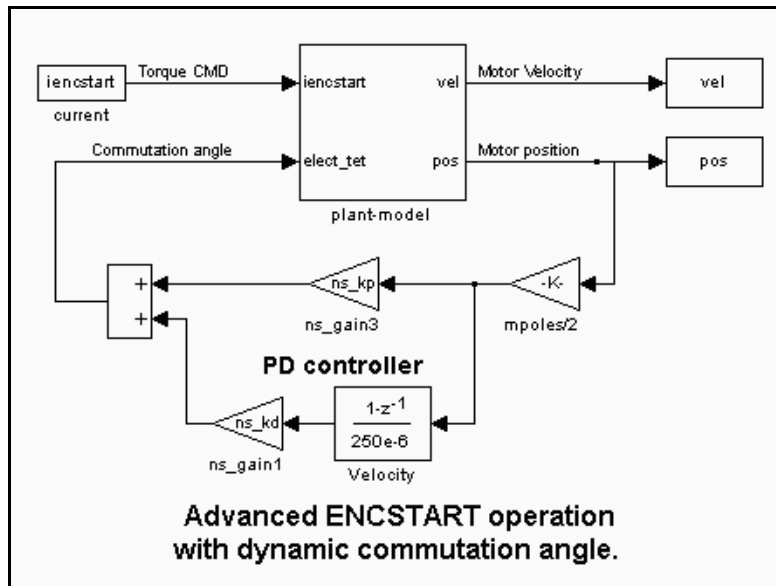
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Process completion conditions

- Minimal movement.
- Settling.
- Dead spot detection.
- Failure report (STATUS2)

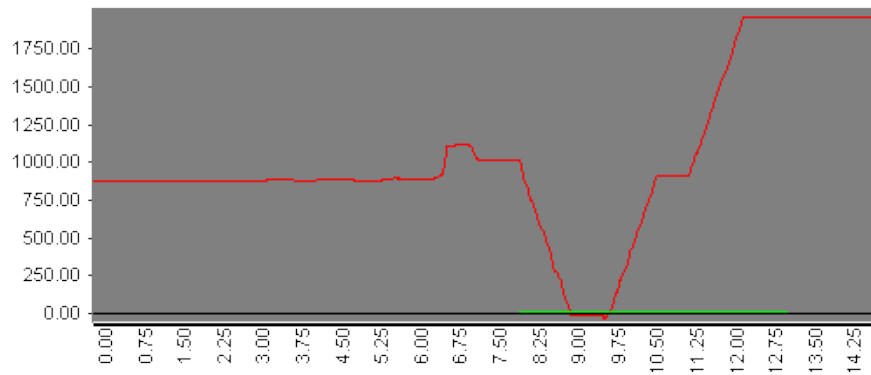
Principle of operation

A dynamic PD controller controls the **commutation angle** and changes it to "meet" and stabilize the motor as close as possible to the motor's starting position. (based on the fact that electrical position may be moved faster than menchanical position.

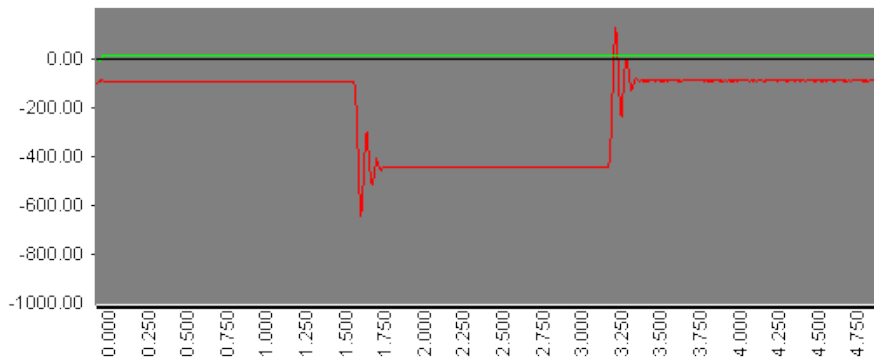


Test recordings on demo system.

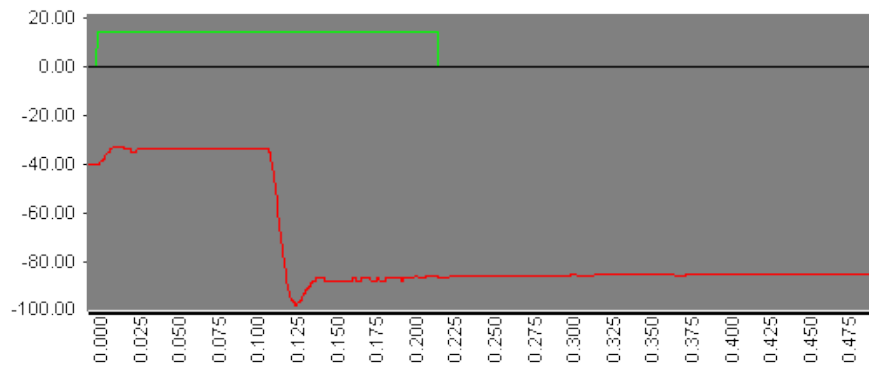
INITMODE=0 position [counts] vs. Time [sec]



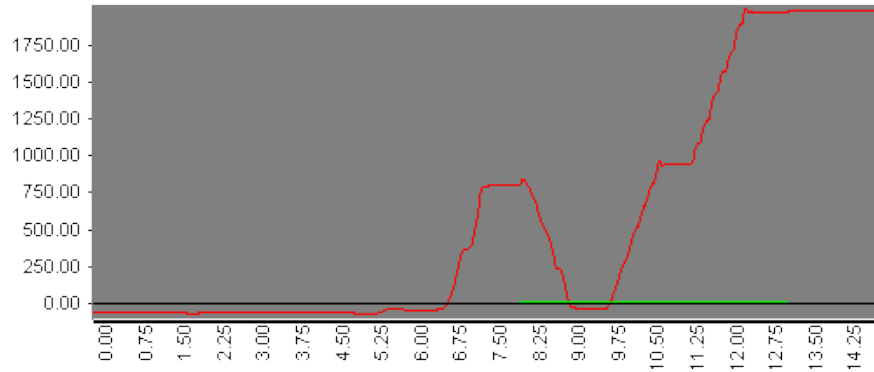
INITMODE=1 position [counts] vs. Time [sec]



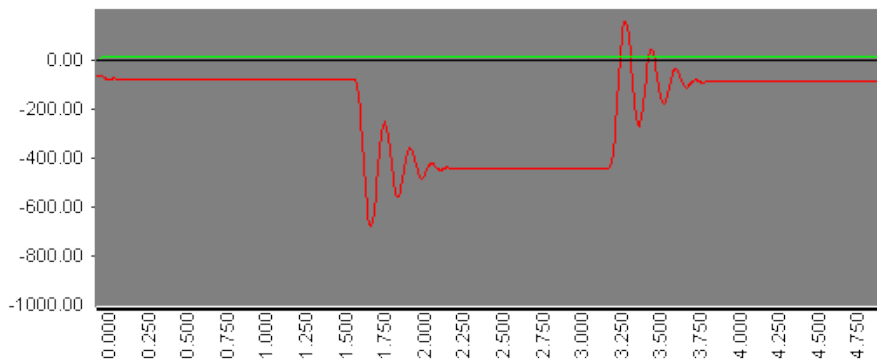
INITMODE=2 position [counts] vs. Time [sec]



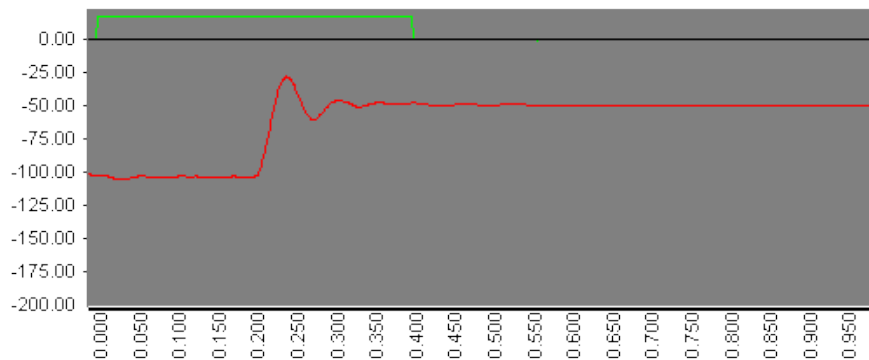
INITMODE=0 w/ load position [counts] vs. Time [sec]



INITMODE=1 w/ load position [counts] vs. Time [sec]



INITMODE=2 w/ load position [counts] vs. Time [sec]



Property	Units	INITMODE=0	INITMODE=1	INITMODE=2
Duration	[sec]	15	5	0.5
Travel	[elect. deg]	720	120	20
Vibration		Minimal	High	Low
Load sensitivity		Minimal	High	Low

Setting parameters for INITMODE=2

The **factory defaults** are:

INITTIME=108

IENCSTART=25

INITGAIN=1000

All round recommended settings:

INITTIME=150

IENCSTART=80

INITGAIN=1000

For very **light and fast** systems:

Reduce IENCSTART

Increase INITGAIN

Reduce INITTIME to 100 to shorten duration

For very **slow systems** :

Increase INITTIME

Increase IENCSTART

Reduce INITGAIN

Typical tuning range

INITGAIN	500 – 1500
IENCSTART	25 – 170
INITTIME	100 – 300

Failure detection

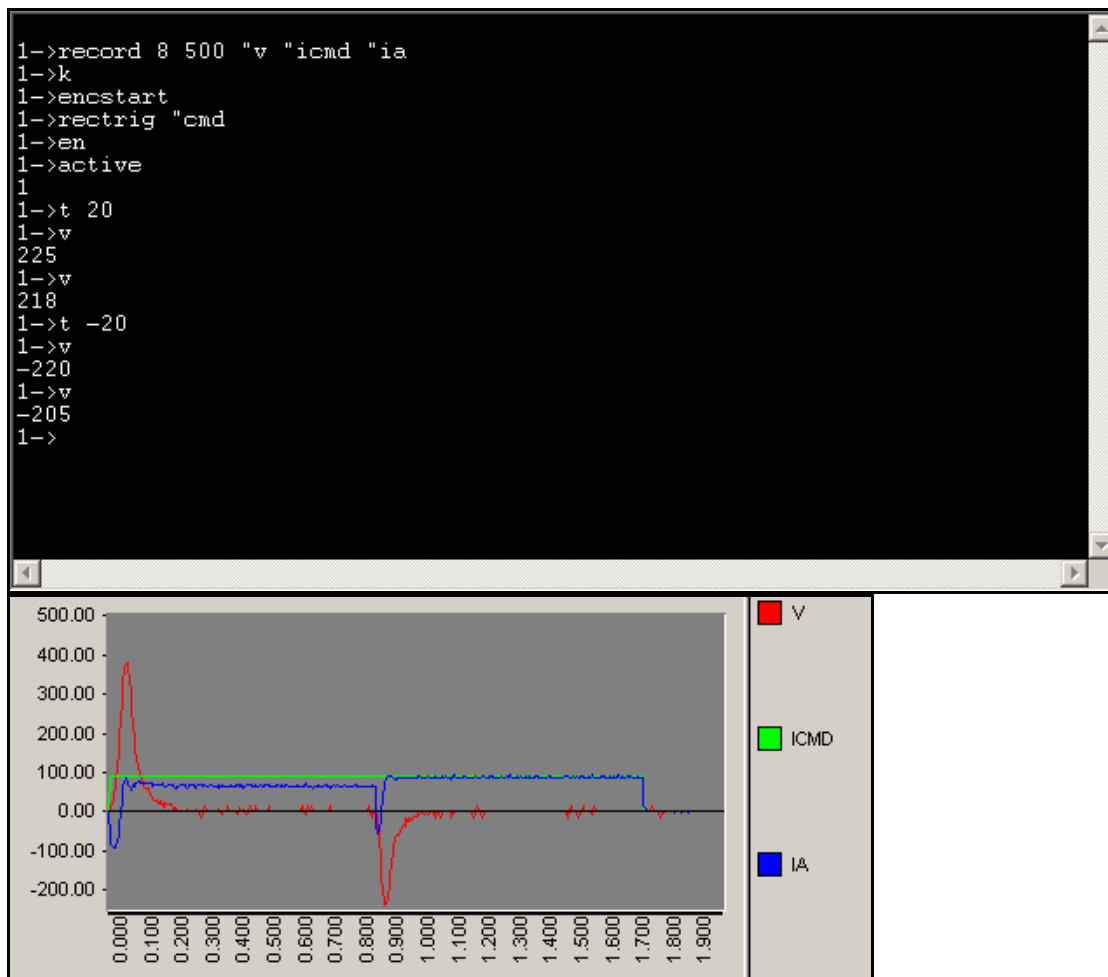
STATUS2 Word 5: Encoder Initialization Failure Word

If the encoder initialization process has failed, the condition which caused that fault will have its bit set to 1 in this word.

Bit #	Description
0 (LSB)	Too little (less than one rev) or too much (more than one rev) motion
1	Phase A current doesn't fit the commanded current
2	Phase A current and phase C current doesn't match
3	At least one of the limit switches was tripped
4	Wake-No-Shake process failed because of internal time-out
5	Wake-No-Shake too high velocity or too much motion (more than quarter of a rev)
6	Wake-No-Shake internal verification failed
7	Wake-No-Shake below minimum required movement
8–15	not used

Demonstration

The following shows a useful recording of the WNS process monitoring current and velocity, The first velocity jump varies in size and direction (depending on initial location), but the second jump should be the same for each parameter settings.



Note: The above recording was performed on a CD SynqNet hence the minimal recording gap is 62.5uSec compared to the 250e-6 uSec of the UCB2, and time scale in MotionLink 8 times shorter than what is displayed.

Background

"MPHASE" Error

Alignment Error Elect. deg	Torque drop [%]
5	0.4
10	1.5
20	6
40	23
60	50
90	100