APPLICATION NOTE

YASKAWA

Title: SGLFW SigmaTrac Setup with Sigma7 Drive

Product(s): SGLFW, Sigma7, SigmaWin	**Doc. No.** AN.Sigma-7.02

Application Overview

The following document describes how to setup a SigmaTrac system with Sigma7 drive from factory default. It also can be used as a general procedure to startup all linear motors with Sigma7 drive.

Table of Contents

1. HARDWARE USED & MODEL NUMBERS:

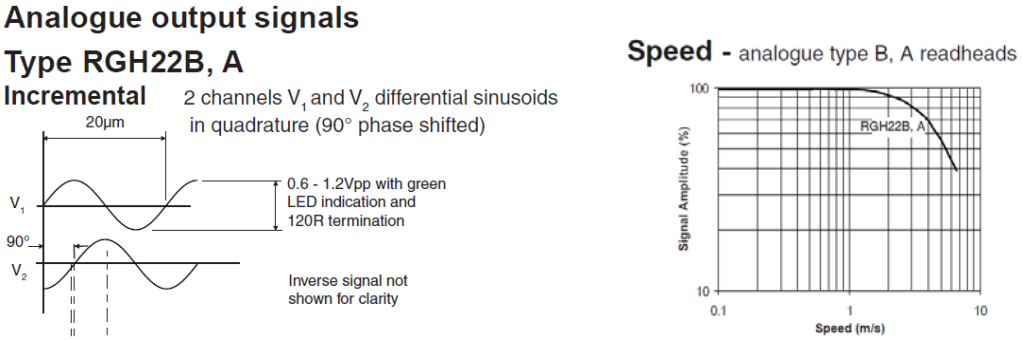
Component	Product and Part Number
ServoPack	SGD7S-2R1F
Linear Motor	SGLFW-35A120AP
Serial Converter	JZDP-D008-019
Linear Encoder	Renishaw RGH22B30L00

Renishaw Linear Encoder Information:

RGH22B30L00 (B: 1Vpp differential) (L: 15 pin D type plug)

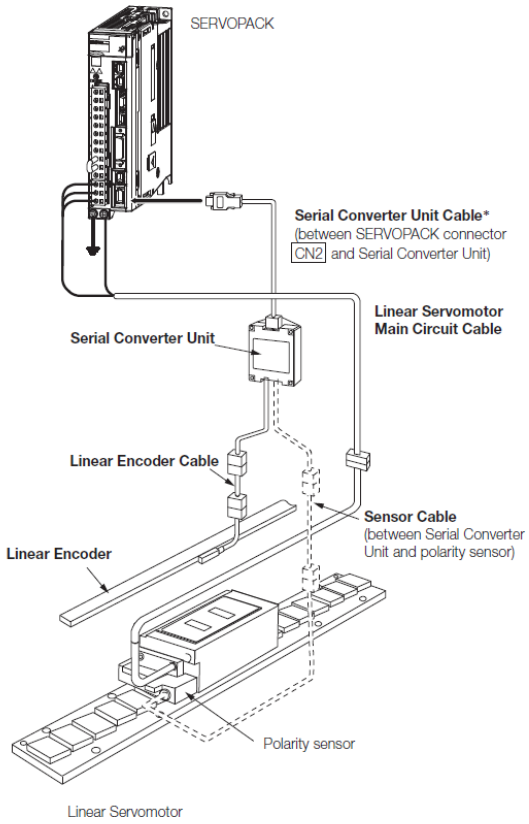
Title: SGLFW SigmaTrac Setup with Sigma7 Drive

Product(s): SGLFW, Sigma7, SigmaWin	**Doc. No.** AN.Sigma-7.02



Important: Make sure the linear encoder LED is blowing green throughout the linear span. If the LED is glowing red or amber, the spacing of the linear encoder reading head may need to be adjusted.

SYSTEM WIRING:



Title: SGLFW SigmaTrac Setup with Sigma7 Drive

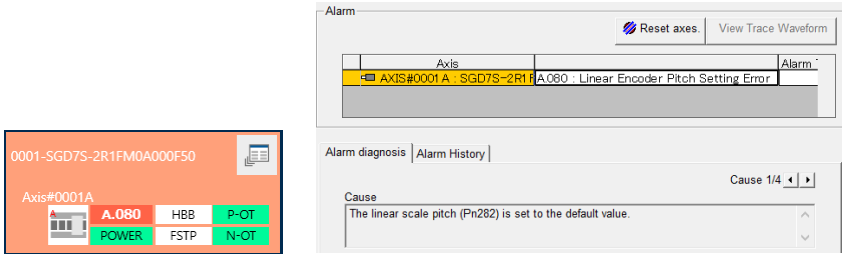
Product(s): SGLFW, Sigma7, SigmaWin | **Doc. No.** AN.Sigma-7.02

2. SOFTWARE SETUP PROCEDURE:

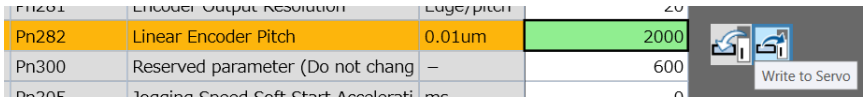
a. From the main Menu, select Edit Parameters and initialize the ServoPack Initialize.
Product Information :

Product Information	Export				
– 0001-SGD7S-2R1FM0A000F50	QR Code				
SERVOPACK	Model/Type	Serial Number	Manufacturing Date	SW Ver.	Remarks
SERVOPACK	SGD7S-2R1FM0A000F50 (Sigma-7Siec Single Axis Controller SERVOPACK)	YAI-M-EVAL-0003	2016.05	0023	[Specification] : Standard [I/F Ver] : 0000-0000
Motor	Model/Type	Number	Manufacturing Date	SW Ver.	Remarks
1 Motor	SGLFW-35A120AP		1995.95		[Resolution] : 0.000000 [um/Pulse] [Encoder type] : incremental
1 Encoder	JZDP-D008-019	3W0153-14-DC1G00	2013.07	0003	

b. When power is up, an A.080 alarm will occurs, because the linear encoder scale pitch was not set:



Per Renishaw Linear Encoder output signal graph, above, the linear pitch of the encoder is 20um; therefore, set Pn282 (0.01um Unit) to 2000 for 20um, then execute "Software Reset" Software Reset from the main menu.



Product Information :

Product Information	Export				
– 0001-SGD7S-2R1FM0A000F50	QR Code				
SERVOPACK	Model/Type	Serial Number	Manufacturing Date	SW Ver.	Remarks
SERVOPACK	SGD7S-2R1FM0A000F50 (Sigma-7Siec Single Axis Controller SERVOPACK)	YAI-M-EVAL-0003	2016.05	0023	[Specification] : Standard [I/F Ver] : 0000-0000
Motor	Model/Type	Number	Manufacturing Date	SW Ver.	Remarks
1 Motor	SGLFW-35A120AP		1995.95		[Resolution] : 0.078125 [um/Pulse]
1 Encoder	JZDP-D008-019	3W0153-14-DC1G00	2013.07	0003	[Encoder type] : incremental

The D00x serial converter provides 8 bit interpolation, which provides 256 pulses per 20um linear scale pitch, i.e. 1 cm = 128000 pulses.

Manually move the Moving Coil from one end to the other of the stroke and confirm that the Pulse Counter Feedback is increasing as the motor moves in the positive direction and vice versa. For more information on the motor/encoder direction setup refer to “Motor Phase Sequence Setting” section below.

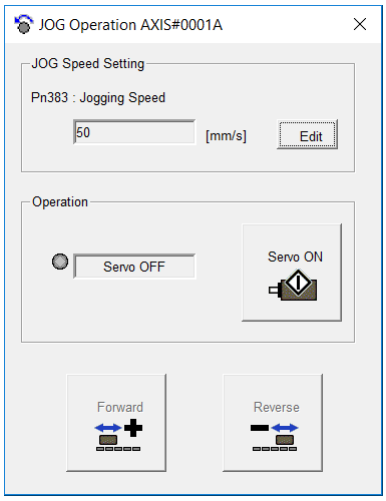
To monitor the encoder position feedback, select Monitor NEW from the main menu to check position feedback (please note that the screen data update can be slow, be patient):

Monitor

Operation

Control	I/F	Item	Unit	0001-SGD7S-2R1FM0A000F50 Axis A
POS	Common	Input reference pulse counter	reference units	403449
POS SPD TRQ	Common	Feedback pulse counter	linear encoder pulse	403423

c. From the main Menu, select “Jog” in Operations to enable and move axis. Warning: During Jog operations, travel limits are ignored.



d. For Program JOG Operation (indexing moves):

Title: SGLFW SigmaTrac Setup with Sigma7 Drive

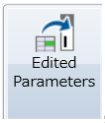
Product(s): SGLFW, Sigma7, SigmaWin | **Doc. No.** AN.Sigma-7.02

1. Disable the positive and negative over-travel limits by setting Pn50A.3 & Pn50B.0 to 8:

Pn50A.3	P-OT (Forward Drive Prohibit) Signa	–	8 : Forward run allowed
Pn50B.0	N-OT (Reverse Drive Prohibit) Signa	–	8 : Reverse run allowed

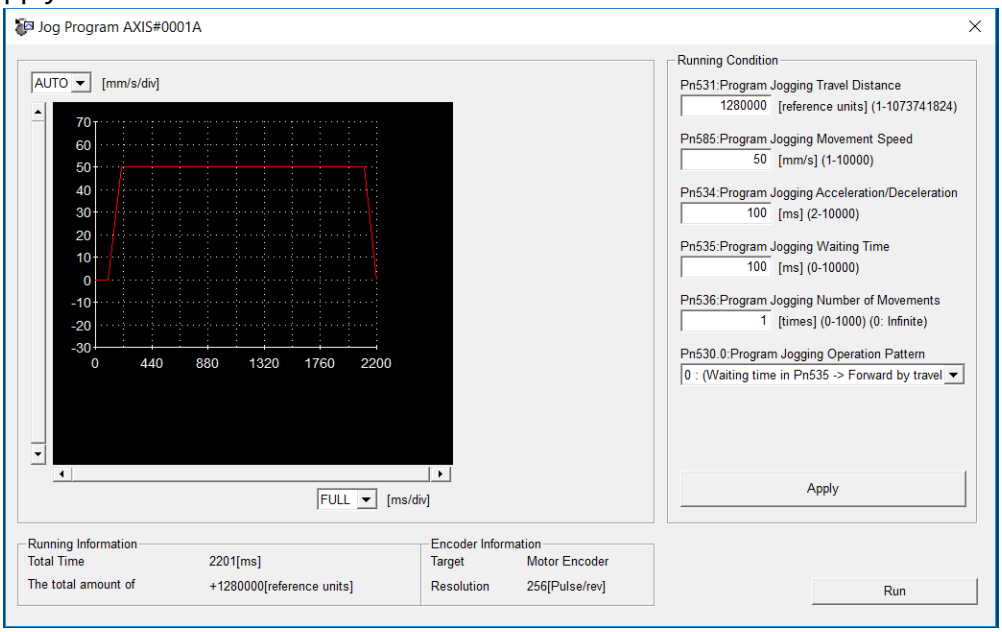
2. In order to use the full encoder resolution, set Pn20E to 1:

Pn20E	Electronic Gear Ratio (Numerator)	–	1

3. Write “Edited Parameters” 

, then execute “Software Reset” 

.
4. After reset, monitor encoder pulse feedback from the monitor list and confirm that only the correct number of feedback pulses is returned for a certain measured distance.
5. From the main Menu, select “Program JOG Operation” in Operations to go through index move setup.
   For 10cm move set Pn531: Program Jogging Travel Distance to 1280000, then “Apply” & “Run”:



3. BEFORE TUNING:

Before tuning increase the force limit, widen the position complete window, and disable control mode switching:

- For safety, the default Forward/Reverse Force Limits (Pn483/Pn484) are set to a low value of 30% of the motor rated force. Change the setting to 300% before tuning in order to use the full motor Force.

Pn483	Forward Force Limit	%	300
Pn484	Reverse Force Limit	%	300

- The default Positioning Completed Width is set to a narrow window of 7 pulses. Change the setting to 128000 (1cm), which can be reduced to more appropriate value after tuning is completed.

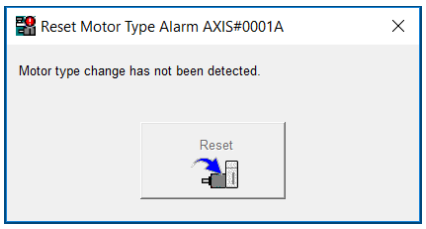
Pn522	Positioning Completed Width	reference units	128000

- The mode switching (PI to P control) cannot be used during Autotuning (with/without host reference) and when estimating the moment of inertia; therefore, set Pn10B.0 to 4:

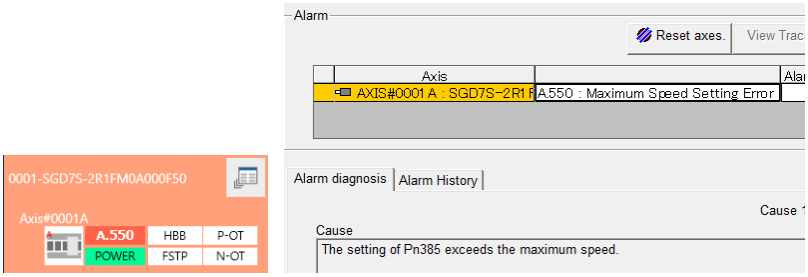
Pn10B.0	Mode Switching Selection	–	4 : Do not use mode switching.

4. OTHER RELATED ALARMS/PARAMETERS:

a. If a rotary type motor was connected to the ServoPack before connecting a linear type motor, an **A.070 alarm** (Motor Type Change Detected) would appear. To clear alarm, select Reset Motor Type Alarm from the main menu, and then press Reset:



b. A maximum speed setting error (**A.550 alarm**) may appear on power-up if the setting of Pn385 (Maximum Motor Speed) is greater than the maximum motor speed:



The error can be reset for normal operations, but to resolve the error, set Pn385 to the right maximum motor speed specification then execute “Software Reset” Software Reset.

Pn385	Maximum Motor Speed	100mm/s	50

c. If an **A.041 alarm** (Encoder Output Pulse Setting Error) appears, the setting of Pn281 (Encoder Output Resolution) is outside of the setting range or does not satisfy the setting conditions. Pn281 Sets the encoder output resolution for the encoder pulse output signals (PAO, /PAO, PBO, and /PBO) from the SERVOPACK to the host controller. The default setting is 20, i.e. 20 pulses per pitch (20um):

Pn281	Encoder Output Resolution	Edge/pitch	20

The number of feedback pulses per linear encoder pitch is divided by the setting of Pn281 (after multiplication by 4) inside the SERVOPACK and then the resulting number of pulses is output. Set the parameter according to the system specifications of the machine or host controller.

The setting range depends on the Servomotor’s maximum speed (Pn385) and the Linear Encoder Scale Pitch (Pn282). Use the following formula to calculate the upper limit of Pn281 setting:

$$\text{Upper limit of Pn281} = \frac{\text{Linear Encoder Pitch*}/100}{\text{Pn385}} \times 72$$

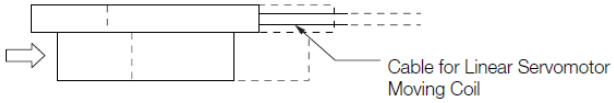
d. Motor Phase Sequence Setting:

Parameter No.	Size	Name	Setting Range	Setting Unit	Default Setting	Applicable Motors	When Enabled
Pn080	2	Application Function Selections 80	0000h to 1111h	–	0000h	Linear	After restart

n.□□□X	Polarity Sensor Selection
0	Use polarity sensor.
1	Do not use polarity sensor.

n.□□X□	Motor Phase Sequence Selection
0	Set a phase-A lead as a phase sequence of U, V, and W.
1	Set a phase-B lead as a phase sequence of U, V, and W.

Manually move the Moving Coil in the direction of the cable and check the value of the feedback pulse counter in Monitor(NEW) to confirm that it is counting up. If the pulses are counted up, the forward direction of the Linear Servomotor is the same as the countup direction of the linear encoder.



If the feedback pulse counter counts down, set a phase-B lead as a phase sequence of U, V, and W (Pn080 = n.□□1□) then execute “Software Reset” Software Reset .

If necessary, return Pn000 (Direction Selection) to its original setting.

e. Polarity Sensor Setting:

Detecting the polarity means that the position of the electrical phase angle on the electrical angle coordinates of the Servomotor is detected. The SERVOPACK cannot control the Servomotor correctly unless it accurately knows the position of the electrical angle coordinate of the Servomotor. If you use a Linear Servomotor that does not have a polarity sensor, then you must detect the polarity.

Parameter No.	Size	Name	Setting Range	Setting Unit	Default Setting	Applicable Motors	When Enabled
Pn080	2	Application Function Selections 80	0000h to 1111h	–	0000h	Linear	After restart

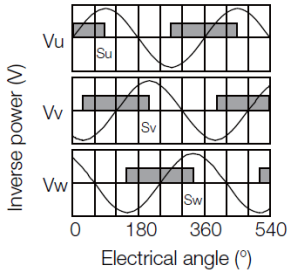
n.□□□X	Polarity Sensor Selection
0	Use polarity sensor.
1	Do not use polarity sensor.

n.□□X□	Motor Phase Sequence Selection
0	Set a phase-A lead as a phase sequence of U, V, and W.
1	Set a phase-B lead as a phase sequence of U, V, and W.

If a polarity sensor is used, it can detect the polarity of the Servomotor. Specify whether there is a polarity sensor in Pn080 = n.□□□x (Polarity Sensor Selection).

◆ Polarity Sensor Output Signal

The figure on the right shows the relationship between the Su, Sv, and Sw polarity sensor output signals and the inverse power of each motor phase Vu, Vv, and Vw when the Moving Coil moves in the direction indicated by the arrow in the dimensional drawings of the Moving Coil.



f. Using an external brake:

Assign (Pn50F.2) /BK Brake Output Signal to an appropriate output terminal that is not used by any other functions:

Pn50F.2	/BK (Brake Output) Signal Allocation	–	1 : Output the signal from the CN1-1 or CN1-2 output terminal.
Pn50F.3	/WARN (Warning Output) Signal Allocation	–	0 : Disabled (the above signal output is not used).
Pn510.0	/NEAR (Near Output) Signal Allocation	–	1 : Output the signal from the CN1-1 or CN1-2 output terminal.
Pn510.1	Reserved parameter (Do not change.)	–	2 : Output the signal from the CN1-23 or CN1-24 output terminal.
			3 : Output the signal from the CN1-25 or CN1-26 output terminal.

For example, if brake output is wired to CN1-25 (-25 output terminals) set Pn50F.2 to 3, and set the other Output Selection Parameters in Pn50E, Pn50F & Pn510 to 0, 1 or 2.

5. LINEAR SERIAL CONVERTER OPTIONS:

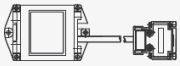
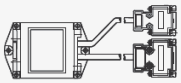
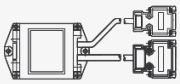
Model Designation:

JZDP – □00□ (1st ... 4th) □□□ (5th ... 7th) – E (8th + 9th Digit)

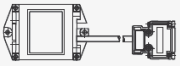
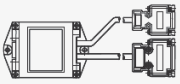
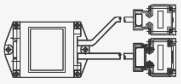
Title: SGLFW SigmaTrac Setup with Sigma7 Drive

Product(s): SGLFW, Sigma7, SigmaWin | **Doc. No.** AN.Sigma-7.02

For Sigma-7 Servo Drives

1st ... 4th Digit - Serial Converter Unit Model				
Code	Appearance	Applicable linear encoder	Polarity sensor	Thermal protector
H003 J003		From Heidenhain Corp.	None	None
H005 J005		From Renishaw PLC	None	None
H006 J006		From Heidenhain Corp.	Yes	Yes
H008 J008		From Renishaw PLC	Yes	Yes

For Sigma-5 Servo Drives

1st ... 4th Digit - Serial Converter Unit Model			
Code	Appearance	Applicable linear encoder	Hall sensor
D003 G003		From Heidenhain Corp.	None
D005 G005		From Renishaw PLC	None
D006 G006		From Heidenhain Corp.	Yes
D008 G008		From Renishaw PLC	Yes

Notes:

- ✓ Code D00x and H00x for 8 bit interpolation (256 counts per encoder linear pitch).
- ✓ Code G00x and J00x for 12 bit interpolation (4096 counts per encoder linear pitch).

Title: SGLFW SigmaTrac Setup with Sigma7 Drive

Product(s): SGLFW, Sigma7, SigmaWin | **Doc. No.** AN.Sigma-7.02

5th ... 7th Digit - Applicable Linear Servomotor							
Servomotor model			Code	Servomotor model			Code
SGLGW (Coreless models) with Standard-force Magnetic way	200 V	30A050C	250	SGLFW2 (Models with F-type Iron Cores)	200 V	30A070A	628
		30A080C	251			30A120A	629
		40A140C	252			30A230A	630
		40A253C	253			45A200A	631
		40A365C	254			45A380A	632
		60A140C	258			90A200A	633
		60A253C	259			90A380A	634
		60A365C	260			90A560A	648
		90A200C	264			1DA380A	649
		90A370C	265			1DA560A	650
		90A535C	266		400 V	30D070A	651
SGLGW- + SGLGM-o-M (Coreless models) with High-force Magnetic way	200 V	40A140C	255			30D120A	652
		40A253C	256			30D230A	653
		40A365C	257			45D200A	654
		60A140C	261			45D380A	655
		60A253C	262			90D200A	657
		60A365C	263			90D380A	658
SGLFW (Models with F-type Iron Cores)	200 V	20A090A	017			90D560A	659
		20A120A	018			1DD380A	660
		35A120A	019			1DD560A	661
		35A230A	020				
		50A200B	181				
		50A380B	182				
		1ZA200B	183				
		1ZA380B	184				
	400 V	35D120A	211				
		35D230A	212				
		50D200B	189				
		50D380B	190				
		1ZD200B	191				
		1ZD380B	192				
		1ED380B	333				
		1ED560B	334				

8th + 9th Digit - Model code extension	
Code	Specification
	For Sigma-7 servomotors
-E	Serial converter units for Sigma-5 servo drives