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HYUNDAI INVERTER
RUN N700

Feedback Option Board Instruction Manual

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

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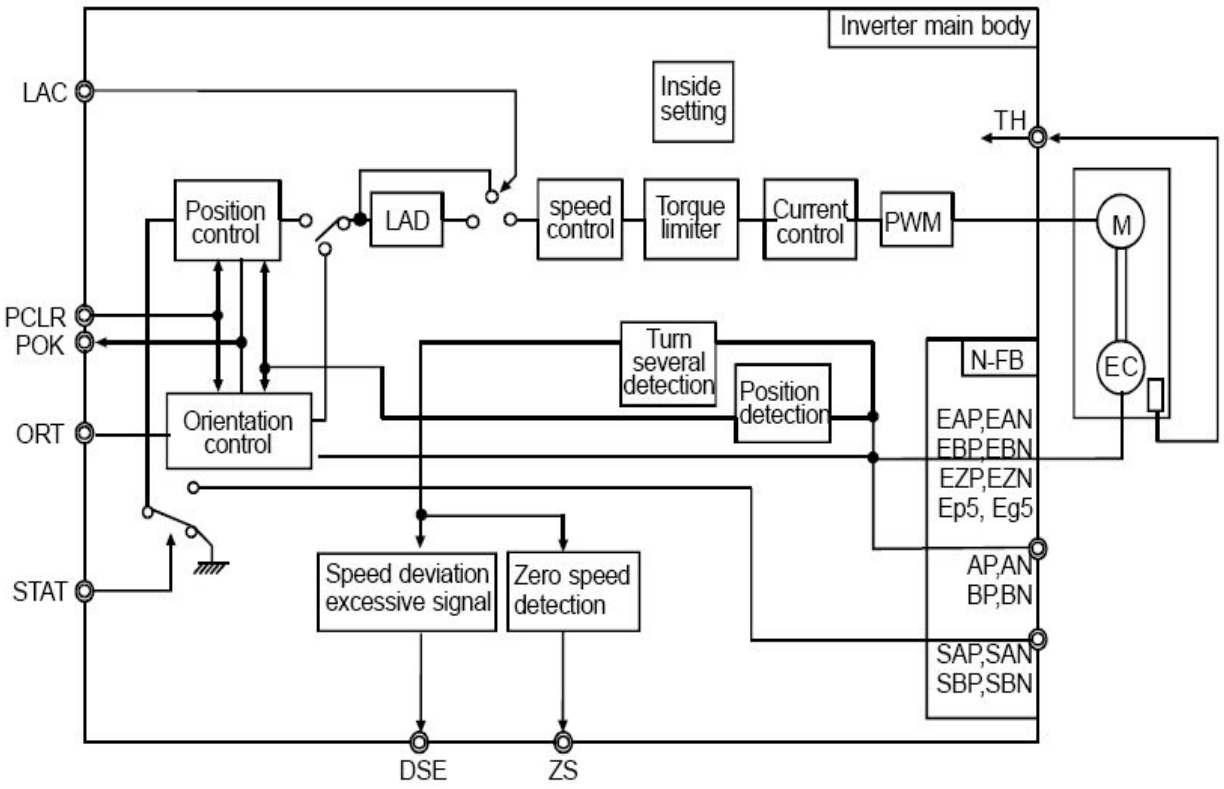
1. Outline

- N7-FB board, installed in an N700 inverter, detects the rotation speed of a motor by accepting pulses from a shaft-mounted motor encoder, resulting in highly accurate speed regulation.
- This N-FB board can also be used to control motor stop positions by entering 90 degree phase difference pulses, as well as for synchronized operation (master/slave or electronic gear), orientation function, and external torque limit input function.

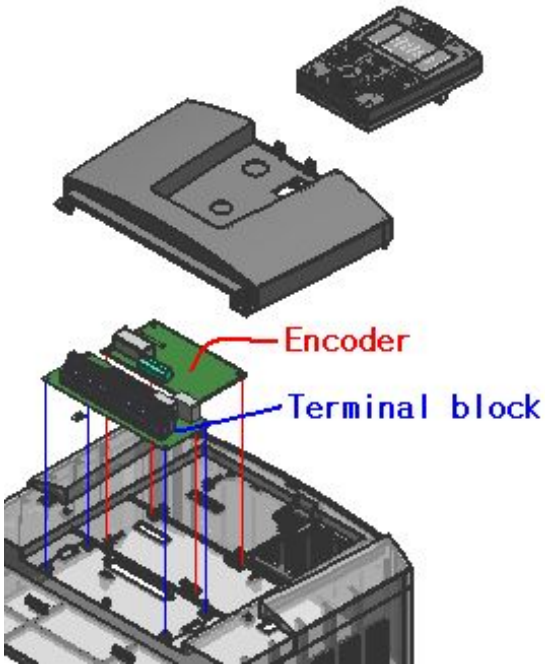
2. Function Block Diagram



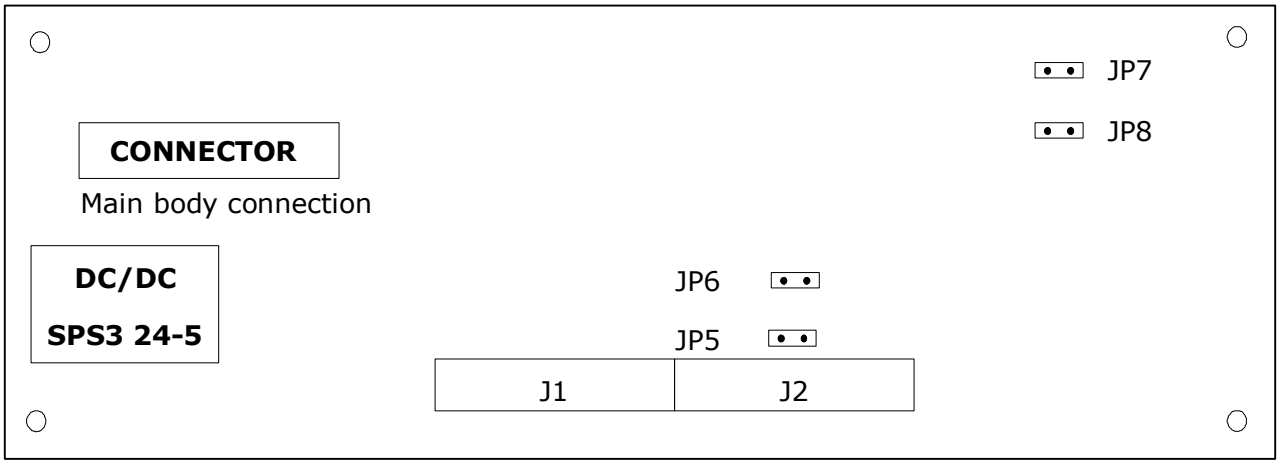
3. Board Specification

ITEM		Electric Specification
Speed control	Encoder feed-back	Standard encoder pulse number 1024 pulse/r Max. input pulse 100k pulse/s
	Speed control system	Proportional-Integral (PI) control
Position control	Position command	Three kinds of pulse train input selectable by main body setting. Mode 0 : 90° phase difference pulse Mode 1 : Forward/Reverse signal pulse Max. input pulse 100k pulse/s
	Electronic gear	Pulse ratio A/B (A,B : 1~9999 selectable) Setting range 1/50 ≤ A/B ≤ 20
Orientation	Stop position	4096 division against 1 rotation of the motor shaft
	Speed	Orientation speed and turn direction selectable
Protection function		Encoder cable line break protection Over speed protection Positioning error Connection abnormal of N7-FB

4. N7-FB Board Installation



5. N7-FB Board Terminal Assignments



J1 Terminal Assignments

EP5	**EG**	**EAP**	**EAN**	**EBP**	**EBN**	**EZP**	**EZN**

J2 Terminal Assignments

SAP	**SAN**	**SBP**	**SBN**	**AP**	**AN**	**BP**	**BN**

6. Function Explanation of the Input Terminal

Terminal	Code	Function	Common Terminal	Electric Specification
Pulse train Position Command Inputs	SAP,SAN SBP,SBN	Pulse train position command input Mode 0:90degree phase difference pulse Mode 1:Forward/Reverse signal; pulse train Mode is selected via the pulse selection parameter(P006)		DC 5V receiver input (based on RS-422 standard)
Encoder Signal inputs	EAP,EAN EBP,EBN EZP,EZN	A, B, Z : rotary encoder signal input		Photo coupler input : Compatible with the DC5V line driver type rotary encoder
Pulse train Position command input permissive signal (Note1)	STAT	Position control with pulse train input is valid when STAT is Turned ON. (Note 2)	CM1	Photo coupler input : Configure to an inverter intelligent input terminal.
Orientation signal (Note1)	ORT	Turn ON for orientation operation. (Note 2)		
LAD cancel signal (Note1)	LAC	Turn ON to cancel LAD. (Note 2)		
Position deviation Clear signal (Note1)	PCLR	Turn ON to clear position deviation counter. (Note 2)		

(Note 1) : Valid when LAC is assigned to an intelligent input terminal of the inverter (N700).

(Note 2) : Refer to the configuration setting procedure for the inverter in the N700 Instruction Manual

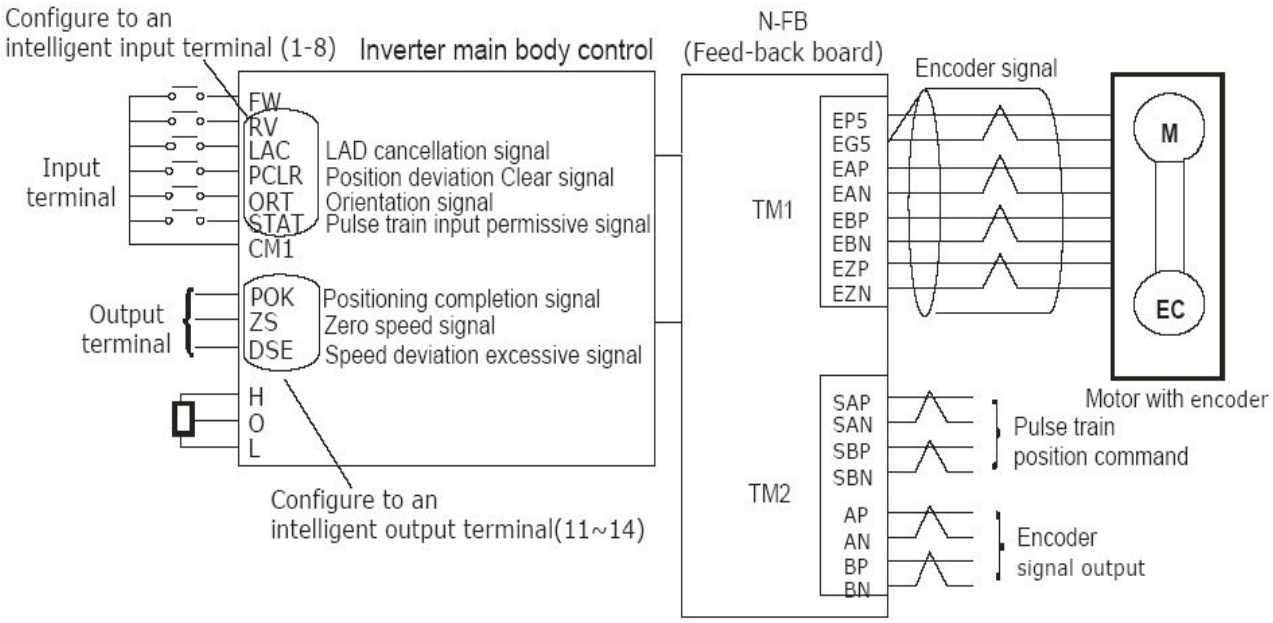
7. Function Explanation of the Output Terminal

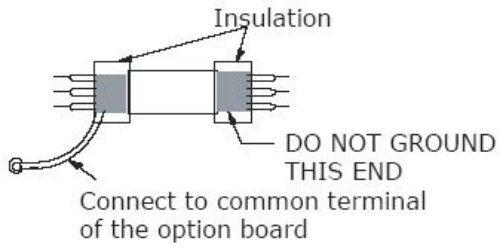
Terminal	Code	Function	Common Terminal	Electric Specification
Encoder signal output	AP,AN BP,BN	Retransmits the input encoder signal (ratio 1:1)		DC 5V line driver output (based on RS-422standard)
Power supply for encoder	EP5,EG5	DC+5V power supply	EG5	150mA max
Positioning Completion Signal (Note 1)	POK	Used for position control or orientation Output ON when the position comes within the specified range (P017). (Note 2)	CM2	Open collector outputs : Configure to an inverter intelligent output terminal
Speed deviation excessive signal (Note 1)	DSE	Output ON when the real rotation speed deviation from command speed exceeds(P027). (Note 2)		
Zero speed Signal (Note 1)	ZS	Output when the real rotation speed becomes zero speed detection level (C063). (Note 2)		

(Note 1) : Valid when POK is assigned to an intelligent output terminal of the inverter (N700).

(Note 2) : Refer to the configuration setting procedure for the inverter in the N700 Instruction Manual

8. Terminal Wiring & Connection





(Note)

Use a shielded, twisted pair cable for the signal cables, and cut the shielded covering.

Also, the signal wire for the encoder should be shield twisted pair line of 28AWG (0.75㎟) or more, and the distance should also be less than 20m.

(If more than 20m, use a 5V line driver relay amplifier)

9. N-FB Board Function Code (Inverter Unit)

Code	Function Name	Setting Range	Initial Data	Change Mode on run
P001	Option.1 Operation Selection on error	0: Trip, 1: Run	0	○
P002	Option.2 Operation Selection on error	0: Trip, 1: Run	0	○
P003	Feedback option selection	0: Invalid, 1: Valid	0	×
P004	Control mode selection	0: ASR, 1: APR	0	×
P005	Encoder pulse number setting	128.~9999./1000~6500 (10000~65000)[PPR]	1024	×
P006	Pulse train input mode selection	0: Mode 0, 1: Mode 1	0	×
P007	Orientation stop position setting	0 ~ 4095	0	○
P008	Orientation speed setting	0.00~99.99/100.0~120.0[Hz]	0.00	○
P009	Orientation direction setting	0: Forward, 1: Reverse	0	×
P010	Orientation completion range setting	0 ~ 9999	5	○
P011	Orientation completion delay time setting	0.00 ~ 99.9[sec]	0.00	○
P012	Electronic gear position selection	0: Feedback, 1: Reference	0	○
P013	Electronic gear numerator of ration setting	0 ~ 9999	1024	○
P014	Electronic gear denominator of ration setting	0 ~ 9999	1024	○
P015	Position control feed forward gain setting	0.00~99.99/100.0~655.3	0.00	○
P016	Position control loop gain setting	0.00 ~99.99	0.50	○
P017	Compensation of secondary resistor selection	0: Invalid, 1: Valid	0	○
P018	Over speed detect level setting	0.00~99.99/100.0~150.0[%]	135.0	○
P019	Speed error over detect level setting	0.00~99.99/100.0~120.0[Hz]	0.00	○
P020	digital option ACC/DEC time input mode selection	0: OPE, 1: OPT1, 2: OPT2	0	○
P021	Stop position setting for orientation input mode selection	0: OPE, 1: OPT1, 2: OPT2	0	×

10. Motor constants Setting

- Motor constants Setting
- If satisfactory performance can not be obtained, adjust the motor constants for the particular symptoms observed according to following table.

Inverter Status	Symptom Observed	Adjustment Guidelines	Parameter to Adjust
At starting	Shock occurs at starting	Set "Motor constant J" higher gradually up to 1,2 times the initially preset (default) value	H007/H013
At deceleration	Instability of motor rotation	Set the speed response lower	A090~A093
		Set "Motor constant J" smaller than the initially preset value.	H007/H013
During torque limit	Insufficient torque during torque limit at low speed	Set overload restriction level lower than the torque limit level.	b031 C007~C010
At Low Frequency operation	Irregular rotation	Set "Motor constant J" higher than the initial preset (default) value.	H007/H013

11. Protection Function

Display	Item	Contents	Processing
E31.1	Encoder Line break	Detect the line break or disconnection of the encoder line	Check the encoder signal line and connection
		Detect when there is an encoder failure. Detect when the specification of the encoder is not line driver output type.	Replace it to a suitable one.
E31.2	Speed error	Detect when the motor rotation speed exceed or lower then the code P019 setting parameter.	Increase the speed controller gain and adjust the code P019.
E31.3	Positioning error	Detect when the deviation of the current position and command value becomes more than 1,000,000 pulses during position controlling.	Increase the position loop gain. Decrease the numbers of the pulse train input per second
E31.4	Connection error	Detect abnormal connection between the inverter main body and N-FB.	Check the connection between the inverter main body and N-FB.
E31.5	Code setting error	Detect when the code setting is wrong.	Check the code setting.
E32.X	Over speed	Detect when the motor rotation speed exceeds the code P018 setting parameter.	Adjust the Kp and J constants related to the speed control system to reduce overshoot.

12. N7-FB Board Operation

- Turn ON the POWER switch of the inverter.
- Set the control method (F012) in [06].
- Set the necessary items according to the instruction manual "Chapter 4. Function Explanation" of the inverter main body.
- For speed control, operation is started when operation command of the inverter main body is turned on.
- For position control, turn on the STAT terminal of N3-FB and operation command of the inverter main body first of all. Next input the pulse train position command to SAP-SAN and SBP-SBN then the motor turns only the pulse that you input.

✓ Confirm the following while trial operation.

- The motor accelerates normally.
- The motor rotates in the correct direction.
- Neither abnormal vibration nor noise is recognized in the motor.

13. Orientation Function

- This function used to position the motor at a certain point during operation.
- This function can be used for replacing a component of the main axis of the subject machine tool.

Function outline

- The orientation function maintains position which has decided with the position control after speed control operation.

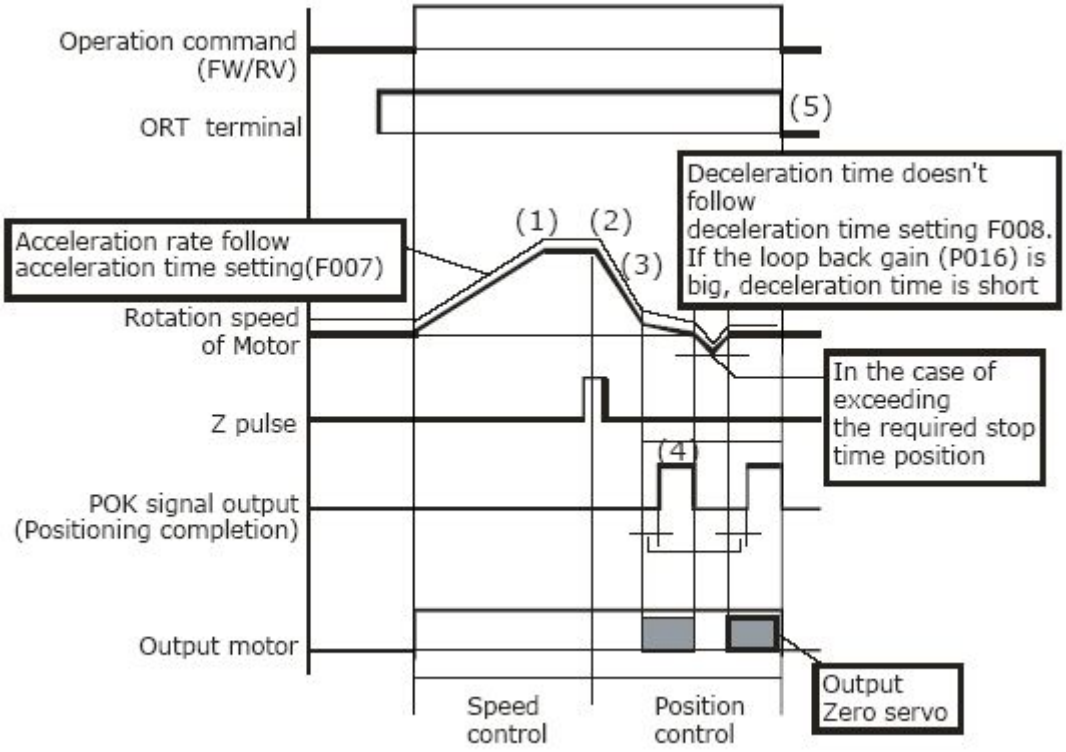
(1) In the speed control operation period, inverter drives at constant speed with the orientation speed setting (P008).
Orientation mode becomes valid when turning RUN command ON under ORT is being ON.

(2) After arriving to the orientation speed setting, the first coming the Z pulse is detected after that the control mode moves to the position control.

(3) Inverter controls the motor to stop at a certain stop position which is set to (P007) during position control operation period.

(4) Inverter maintains the position after the completion, and outputs the 'position control completion (POK) signal' after the set value of 'delay time setting (P011).
Inverter drives th motor reverse and return to the required stop position in the case it exceeds the required stop position.

(5) When the ORT terminal is turned off, the inverter stops operation and the orientation mode is cleared.



14. Speed Control Function (ASR)

- Mode Selection: P004(Control mode select) is set to 0(ASR Mode)
- Drive after setting up the frequency, operation command and each motor constant.

15. Position Control Function (APR)

- Mode Selection: P004(Control mode select) is set to 1(APR Mode)

Function outline

- This function generates the frequency based on the position command pulse which comes from the pulse train input from the terminal and position feed back pulse which is detected by the

motor encoder, and performs the position control operation.

- It can be used as synchronous operation of main and sub motor.
- The turn ratio of main and sub motor can be changed by setting up the electronic gear ration.