YASKAWA
A World of Automation Solutions

ENGINEERING PUBLICATION

MOTION CONTROL DIVISION

PRODUCT: JUSP-NS600 SIGMA II INDEXER

SUBJECT: USING THE DIGITAL OPERATOR WITH THE SIGMA II INDEXER

CATEGORY: TECH. NOTE

ENGINEER: Paul Zajac **DISTRIBUTION: YEA**

Summary:

The following document describes how to use the digital operator with the JUSP-NS600 Sigma II Indexer. The digital operator can be used to monitor the status of the servo system, perform auxiliary functions, and read and write parameters, index table settings, jog speed table settings, and zone table settings, when connected to the CN7 communication port on the Indexer.

INDEXER JUSP-NS600

Using the Digital Operator

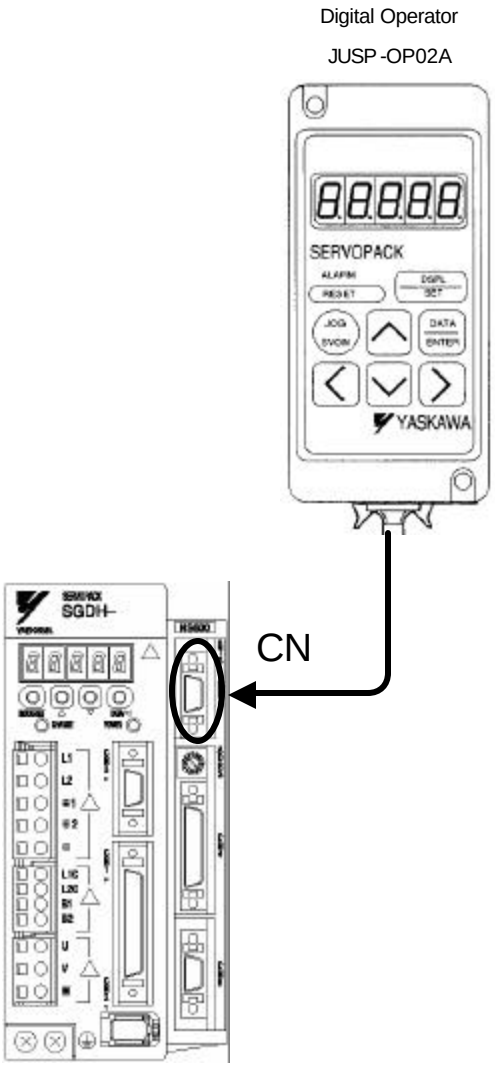
1. Connection - P.2
2. Status Display Screen - P.3
3. Switching the Basic Screen - P.4
4. Parameter Editing Screen - P.5
5. Monitor Screen - P.7

Un000	Motor Speed	P.8
Un002	Torque	P.8
Un003	No. of Speed Pulses	P.8
Un004	Electrical Angle	P.8
Un005	SGDH Input Signal	P.8
Un006	SGDH Output Signal	P.8
Un007	Reference Speed	P.8
Un008	Position Deviation	P.8
Un009	Cumulative Load Factor	P.9
Un00A	Regenerative Load Factor	P.9
Un00B	DB Load Factor	P.9
Un00C	Position Reference Counter	P.9
Un00D	Encoder Pulse Counter	P.9
Un800	Error	P.10
Un801	NS600 Input Signal	P.10
Un802	NS600 Output Signal	P.10
Un803	Status Flag	P.10
Un804	Current Position of Position Reference	P.10
Un805	Current Position of Motor	P.10
Un806	Positioning Target Position	P.11
Un807	Positioning Distance	P.11
Un808	Registration Target Position	P.11
Un809	Registration Range	P.11
Un80A	Program Step	P.11
Un80B	Elapsed Time Status of Event	P.11
Un80C	Execution Status of LOOP	P.11
Un80D	Serial Communication Received Character Trace	P.12

6. Auxiliary Function Execution Screen - P.14

Fn000	Alarm Trace Display	P.15
Fn001	Rigidity Setting	P.16
Fn002	JOG Operation	P.17
Fn003	Origin Search	P.18
Fn005	Parameter Initialization	P.20
Fn006	Alarm Traceback Initialization	P.21
Fn007	Store Inertia Ratio	P.22
Fn008	Reset Absolute Encoder	P.23
Fn00C	Analog Monitor Zero Adjustment	P.25
Fn00D	Analog Monitor Gain Adjustment	P.26
Fn00E	Motor Current Automatic Zero Adjustment	P.27
Fn00F	Motor Current Manual Zero Adjustment	P.28
Fn010	Write Protection Setting	P.29
Fn011	Motor Type Code Display	P.30
Fn012	SGDH Software Version Display	P.31
Fn013	Multi-Turn Limit Setting	P.32
Fn800	NS600 Software Version Display	P.34
Fn801	NS600 Model Code Display	P.35
Fn802	NS600 Unique Specification Number Display	P.36
Fn803	Save Program (Index) Table	P.37
Fn804	ZONE Table Storage	P.38
Fn805	Save JOG Speed Table	P.39

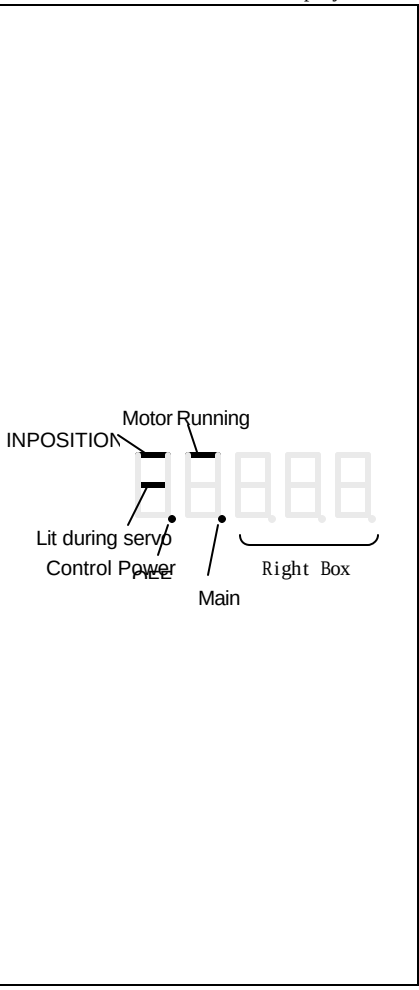
Connect to CN7 on the NS600.



Key	Name	Function
ALARM RESET	ALARM	This operates as an alarm reset in the status display screen.
DSPL SET	DSPL/SET	It is used to switch screens and operate auxiliary functions.
DATA ENTE	DATA/ENTER	Used for numeric input.
^	UP	Used for deleting numbers.
v	DOWN	
<	LEFT	Used for moving the cursor,
>	RIGHT	
JOG SVON	JOG SVON	Used for switching the servo ON/OFF during JOG operation,

The digital operator can be connected/disconnected with the power

2. Status Display Screen

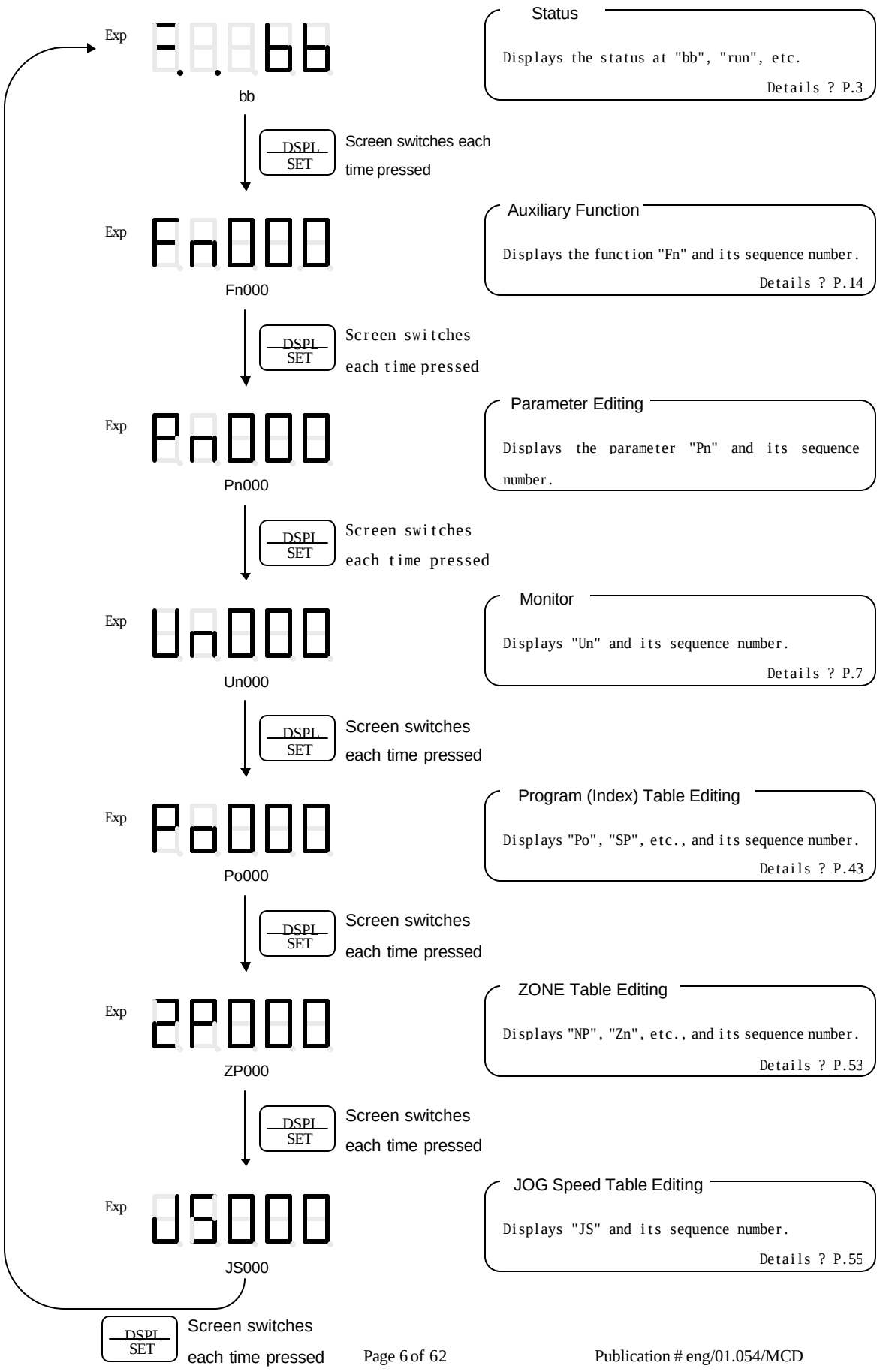
Display	Meaning
 bb	Servo OFF state. bb:Base Block
run	Servo ON state.
Pot	P-OT state. Forward run prohibition by P-OT signal. P-OT:Positive-side Over Travel
not	N-OT state. Reverse run prohibition by N-OT signal. N-OT:Negative-side Over Travel
PLS	P-LS state. Forward run prohibition by according to parameter P-LS:Positive-side Limit Switch
nLS	N-LS state. Reverse run prohibition according to parameter N-LS:Negative-side Limit Switch
A Code A.xx	Alarm or warning state. A.xx:SGDH alarm or warning code
E Code A ExxA	Alarm state. ExxA: NS600 Alarm Code
E Code E 2 ExxE	Displayed for only 2 minutes upon alarm occurrence.
StorE Flashing StorE	Storing to flash memory. **Do not shut off control power at this time.**
InIt Flashing InIt	Initializing factory settings. **Do not shut off control power at this time.**

Important

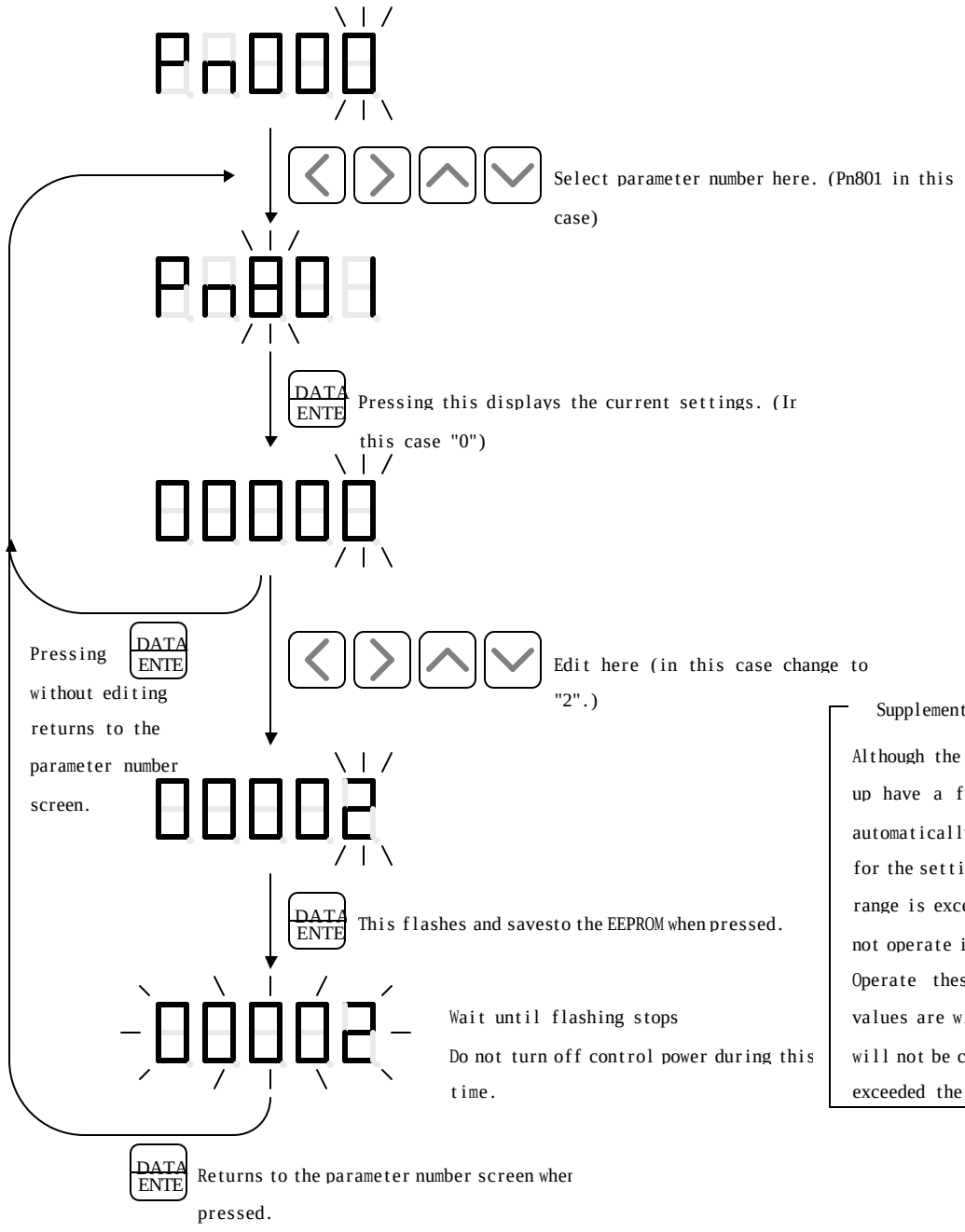
In this screen ALARM RESET Only acts as an alarm reset.

At alarm occurrence, reset after removing the cause of the alarm.

3. Basic Screen Switching



4. Parameter Editing Screen

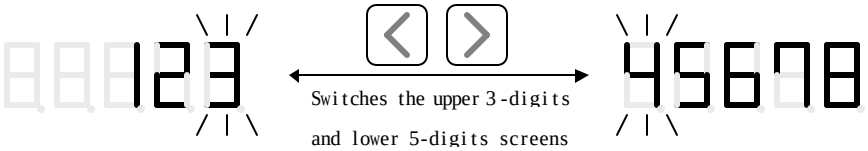
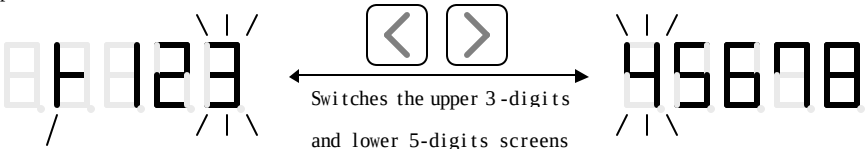


Supplement

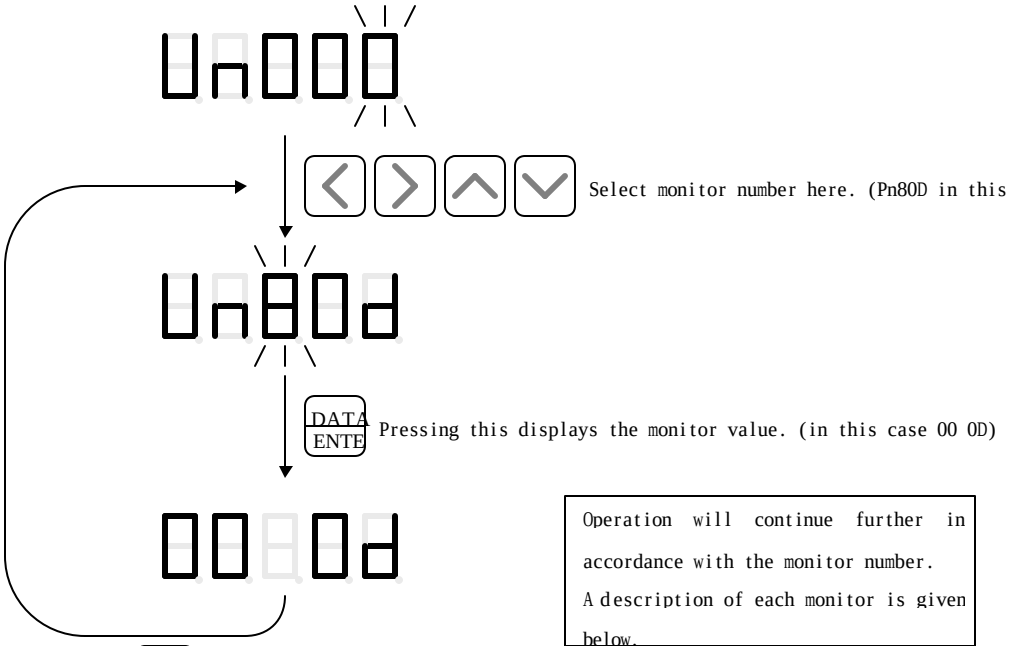
Although the parameters from Pn800 on up have a function operating which automatically displays the exact value for the setting range when said setting range is exceeded, this function does not operate in parameters below Pn800. Operate these so that the setting values are within range as the values will not be changed when the value has exceeded the setting range.

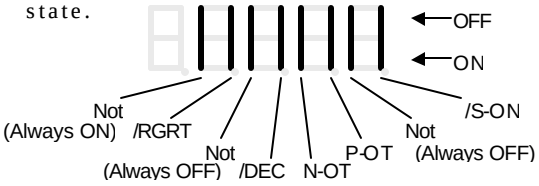
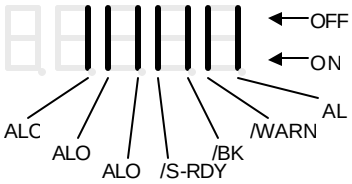
Imp There are both online and offline parameters. Offline parameters are enabled after the control power is cycled.

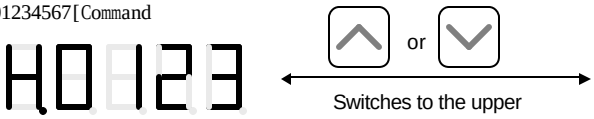
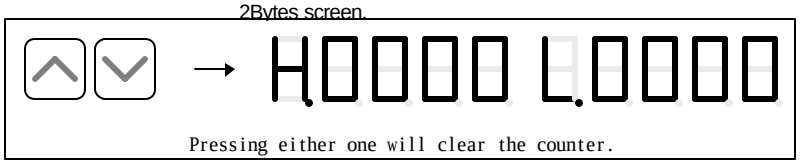
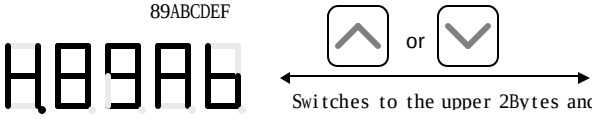
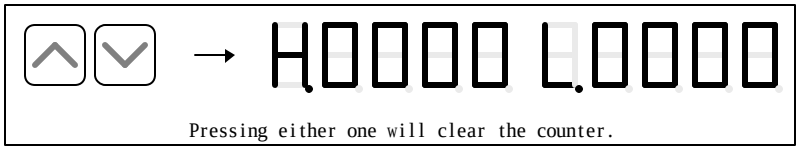
The parameter display methods are shown in the table below.

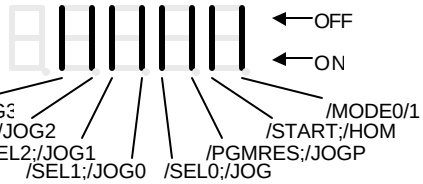
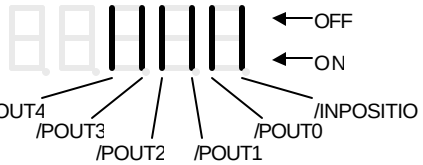
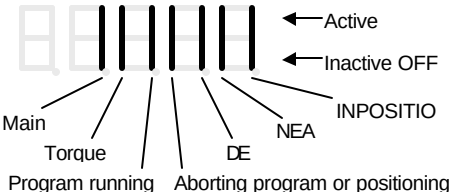
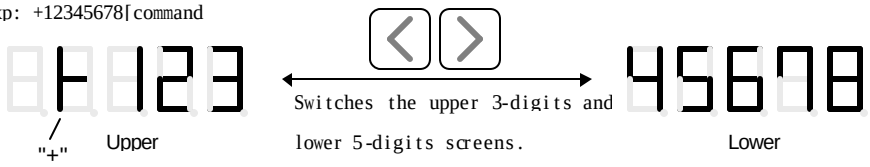
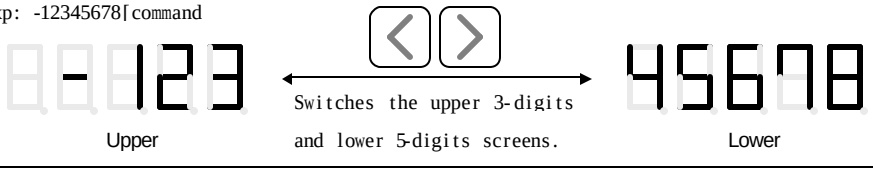
Number Type	Display Method
5-digit Decimal	Exp:
4-digit Hexadecimal	Exp.: This display is a parameter ir units of digits. For example, if Pn000.0 is stated, this indicates the last digit at the bottom of Pn000.
8-digit Decimal	Exp:  Switches the upper 3-digits and lower 5-digits screens Upper Lower
8digit Signed Decimals	Exp:  Switches the upper 3-digits and lower 5-digits screens "+" Upper Lower

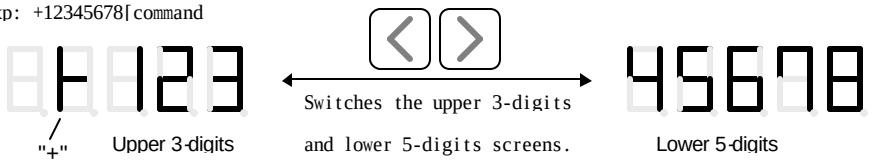
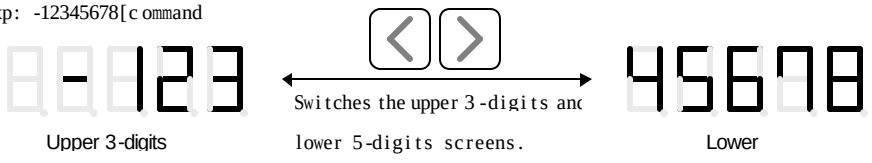
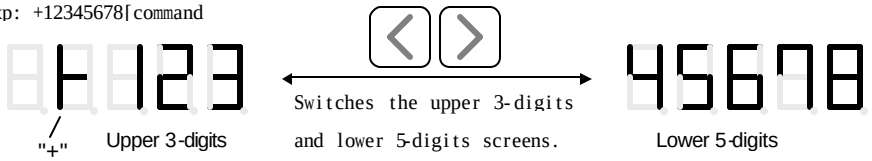
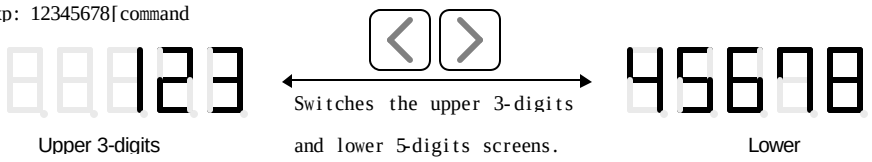
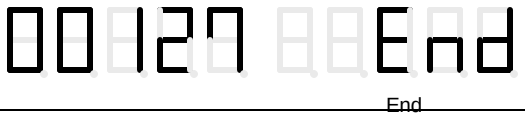
5. Monitor Screen

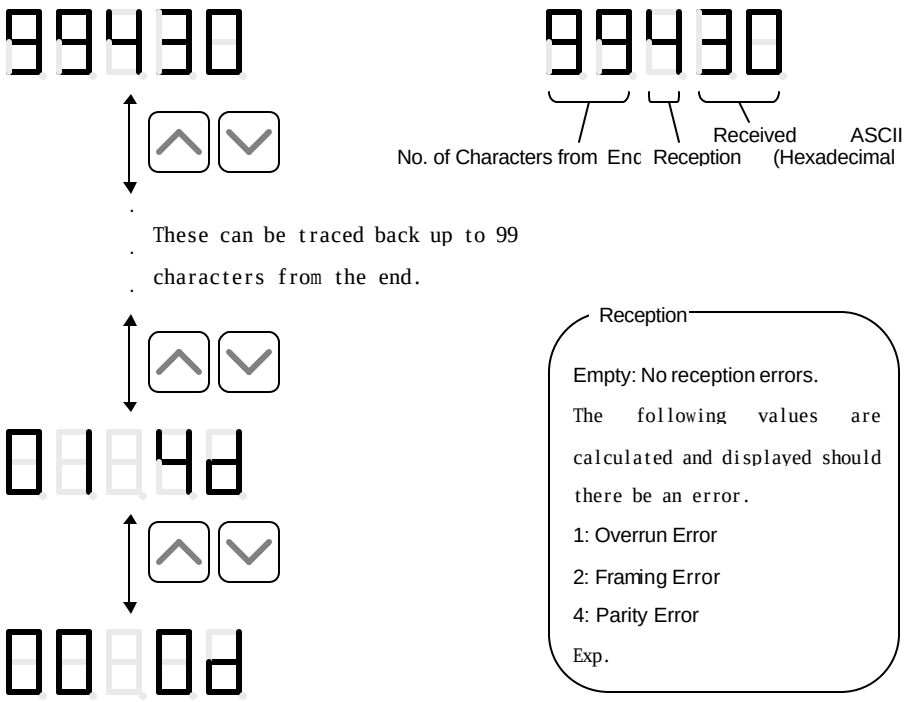


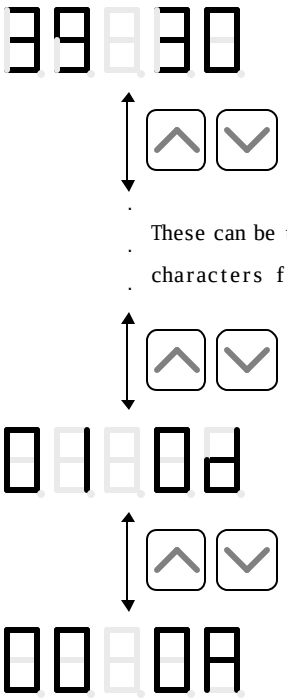
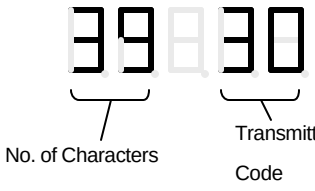
Monitor Number	Monitor Content	Example
Un000	Motor Speed [rpm]	Exp: Displays the motor speed.
Un002	Torque [%]	Exp: Displays the torque. Displays as a percentage [%] of rated torque.
Un003	No. of Speed Pulses	Exp: Displays the number of encoder pulses counted from the start of the encoder C-phase.
Un004	Electrical Angle [deg]	Exp: Displays the electrical angle of the motor.
Un005	SGDH Input Signal (CN1)	Exp Displays whether each signal is ON/OFF. The ON/OFF logic is the input photocoupler ON/OFF state. 
Un006	SGDH Output Signal	Exp Displays whether each signal is ON/OFF. The ON/OFF logic is the output photocoupler ON/OFF state. 
Un007	Reference Speed [rpm]	Exp: Displays the reference speed of the position reference.
Un008	Position Deviation [Command Unit]	Exp: 6250[command SAt Displays the position deviation. Displays "SAt" when ±9999 us exceeded.

Monitor Number	Monitor Content	Example
Un009	Cumulative Load Factor	Exp: Displays the operating torque at 10sec intervals. Displays as a percentage [%] of rated torque.
Un00A	Regenerative Load Factor	Exp: Displays the power consumption of the regen resistor at 10sec intervals.
Un00B	DB Load Factor [%]	Exp: Displays the power consumption of the dynamic brake at 10sec intervals. Displays as a percentage [%] of allowable dynamic brake power consumption.
Un00	Position Reference Counter	Displays the position reference counter used in the monitor. Exp:01234567[Command  or Switches to the upper 2Bytes and lower 2Bytes screen. Upper 2 Lower 2  Pressing either one will clear the counter.
Un00	Encoder Pulse Counter [Pulses]	Displays the encoder pulse counter used in the monitor. Exp: 89ABCDEF  or Switches to the upper 2Bytes and lower 2Bytes screen. Upper 2 Lower 2  Pressing either one will clear the counter.

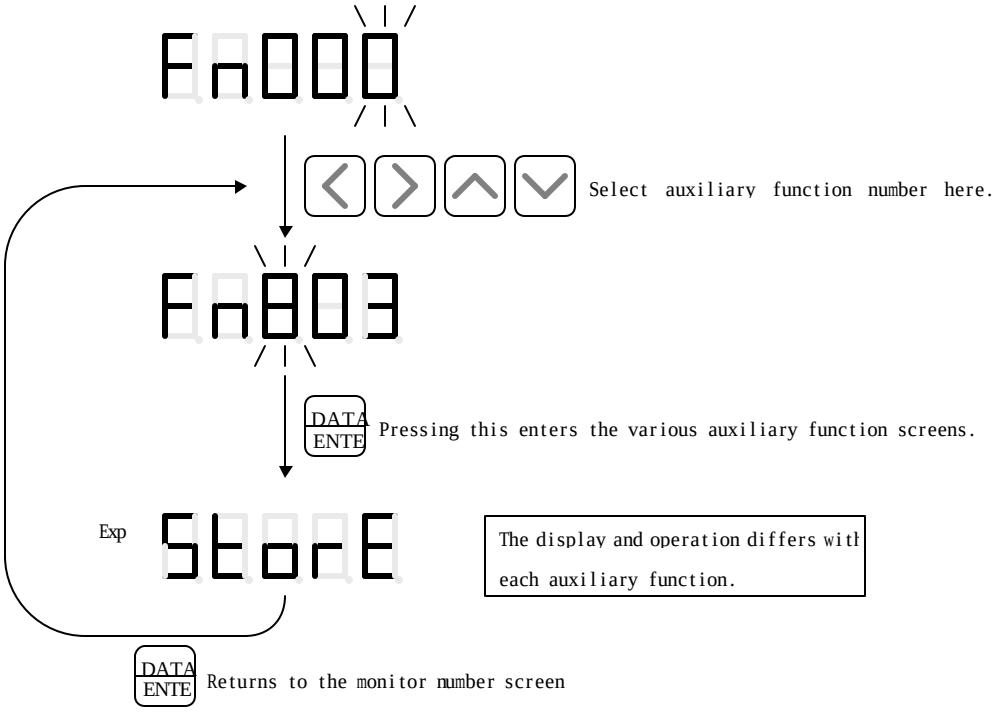
Monitor Number	Monitor Content	Example
Un800	Error	Exp: none Displays the most recently occurred error. Displays "none" if no errors have ever occurred.
Un801	NS600 Input Signal (CN4)	Exp Displays whether each signal is ON/OFF. The ON/OFF logic is the input photocoupler ON/OFF state. 
Un802	NS600 Output Signal	Exp Displays whether each signal is ON/OFF. The ON/OFF logic is the input photocoupler ON/OFF state. 
Un803	Status Flag	Exp Displays various flags showing the status. 
Un804	Current Position of Position Reference	Displays the reference speed of the current position. Exp: +12345678[command 
Un805	Current Position of Motor	Displays the reference speed of the motor. Exp: -12345678[command 

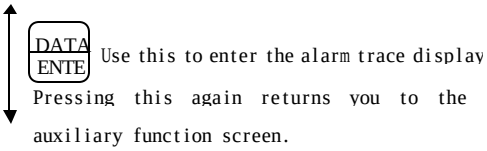
Monitor Number	Monitor Content	Example
Un806	Positioning Target Position [Command Unit]	Displays the positioning target. Exp: +12345678[command 
Un807	Positioning Distance [Command Unit]	Displays the distance from the positioning start to the target position. Exp: -12345678[command 
Un808	Registration Target Position [Command Unit]	Displays the registration target position fixed by latching. Exp: +12345678[command 
Un809	Registration Distance [Command Unit]	Displays the registration distance. Exp: 12345678[command 
Un80A	Program Step	Exp:  Displays the currently executed program step. Displays "End" when no program is being executed.
Un80B	EVENT Time Progress Status [msec]	Exp: Displays the progress state during a program (Index) table event.
Un80	LOOP Execution Progress Status [Times]	Exp: Displays the progress state for a program (Index) table LOOP.

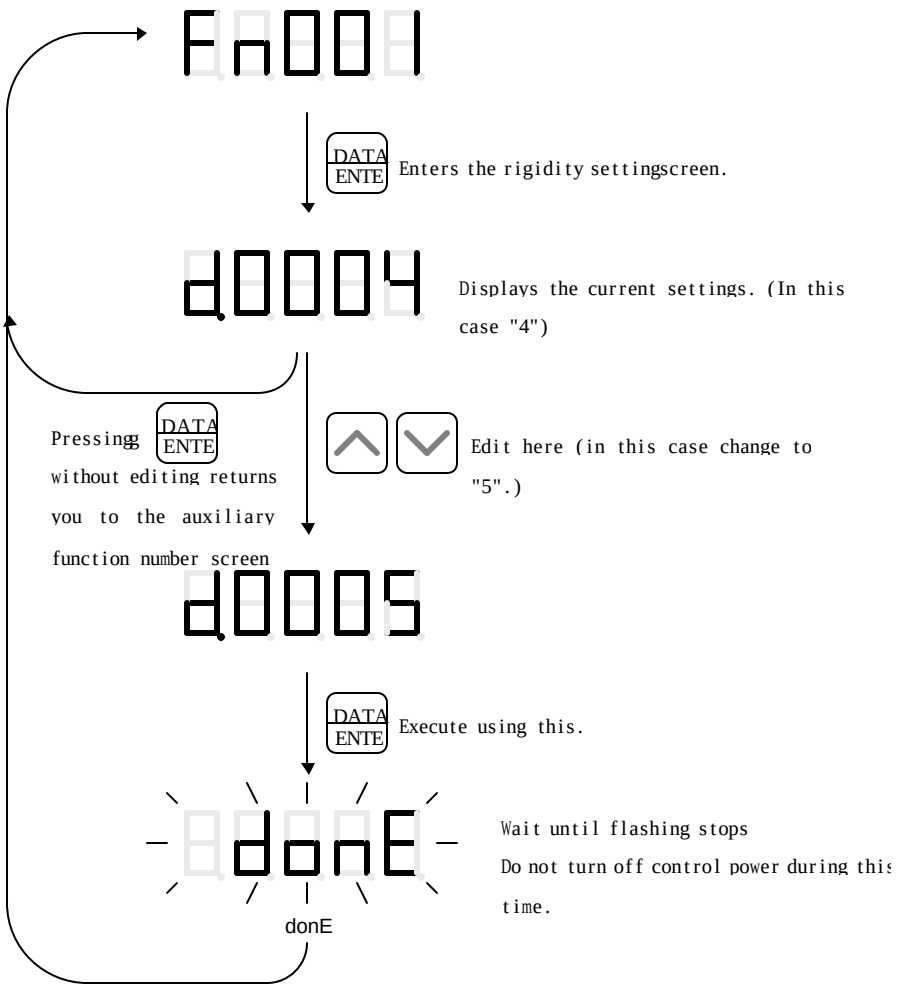
Monitor Number	Monitor Content	Example
Un80	Serial Communication	Shows the history of characters received in serial communication. Exp 
Un80E	Serial Communication	Exp.: 5 Shows the number of characters received in serial communication.
Un80F	Serial Communication	Exp.: 1 Shows the number of characters which resulted in reception errors in serial communication.

Monitor Number	Monitor Content	Example
Un810	Serial Communication	Shows the history of characters transmitted in serial communication. Exp.   No. of Characters Transmitted Code ASCII These can be traced back up to 39 characters from the end.
Un811	Serial Communication	Exp.: 17 Shows the number of characters transmitted in serial communication.

6. Auxiliary Function Execution Screen



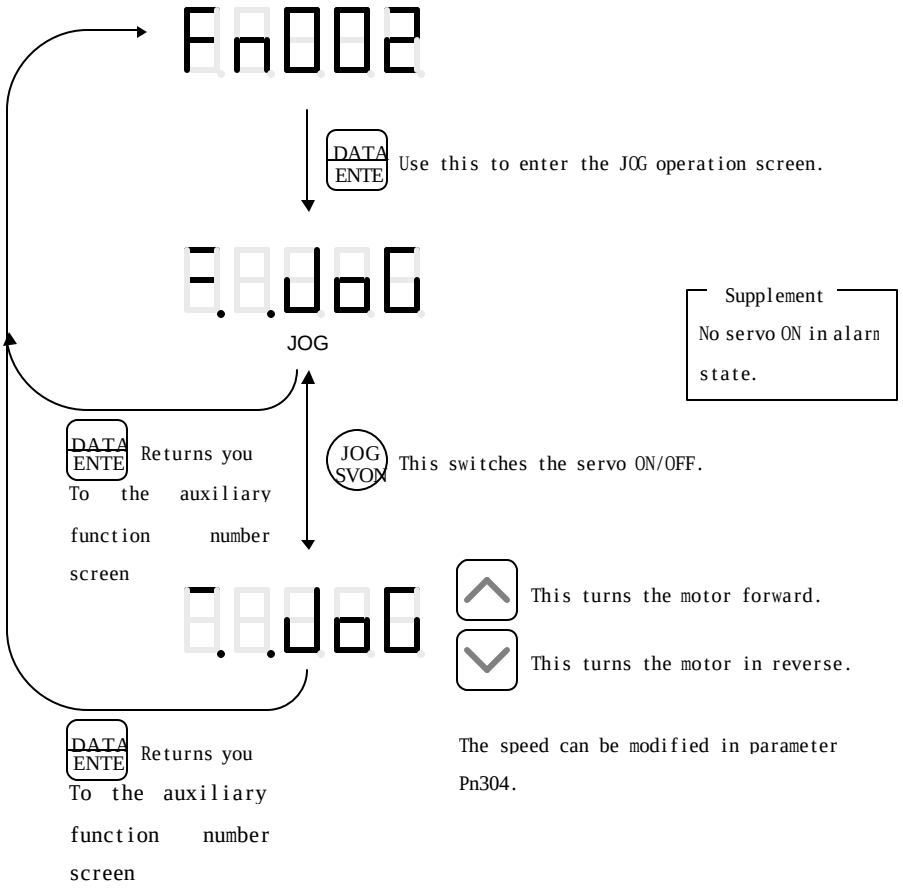
Auxiliary Number	Function	Example
Fn000	Alarm Trace Display	Displays the history of previously generated alarms.  Exp These can be traced backup to nine instances. none Displays "none" if there is no alarm.

Auxiliary Number	Function	Example
Fn001	Rigidity Setting	This sets the machine rigidity. Upon execution, this updates the parameters Pn100, Pn101, Pn102, Pn401, and stores the data in the EEPROM. 

Auxiliary Number	Function	Example
Fn002	JOG Operation	Performs JOG operation.

Note

P-OT, N-OT, P-LS, N-LS (Forward or reverse prohibition by signal or parameter) are disabled during JOG operation.



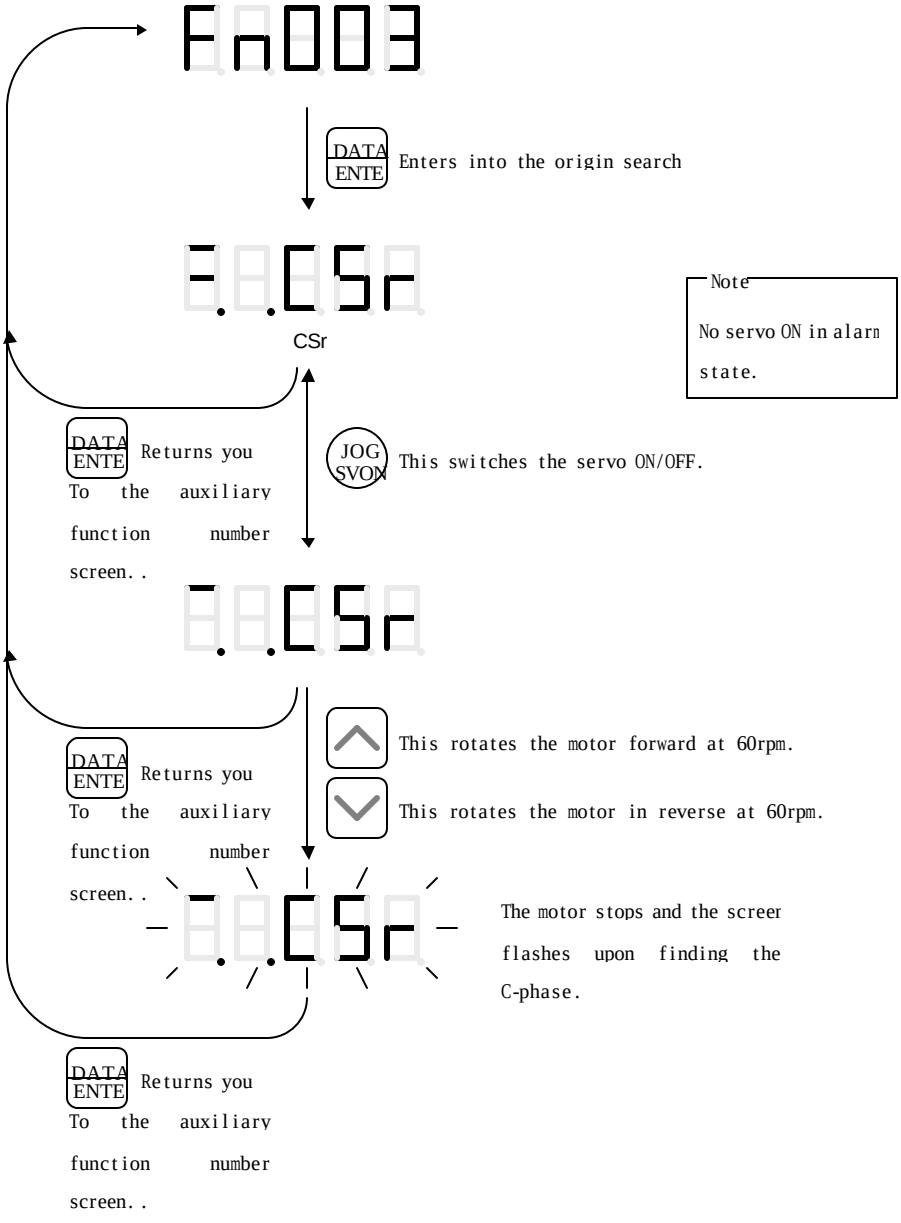
Common error

Display	Meaning
E5AE	E5AE: "Unexecutable in servo ON state" error Cannot be executed while servo is ON. Turn servo OFF and try again.
E5CE	E5CE: "Unexecutable with main power OFF" error Cannot be executed while main power is OFF. Turn main power ON and try again.
E5EE	E5EE: "Unexecuteable while program is running" error. Execution is not possible as the program is running or has been aborted.

Auxiliary Number	Function	Example
Fn003	Origin Search	Turn the motor and search for the C-phase.

⚠ Note

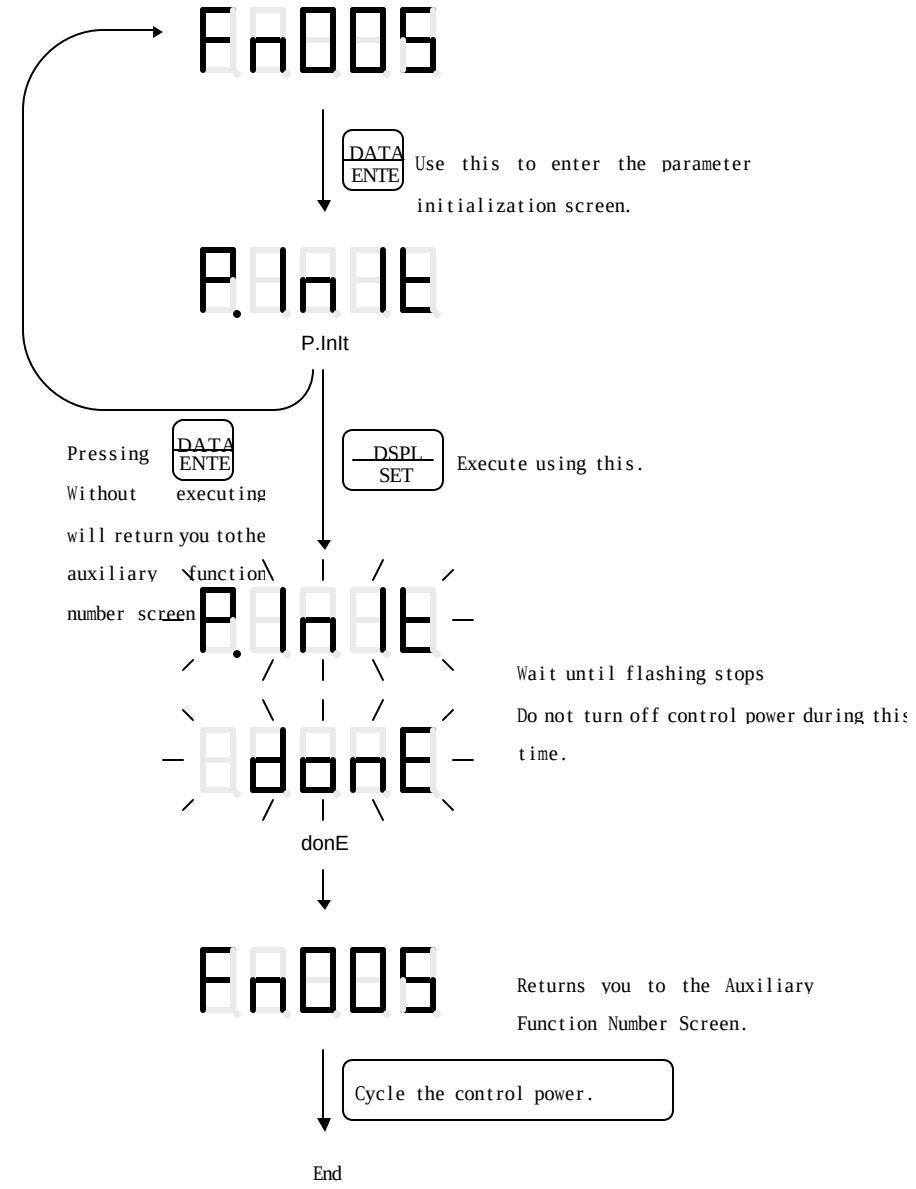
P-OT, N-OT, P-LS, N-LS (Forward or reverse prohibition by signal or parameter) are disabled during origin search.



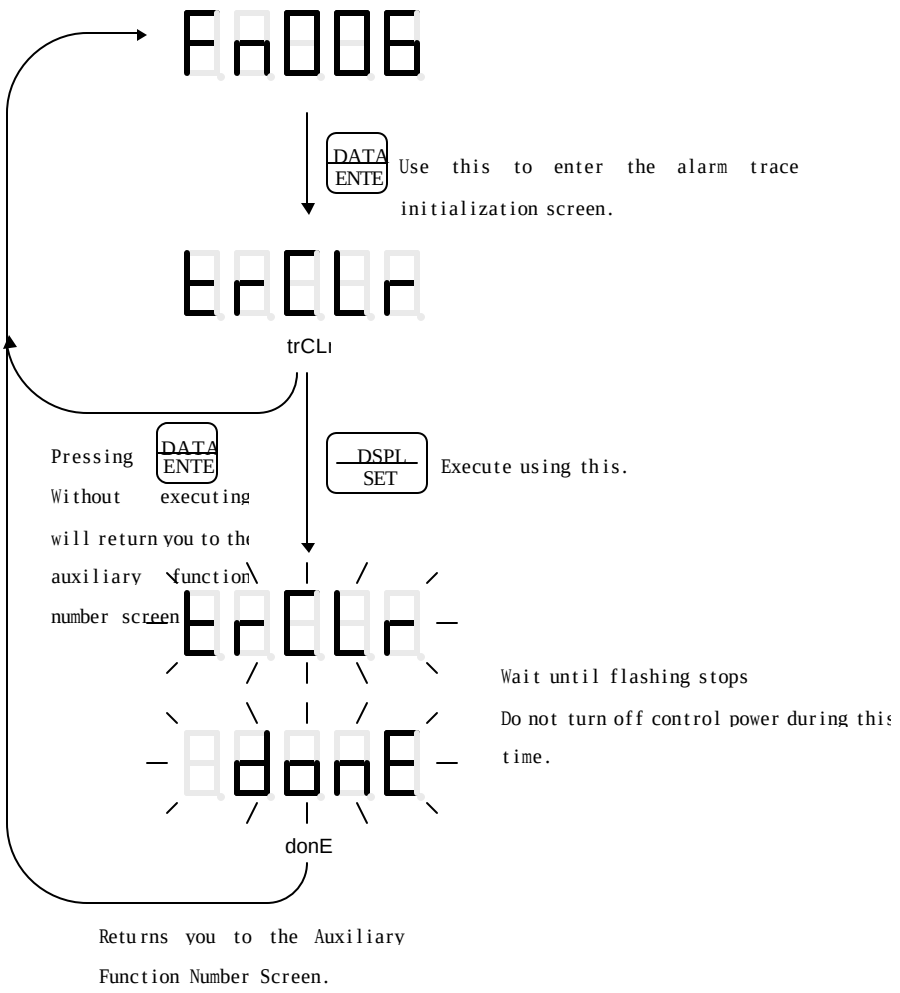
Common errors

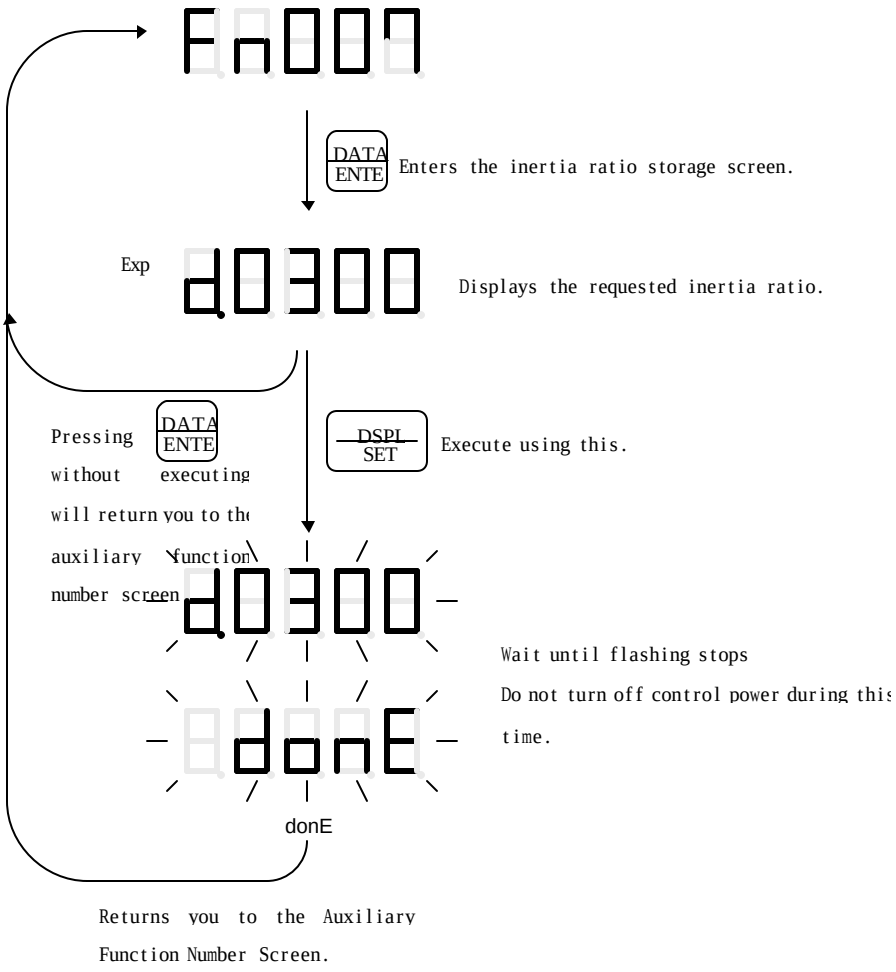
Display	Meaning
	E5AE: "Unexecutable in servo ON state" error Cannot be executed while servo is ON.

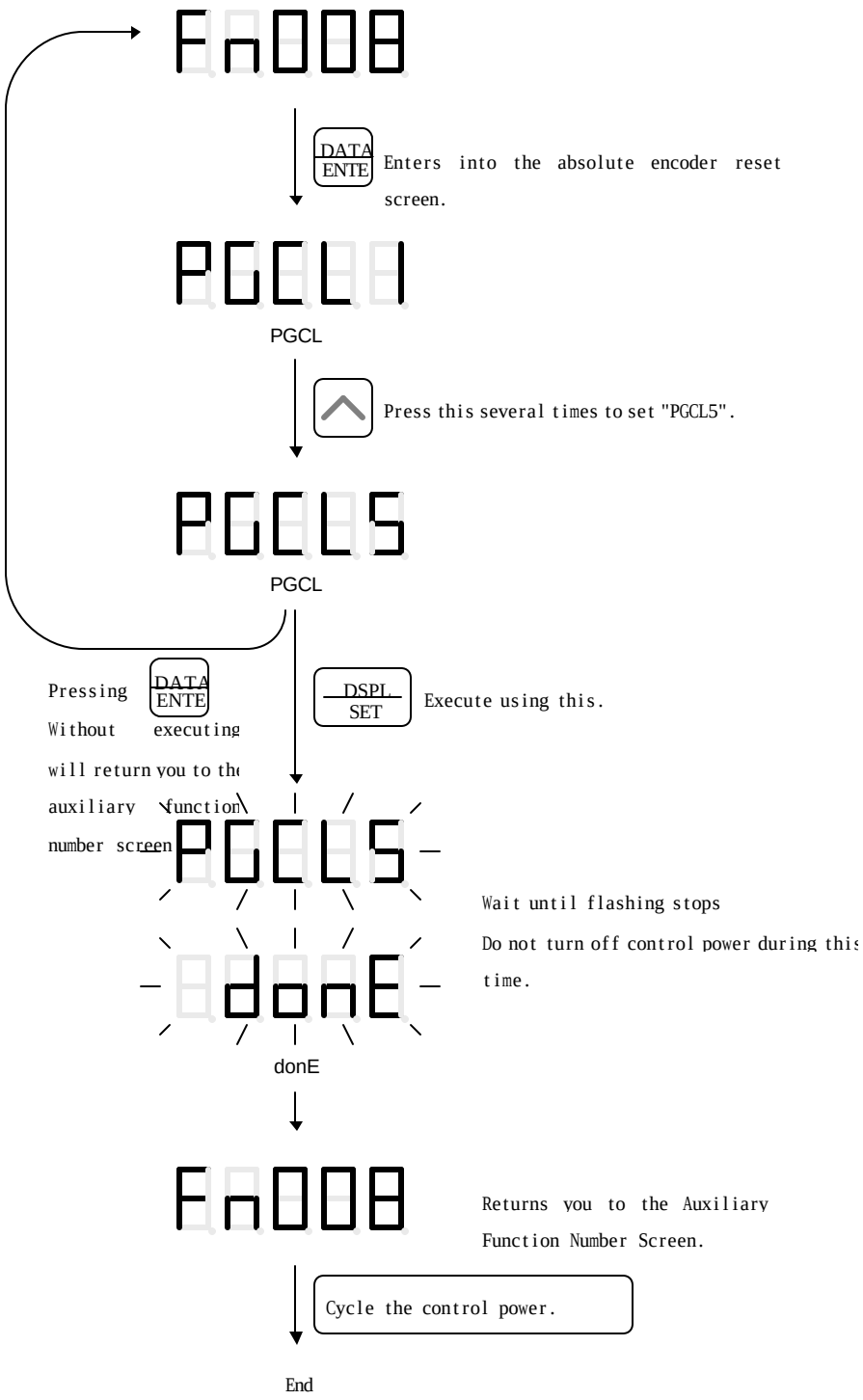
	E5CE: "Unexecutable with main power OFF" error. Cannot be executed while main power is OFF. Turn main power ON and try again.
	E5EE: "Unexecuteable while program is running" error. Execution is not possible as the program is running or has been aborted. Try again after resetting program execution.

Auxiliary Number	Function	Example
Fn005	Parameter Initialization	Initializes the parameters and returns to the factory settings. Important Always displayed in the servo OFF state.  Common errors Display: E5AE Meaning: E5AE:"Unexecutable in servo ON state" error. Cannot be executed while servo is ON. Turn servo OFF and try again.

Auxiliary Number	Function	Example
Fn006	Alarm Trace Initialize	Clears the history of previously generated alarms.

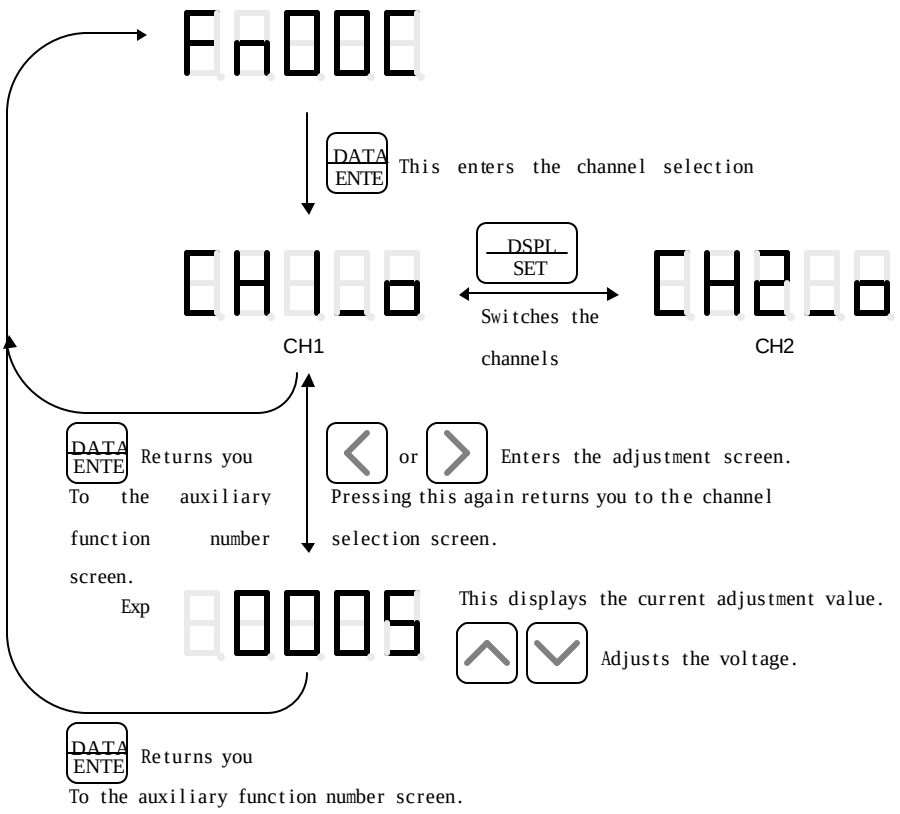


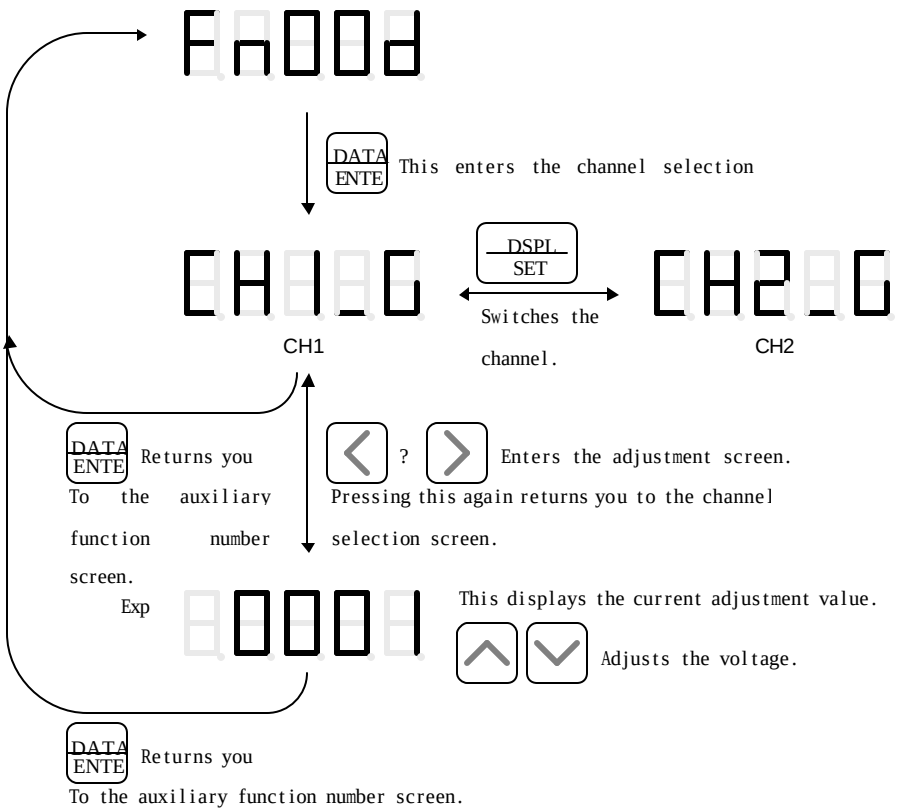
Auxiliary Number	Function	Example
Fn007	Store Inertia Ratio	Saves the inertia ratio requested in online autotuning into the parameters. When executed, it updates the inertia ratio requested in parameter Pn103 and stores it in the EEPROM. 

Auxiliary Number	Function	Example
Fn008	Absolute Encoder Reset	Resets the absolute encoder and clears the recorded position data. Perform in the following situations. At first machine start-up When an encoder back-up alarm occurs When the encoder cable is disconnected 

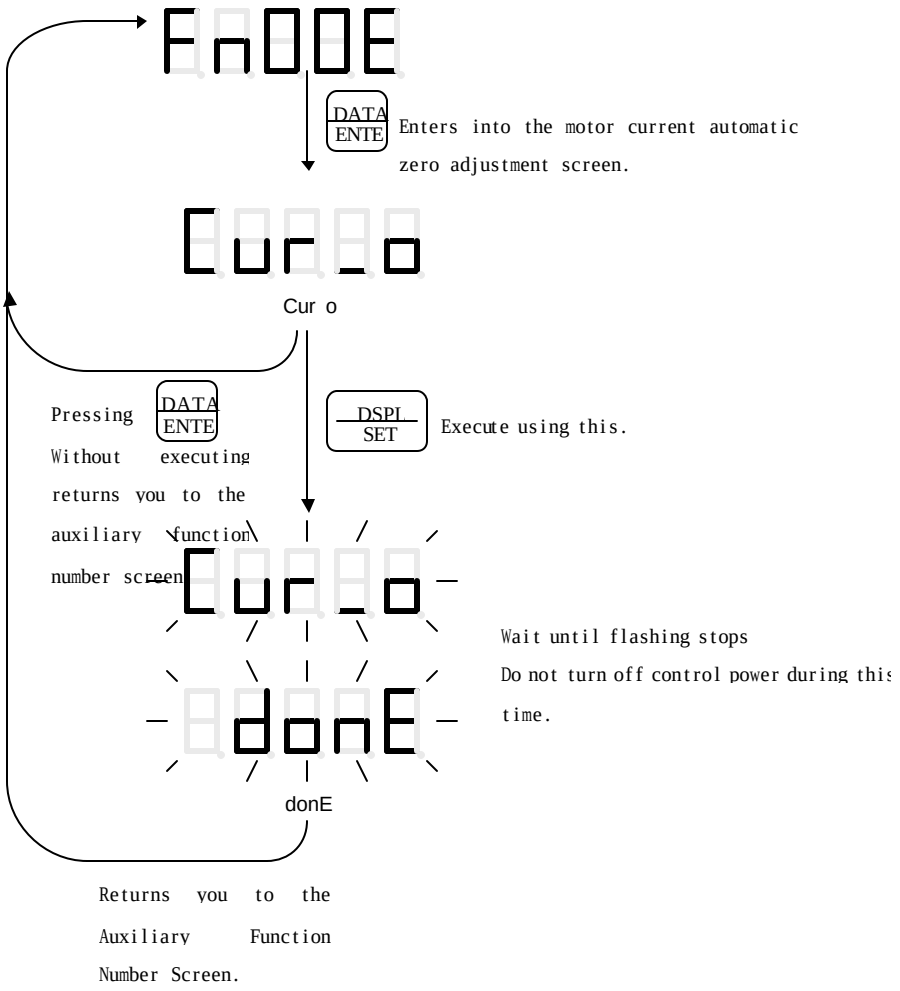
Common errors

Display	Meaning
	E5AE: "Unexecutable in servo ON state" error Cannot be executed while servo is ON. Turn servo OFF and try again.
	E61E: Encoder Mismatch Error Cannot be executed without absolute encoder.
 nO	Improper operation. Try again.

Auxiliary Number	Function	Example
Fn00C	Analog Monitor Zero Adjustment	Executes analog monitor (offset voltage) zero adjustment. 

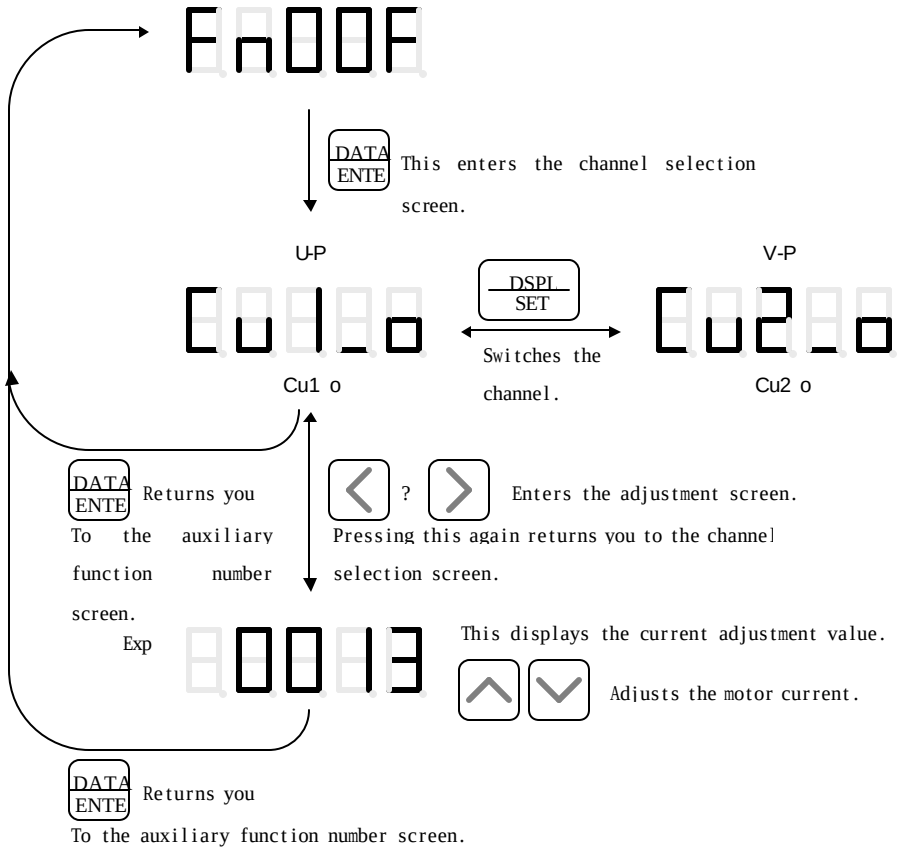
Auxiliary Number	Function	Example
Fn00D	Analog Monitor Gain Adjustment	Performs gain adjustment on analog monitor. 

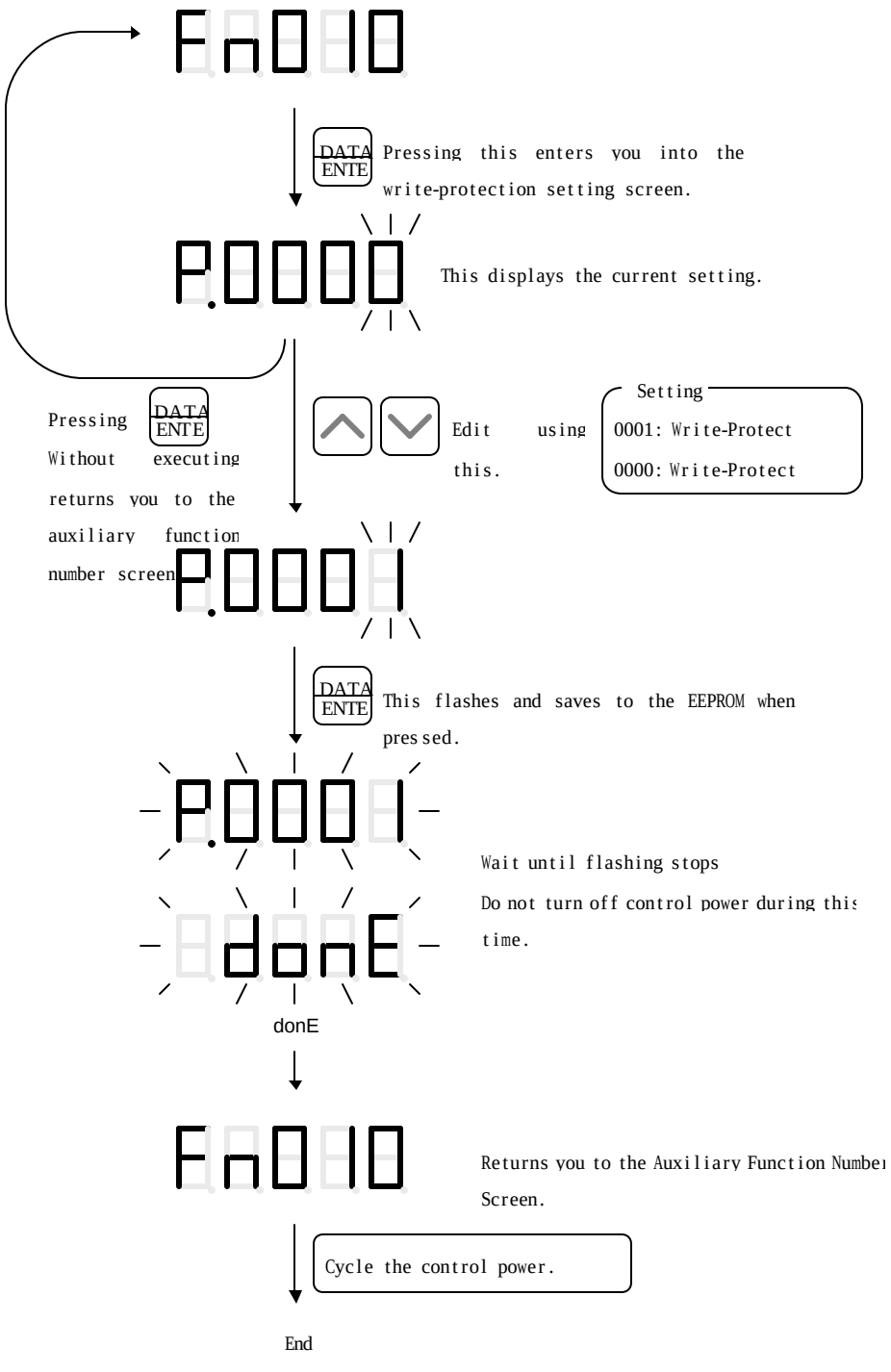
Auxiliary Number	Function	Example
Fn00E	Motor Current Automatic Zero	Executes automatic motor current (offset current) zero adjustment. Because the offset adjustment for the motor current detection signal is adjusted prior to delivery by Yaskawa, it is normally not necessary for the customer to make adjustments. Use this only when the torque ripple based on the current offset is believed to be producing an excessive error, or when more precision is needed to further decrease the torque ripple. Important: Careless execution of this function can lead to degradation of the performance characteristics. Perform this only if the torque ripple occurrences are obviously larger than in other servo amplifiers.

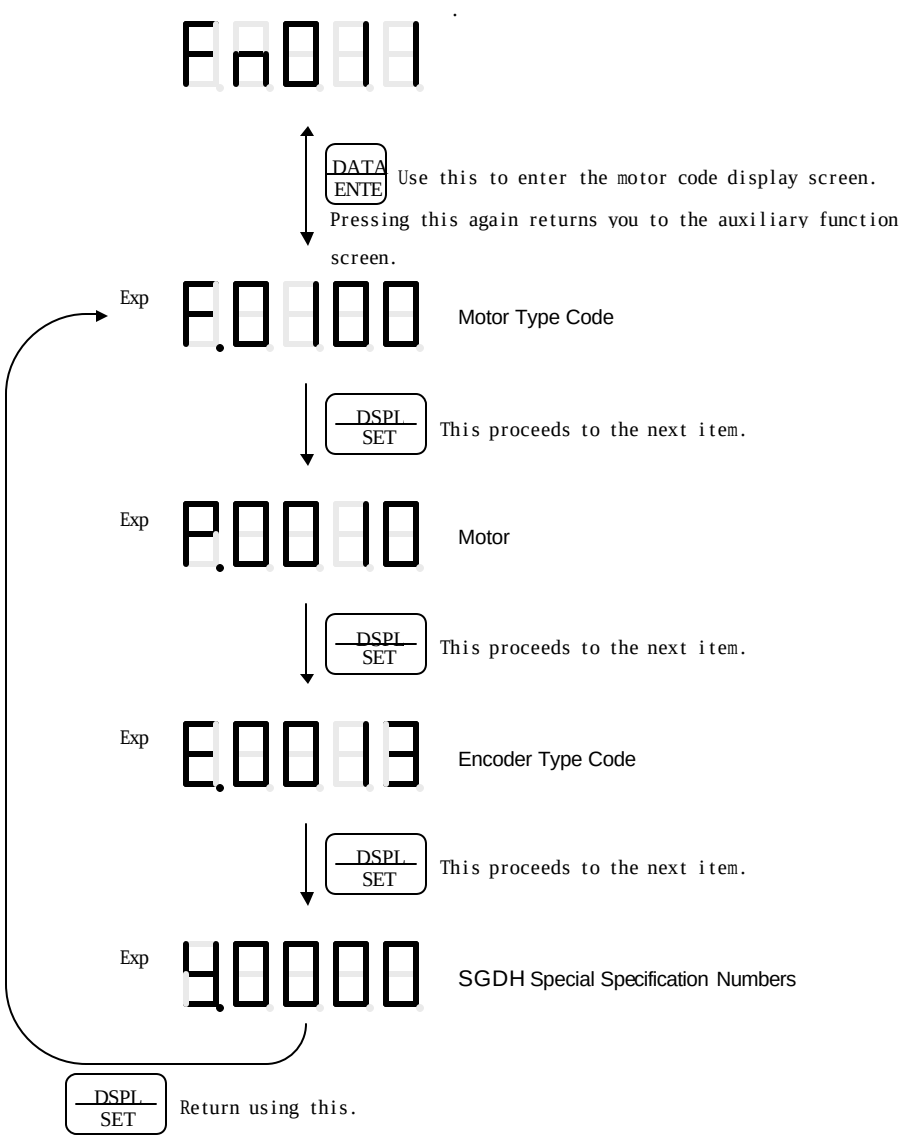


Common errors

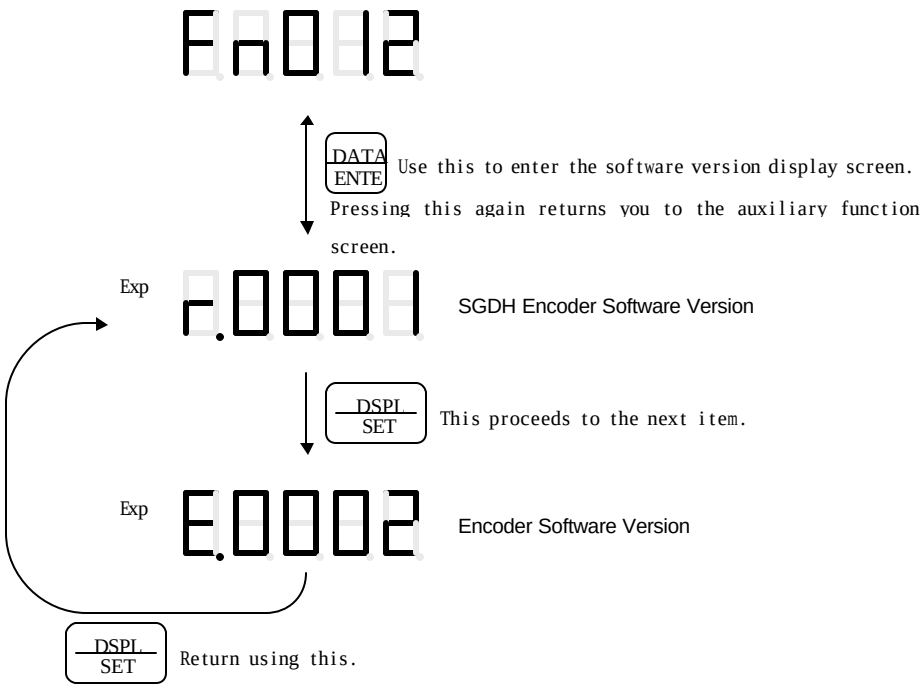
Display	Meaning
	E5AE: "Unexecutable in servo ON state" error Cannot be executed while servo is ON. Turn servo OFF and try again.
	E5CE: "Unexecutable with main power OFF" error Cannot be executed while main power is OFF. Turn main power ON and try again.

Auxiliary Number	Function	Example
Fn00F	Motor Current Manual Zero	Executes manual motor current (offset current) zero adjustment. Because the offset adjustment for the motor current detection signal is adjusted prior to delivery by Yaskawa, it is normally not necessary for the customer to make adjustments. Use this only when the torque ripple based on the current offset is believed to be producing an excessive error, or when more precision is needed to further decrease the torque ripple. Important Careless execution of this function can lead to degradation of the performance characteristics. If the torque ripple occurrences are obviously larger than in other servo amplifiers, then perform automatic offset adjustment (Fn00E). Important During manual adjustment, rotate the motor at about 100rpm, and adjust so that the ripple in the torque monitor is minimized. It is necessary to well balance the motor U-phase current and V-phase current offset. Perform the adjustment on both sides 

Auxiliary Number	Function	Example
Fn010	Write Protection	Sets write protection. When write protected. the program (index) table, ZONE table, JOG speed table, and parameters cannot be changed, and incomplete auxiliary functions cannot be executed. 

Auxiliary Number	Function	Example
Fn011	Motor Type Code Display	Displays the motor type code, encoder type code, and SGDH special specification numbers. 

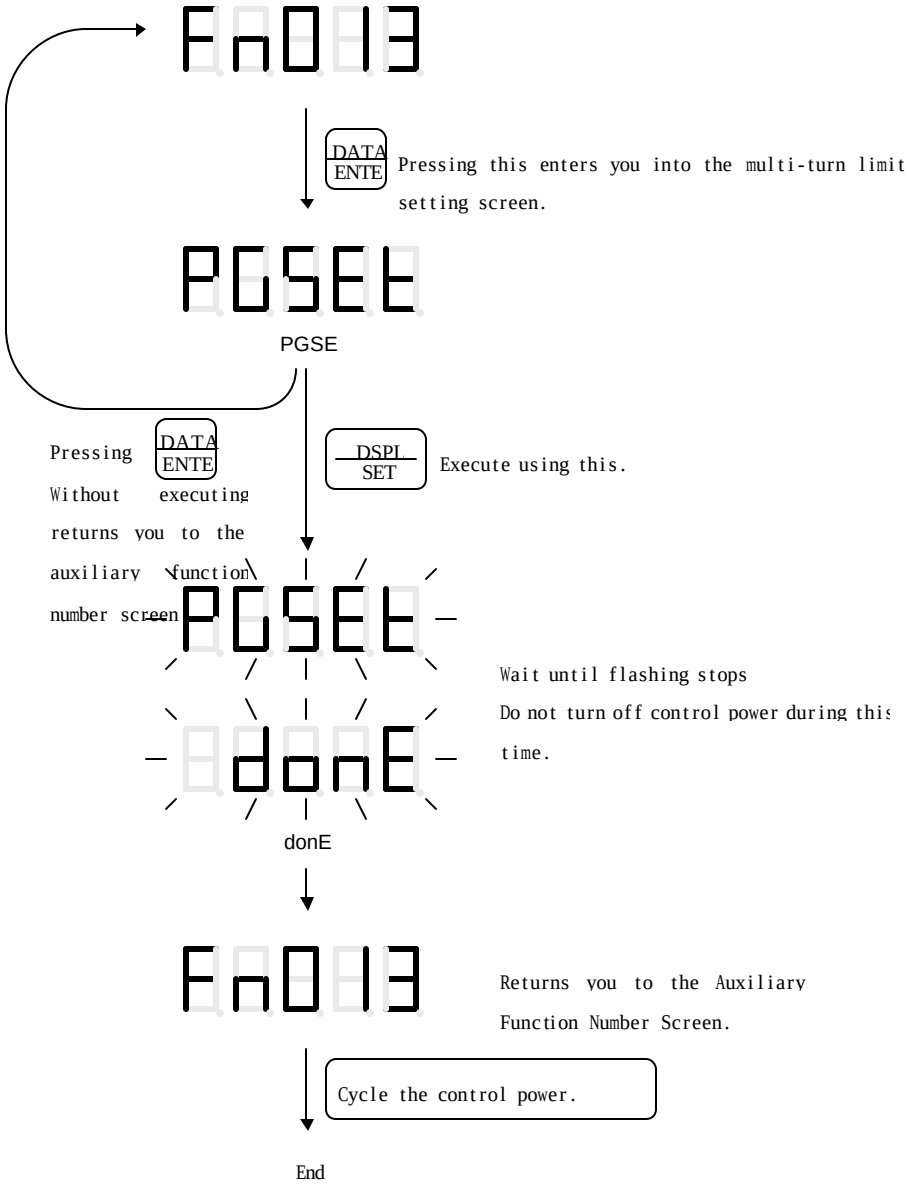
Auxiliary Number	Function	Example
Fn012	SGDH Software Version Display	Displays the SGDH and Encoder software versions.



Auxiliary Number	Function	Example
Fn013	Multi-Turn Limit Setting	Sets the multi-turn limit. Upon execution, updates the maximum multi-turn limit stored in the absolute encoder to the value in Pn205.

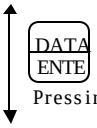
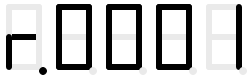
⚠ Danger

- **Multi-turn limit change is not necessary in application performing linear operation. It is dangerous to carelessly operate this function.**
- **If a multi-turn limit non-coincidence error is generated, always check first whether the servo amplifier parameter Pn205 is correct. Operating Fn013 with an incorrect value in Pn205 results in incorrect values being set into the encoder. Although no alarm will result, large position deviations will be detected, and there is a risk of the machine moving to an unmeasured position.**



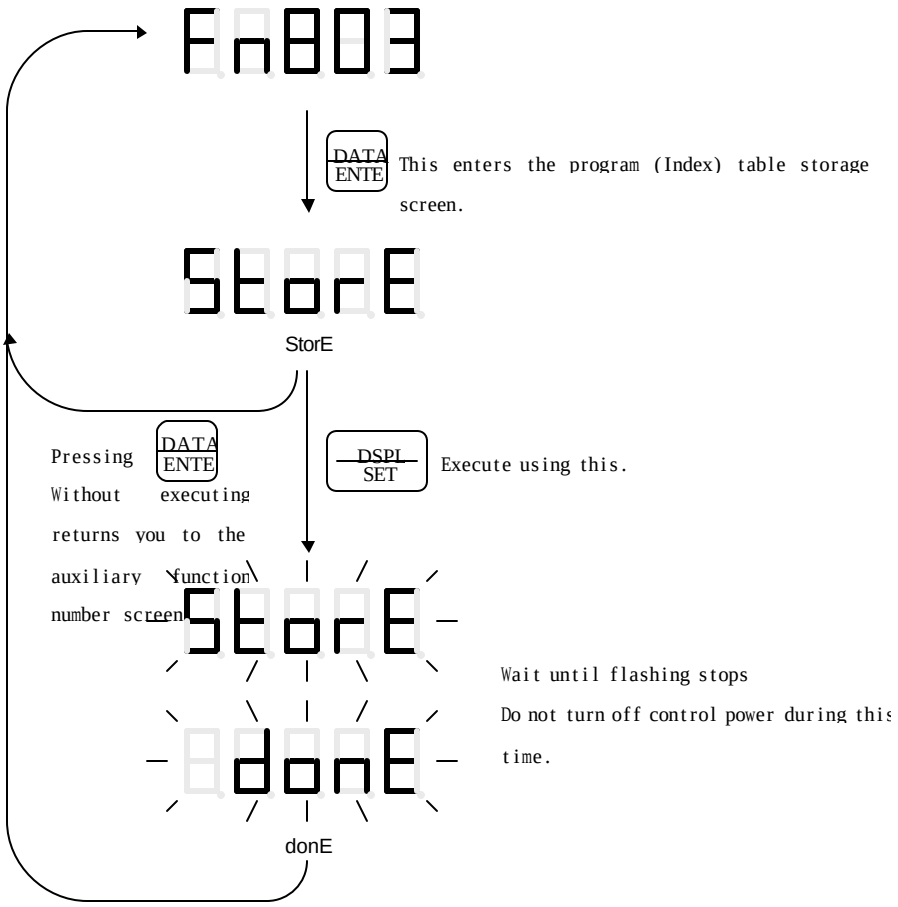
Common errors

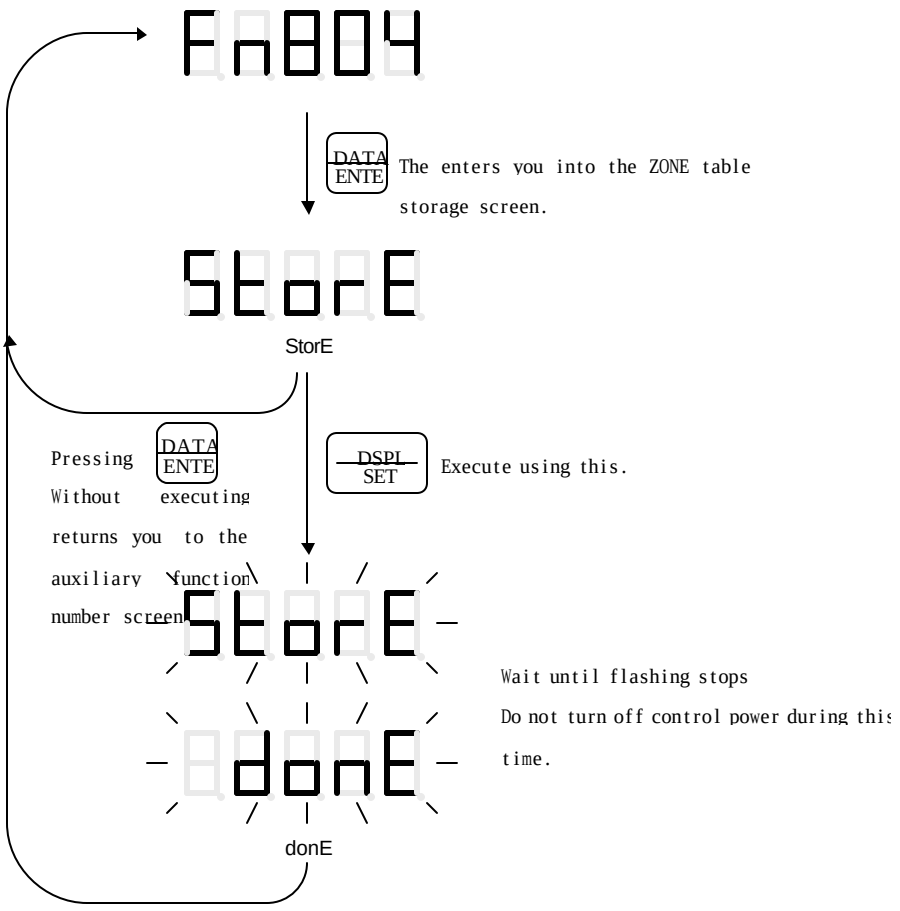
Display	Meaning
	E61E: Encoder Mismatch Error Cannot be executed without absolute encoder.
	E62E: "Unexecutable unless A.CC" error. Cannot be executed without alarm A.CC. Alarm A.CC occurs only when the multi-turn maximum value stored in the absolute encoder does not coincide with the value in parameter Pn205.

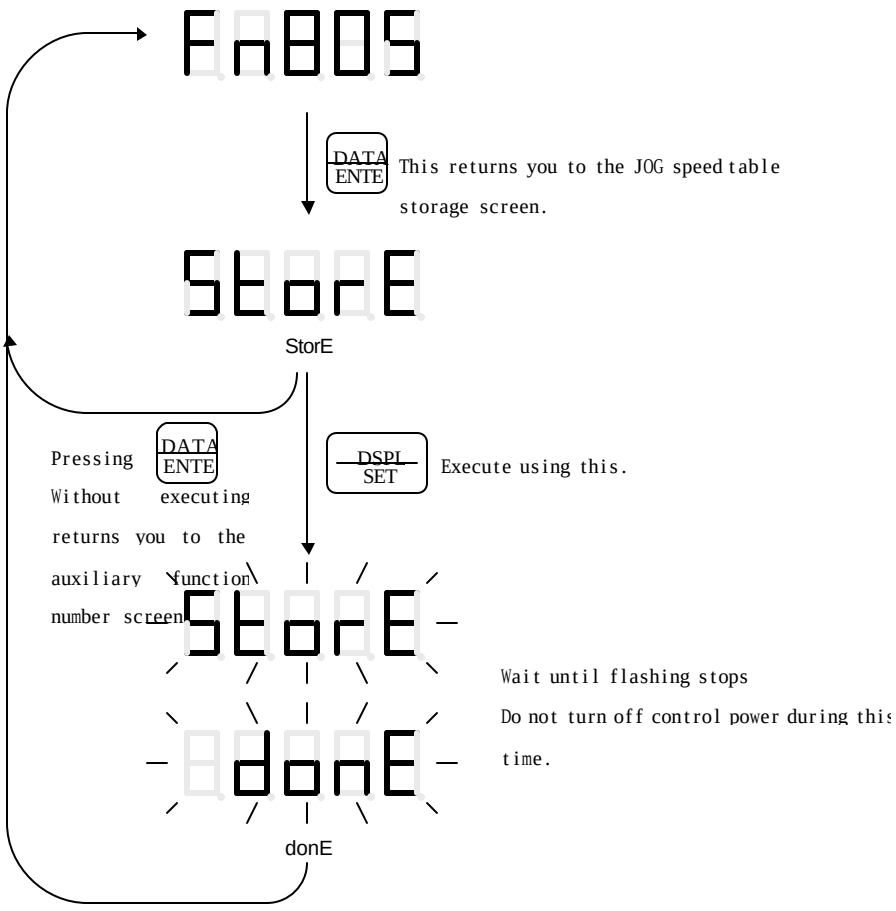
Auxiliary Number	Function	Example
Fn800	NS600 Software Version Display	Displays the NS600 software version.  DATA ENTE Use this to enter the software version display screen. Pressing this again returns you to the auxiliary function screen. Exp  Software Version

Auxiliary Number	Function	Example
Fn801	NS600 Device Codes Display	Displays NS600 device codes. Use this to enter the device code display screen. Pressing this again returns you to the auxiliary function screen. Device Codes

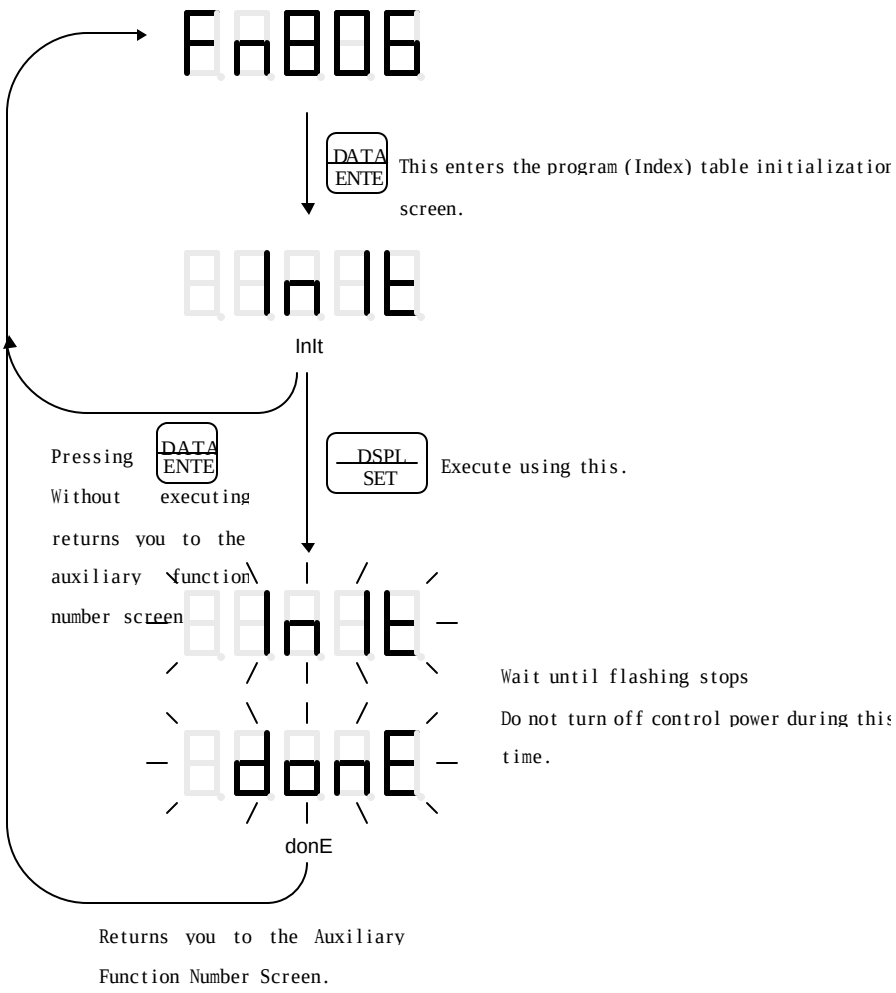
Auxiliary Number	Function	Example
Fn802	NS600 Special Specification	Displays NS600 special specification numbers. DATA ENTE This enters the special specification number display Pressing this again returns you to the auxiliary function screen. Exp Special Specification Number

Auxiliary Number	Function	Example
Fn803	Program (Index) Table Save	Saves the program (index) table. Upon execution, stores the program (Index) table on the RAM in the flash memory. The data stored in the flash memory remains even if power is cut off. 

Auxiliary Number	Function	Example
Fn804	ZONE Table Save	Stores the ZONE speed table. Upon execution, stores the ZONE speed table on the RAM in the flash memory. 

Auxiliary Number	Function	Example
Fn805	JOG Speed Table Save	Stores the JOG speed table. Upon execution, stores the JOG speed table on the RAM in the flash memory. The data stored in the flash memory remains even if power is cut off. 

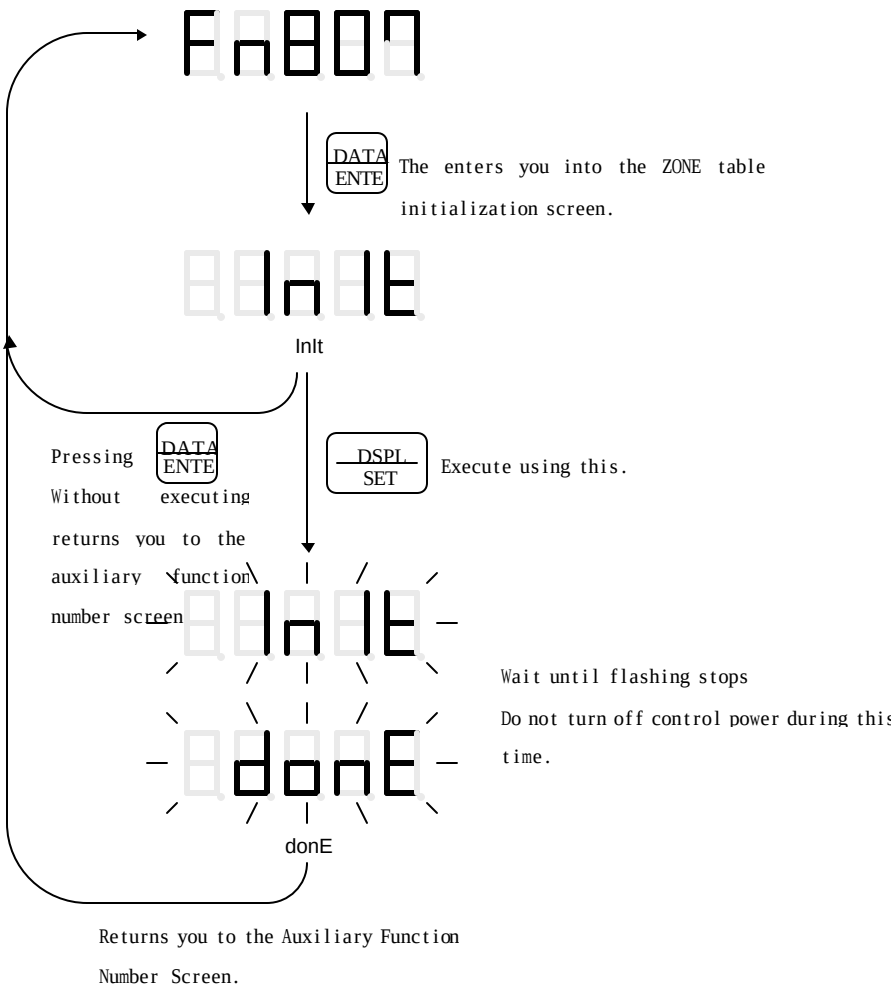
Auxiliary Number	Function	Example
Fn806	Program (Index) Table Initialize	This initializes the program (Index) table and returns to the factory settings.

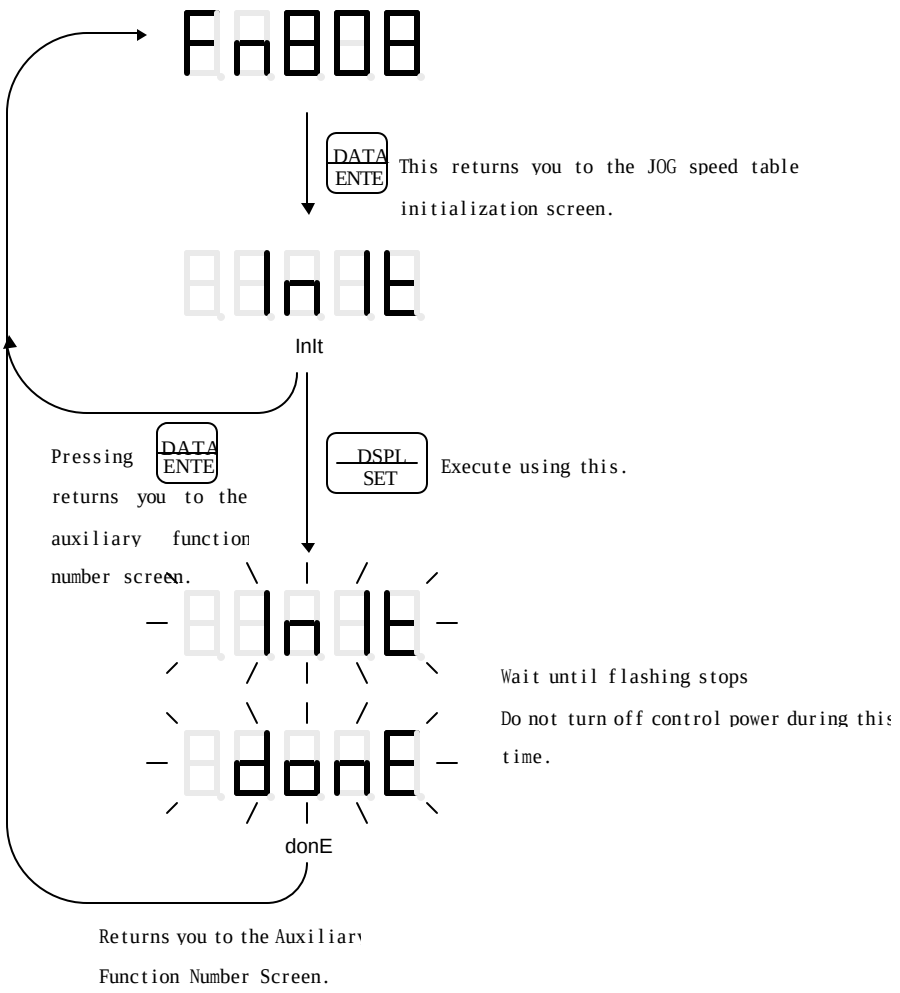


Common errors

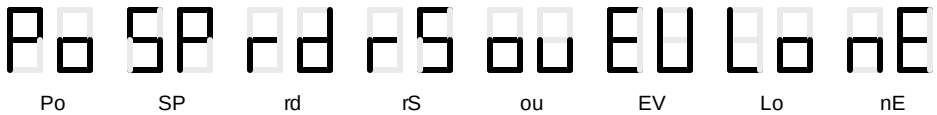
Display	Meaning
E5EE	E5EE: "Unexecuteable while program is running" error. Execution is not possible as the program is running or has been aborted.

Auxiliary Number	Function	Example
Fn807	ZONE Table Initialize	Initializes the ZONE table and returns to the factory settings.



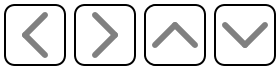
Auxiliary Number	Function	Example
Fn808	JOG Speed Table Initialize	Initializes the JOG speed table and returns to the factory settings. 

Displays each column with this symbol.

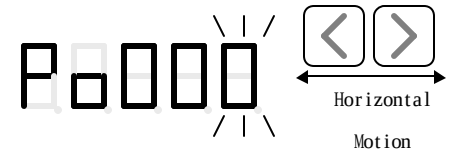


Po SP rd rS ou EV Lo nE

PGMSTE	POS	SPD	RDST	RSPD	POUT	EVENT	LOOP	NEXT
0	POS000	SPD000	RDST000	RSPD000	POUT000	EVENT00	LOOP000	NEXT000
1	POS001	SPD001	RDST001	RSPD001	POUT001	EVENT00	LOOP001	NEXT001
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
127	POS127	SPD127	RDST127	RSPD127	POUT127	EVENT12	LOOP127	NEXT127

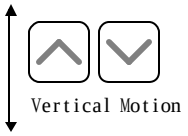


Moves between the rows and columns.

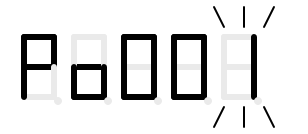


Po000 Horizontal Motion SP000

PGMSTE	POS	SPD
0	POS000	SPD000
1	POS001	SPD001



Vertical Motion



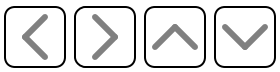
Po001

PGMSTE	POS	SPD
0	POS000	SPD000
1	POS001	SPD001

DATA ENTE This enters the setting editing screen. Return by pressing a second time.

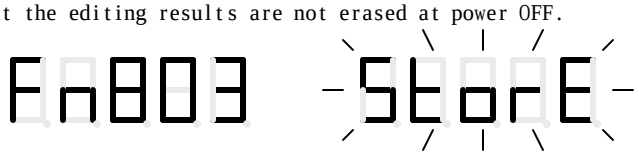
Exp

StoP



Edit using this.

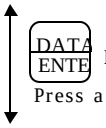
Execute Fn803 so that the editing results are not erased at power OFF.



Fn803 StorE

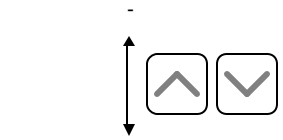
Display	Meaning
	E5EE: "Unexecuteable while program is running" error. The program (Index) table cannot be modified while the program is running or when aborted. Modify after resetting the program operation.

Column	Example
POS Positioning Target Position	

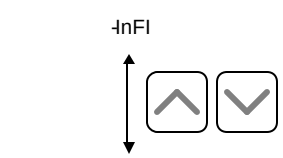


Enters the setting editing screen.
Press a second time to return.

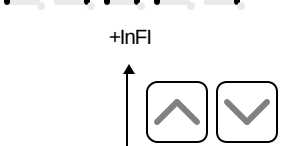
Set to " -"



Set to "INFINITE"

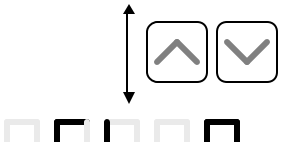


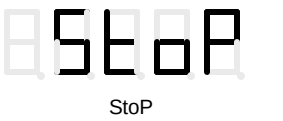
Set to "+INFINITE"



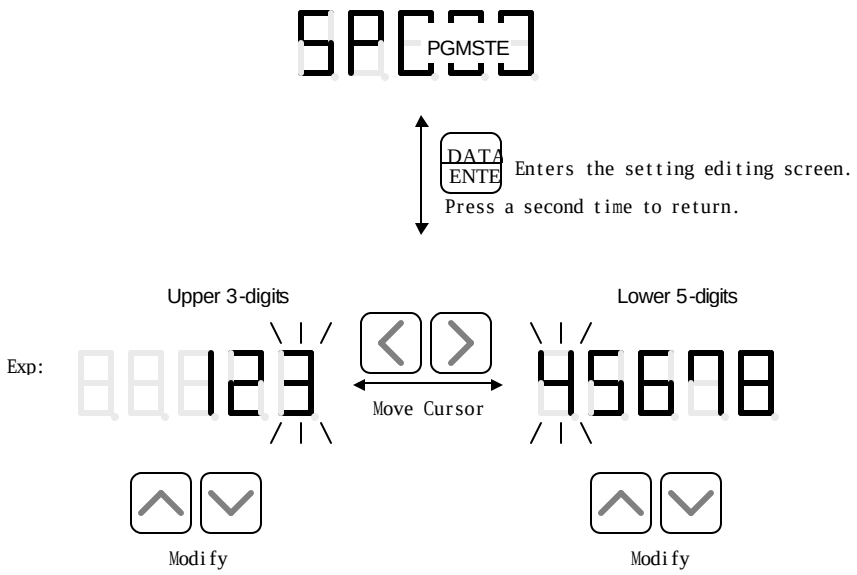
Exp.: Set to

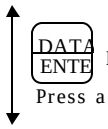
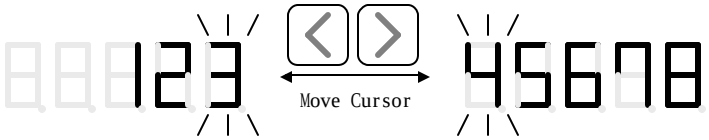
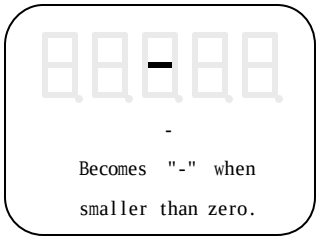
Exp.: Set to A+12345678

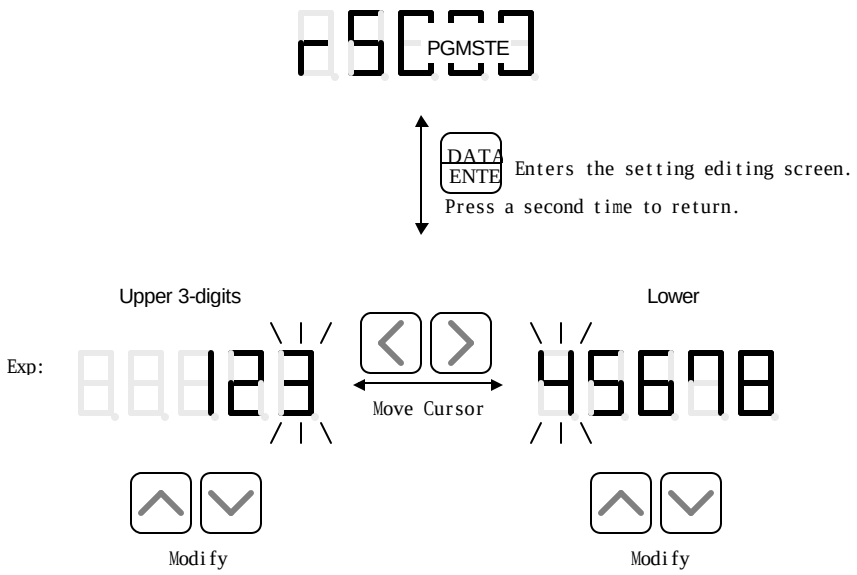


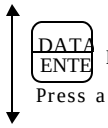
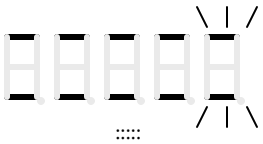
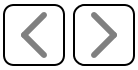


Set to "STOP"

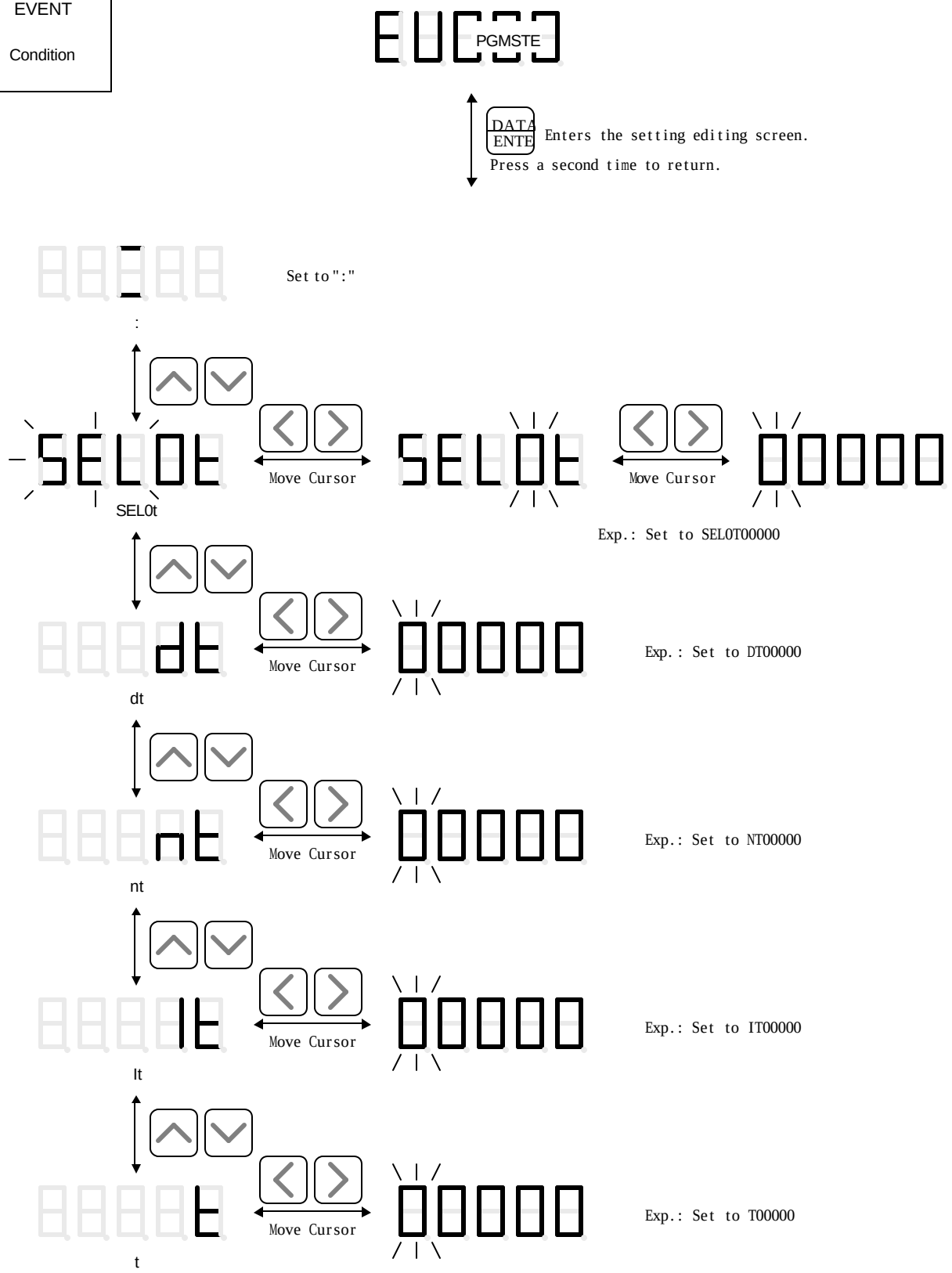
Column	Example
SPD Positioning Speed	

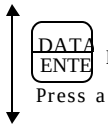
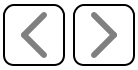
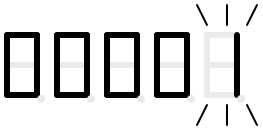
Column	Example
RDST Registration Distance	  Enters the setting editing screen. Press a second time to return. Upper 3-digits Lower 5-digits Exp:  Modify Modify  - Becomes "-" when smaller than zero.

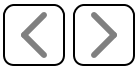
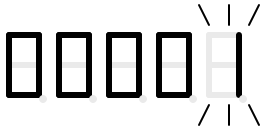
Column	Example
RSPD Registration Speed	

Column	Example
POUT Programmable Output Signal	  Enters the setting editing screen. Press a second time to return. Exp.:"::::  :::::  Move Cursor Set to ":" : Modify Setting Set to "Z" Z Modify Setting Set to "A" A Modify Setting Set to "n" n

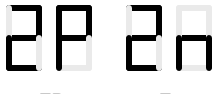
Column	Example
EVENT Condition	



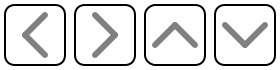
Column	Example
LOOP #. of Times Executed	  Enters the setting editing screen. Press a second time to return.  Move Cursor Exp:  Modify Setting

Column	Example
NEXT Next PGMSTEP executed	 Enters the setting editing screen. Press a second time to return.  Move Cursor Exp:  Modify Setting End Becomes "End" when smaller than zero.

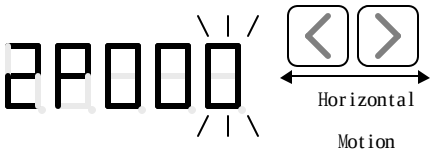
Displays each row with this symbol.



ZONE	ZONEP	ZONEN
0	ZONEP00	ZONEN00
1	ZONEP00	ZONEN00
.	.	.
.	.	.
.	.	.
31	ZONEP03	ZONEN03

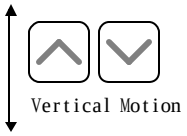


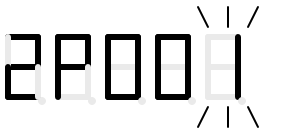
Moves between the rows and columns.



ZONE	ZONEP	ZONEN
0	ZONEP00	ZONEN00
1	ZONEP00	ZONEN00

ZONE	ZONEP	ZONEN
0	ZONEP00	ZONEN00
1	ZONEP00	ZONEN00



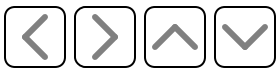


ZONE ? ?	ZONEP	ZONEN
0	ZONEP00	ZONEN00
1	ZONEP00	ZONEN00

This enters the setting editing screen. Return by pressing a second time.

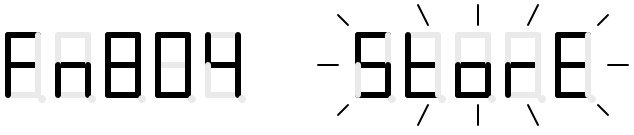
Exp

+000

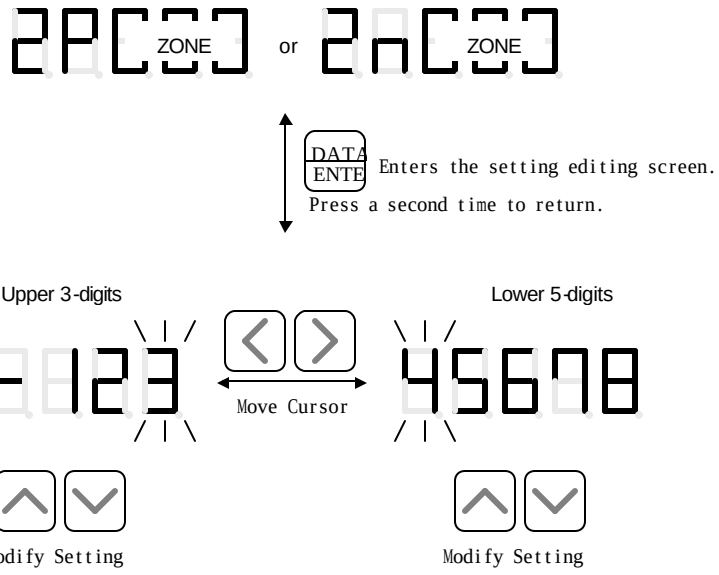


Edit using this.

Execute Fn804 so that the editing results are not erased at power OFF.



StorE

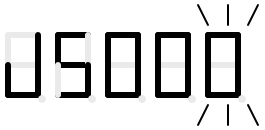
Column	Example
ZONEP or ZONEN	

Displays the row with this symbol.

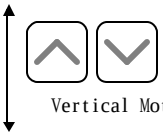
JS

JOG Speed	JSPD
0	JSPD000
1	JSPD001
.	.
.	.
.	.
15	JSPD015

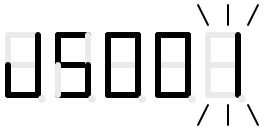
Moves between the rows.



JOG Speed	JSPD
0	JSPD000
1	JSPD001



Vertical Motion

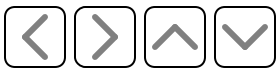


JOG Speed	JSPD
0	JSPD000
1	JSPD001

DATA ENTE This enters the setting editing screen. Return by pressing a second time.

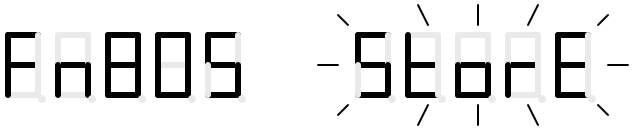
Exp

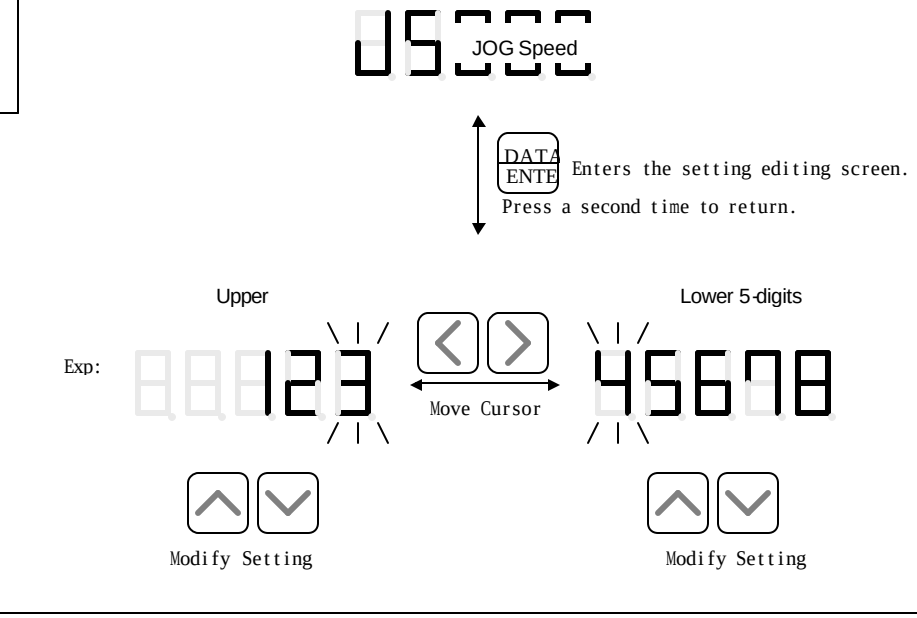
000



Edit using this.

Execute Fn805 so that the editing results are not erased at power OFF.



StorE

Column	Example
JSPD