Robostar Robot

N1 Series Option

Profibus

☑ Option Module

- Profibus

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Regarding Product Warranty

Robostar products are manufactured under strict quality control and all Robostar products are covered under one year warranty from the date of manufacture. We offer free services during this warranty period only for mechanical breakdowns caused by faults by Robostar or breakdowns which arise from problem in design and manufacturing faults during normal use.

No free service is provided in the following occasions.

(1) After the warranty period expires

(2) Mechanical troubles caused by inappropriate repairs, alteration, movement and other negligent handling directed by your company or a third party.

(3) Mechanical troubles caused by use of other products than the ones assigned by our company, such as components and grease

(4) Mechanical troubles caused by fires, disasters, earthquakes, storm and flooding and other natural disasters

(5) Malfunction due to use in environment beyond our product specifications, such as in excretions and flooding

(6) Malfunction due to normal wear of consumable parts

(7) Malfunction due to lack of carrying out maintenance work checklist as listed in User Manual and Handling Manual

(8) Damage not included in robot repair costs

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Composition of User Manual

The User Manual of this product is composed of the following. If this is the first time to use this product, fully understand each and every detail in the manual before use.

■ **Profibus**

Explains how to connect a connector to N1 series using Prifibus communication modules as well as how to use it.

Table of Contents

Chapter 1. Overview

1.1 What is a Profibus Option Card?

The Profibus Option Card is a board handling Profibus-DP communication with the N1 series controller made by Robostar Co., Ltd. The N1 series controller allows the use of Profibus Option Card to enable communication with systems such as PC or PLC using Profibus protocols. The Profibus Option Card complies with Profibus-DP standards and is capable of communication with any device which uses Profibus-DP protocols and physical layer for Profibus-DP.

1.2 System Configuration

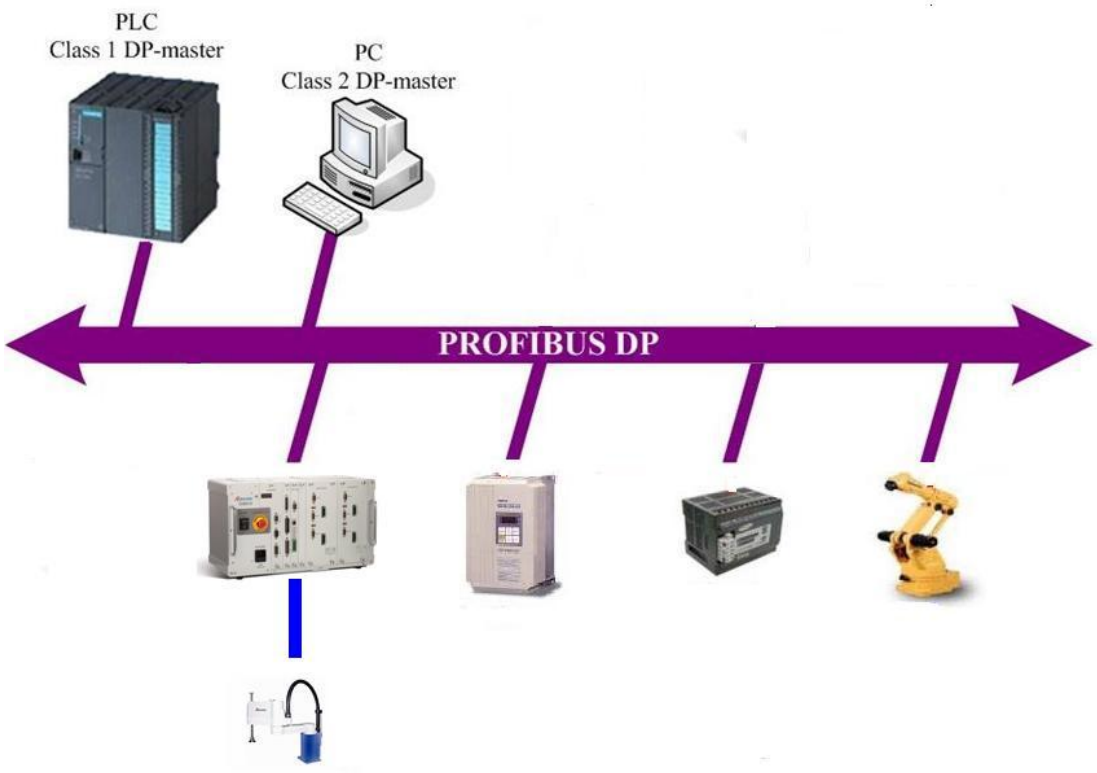


Fig. 1.1 Connection Diagram of Profibus Network System

When interfacing with systems such as PC or PLC using Profibus, standard RS484 cable recommended by Profibus Association is used for connecting network. In the event of extending network by means of other network methods (Ex. Optical network), equipment matching the specifications should be used to get the extension done.

Chapter 2. Function

2.1 Profibus-DP device type and function

2.1.1 DP Master class1(DPM1)

This is a central controller which exchanges information periodically with the dispersed station (Slave) within the defined Message cycle. Its conventional device includes Programmable Logic Controllers(PLC) or PC.

2.1.2 DP Master class2(DPM2)

Used for engineering or setting/operation device type, setting of a connected device, evaluating measurements and parameters and commissioning for request of device status, as well as for maintaining and diagnosing use.

2.1.3 DP Slave

Slave is a peripheral device (I/O device, drive, HMI, valve, measurement transducer) which sends output data to the peripheral device by gathering input data, and a certain device supplies only one - input or output data.

function	DP-Slave		DP-Master class1		DP-Master class2	
	Req	Res	Req	Res	Req	Res
Data exchange	-	○	○	-	△	-
Read Input	-	○	-	-	△	-
Read Output	-	○	○	-	△	-
Get Diagnositics	-	○	○	-	△	-
Get Parameters	-	○	○	-	△	-
Check Config	-	○	○	-	△	-
Get Config	-	○	-	-	△	-
Set Global Control	-	○	○	-	△	-
Set Slave Address	-	△	-	-	△	-
Get Master Diag	-	-	-	○	△	-
Start Seq	-	-	-	△	△	-
Download	-	-	-	△	△	-
Upload	-	-	-	△	△	-
End Seq	-	-	-	△	△	-
Act Parameter Brct	-	-	-	△	△	-
Act Parameter	-	-	-	△	△	-

Req : request, Res : response ○: Essential function, △ : Optional function, - : No function

Table 2.1 Alarms for Profibus-DP Function

2.2 Profibus-DP Communication Specifications

Table 2.2 shows Profibus-DP communication specifications.

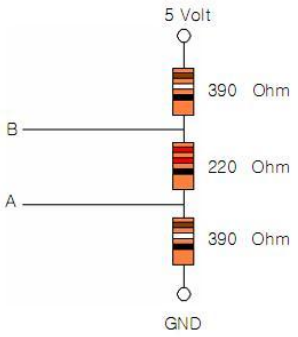
Specifications	
Communication Speed	12M/6M/3M/1.5M/500k/187.5k/93.75k/45.45k/19.2k/9.6kbs
Communication Method	RS485-based half-duplex communication
Synchronous Method	Frame synchronous method
Encoding Method	NRZI(Non-Return to Zero, Inverted)
Channel Format	Bus format
Number of Units Accessed	32 per segment without repeater; Up to 124 with repeater present
Data Transfer	Max 46byte input and 46byte output per slave
Slave Address	3~125 (generally no. 1, 2 used by master)
Connection Cable	Shielded twisted pair cable
Terminating Resistance	

Table 2.2 Communication Specifications

2.3 Profibus-DP Address Map

Table 2.3 shows the Profibus-DP address map.

Address	Description
0	Service-, diagnosis-and programming tool
1..2	Master(class1)
3..125	Slave(total 123 or 124)
126	Used for setting the slave address via software
127	Used when Master transmits data to all units (Broadcast Address)

Table 2.3 Profibus Address map

Chapter 3. Specifications

3.1 Profibus Option Card Specifications

Fig. 3.1 shows the front view of Profibus Option Card.

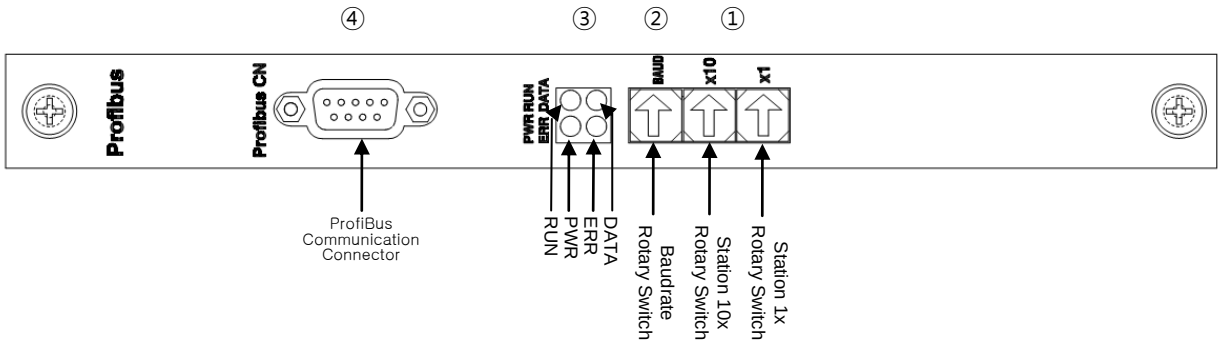


Fig. 3.1 Block Diagram of Profibus Option Card

Table 3.1 shows Profibus Option Card specifications.

Functions	Description
Status Display	Status LED
Setup Switch	Station Number Switch
Communication Port	RS485-based Profibus-DP protocol Interface
Operating Voltage	Internal +5V ±5% : 0.5A nominal Maximum
Operating Temperature	Temperature : operating 0 ~ 40℃ Storage -15 ~ 60℃
Operating Humidity	Humidity : 20 ~ 85% (non-condensing)

Table 3.1 Profibus Option Card Specifications

3.2 Description of LED Functions

The status of Profibus Option Card can be simply known from the outside through the status display LED attached to Profibus Option Card.

	Functions
DATA	Represents current data being exchanged by being connected to Profibus Network
RUN	Represents Profibus Option Card under normal operation
ERR	Represents status of Profibus communication alarm
PWR	Represents status for power supply to Profibus Option Card

Table 3.2 Description of LED Status on Profibus Option Card

3.3 Station Number Setting

Use the Station 10x Rotary Switch and Station 1x Rotary Switch in Fig. 3.1 ① and change into Station Number set in Master for communication with Profibus-DP Master. Rotary Switch makes use of a decimal number so you can set a tenth place with 10x Rotary Switch and the first place with 1x Rotary Switch.

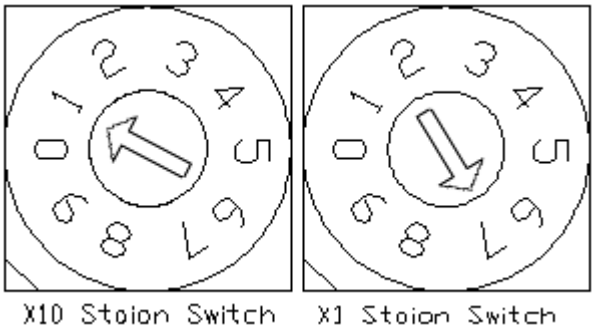


Fig. 3.3 Examples of Station Number Setting

Station Number setting can be done from Station 0 to 97, where the slave station where Profibus Option Card belongs is generally capable of setting from Station 1 to 64. "Fig. 3.3 Station Number Setting" shows an example set by 17 stations.

3.4 Baud rate Setting

Communication speed with Profibus Master is set by use of Baud rate Rotary Switch in Fig.3.1 ②. Rotary Switch uses a decimal number and communication speed for each number is shown in Table 3.3.

Baud rate setup value	
Value	Communication Speed
0	9.6 Kbit/s
1	19.2 Kbit/s
2	93.75 Kbit/s
3	187.5 Kbit/s
4	500 Kbit/s
5	Reserved
6	1.5 Mbit/s
7	3 Mbit/s
8	6 Mbit/s
9	AUTO

Table 3.3 Baud rate setup value

3.5 How to Set Input/Output Data Size

The use of Rotary Switch allows you to set Data Size of communication with Master.

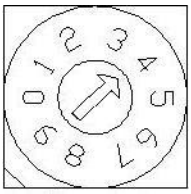
1) Turn the power to N1 controller OFF.
2) Set a mode using the Rotary Switch in Fig. 3.1 ①.

Mode Setup Value	
Value	Mode
99	Input Data Size setup Mode
98	Output Data Size setup Mode

Fig. 3.4 Input Data Size Setup Mode

Table 3.4 Mode Setup Value

3) Use the Rotary Switch in Fig.3.1 ② to set input/output Data Sizes.



Setup Values for Input/Output Data Size	
Value	Data Size
0	8 byte
1	16 byte
2	32 byte
3	46 byte
Values other than the above values	8 byte

Fig. 3.4 Input Data Size Setup Mode

Table 3.4 Mode Setup Value

※ **The Module supported from N1 controller only supports 8X8 Byte and 46X46 Byte.**

4) Turn power to N1 controller ON.
5) Check if LED (Input/output setup LED) is blinking (performing ON->OFF 2~3times).

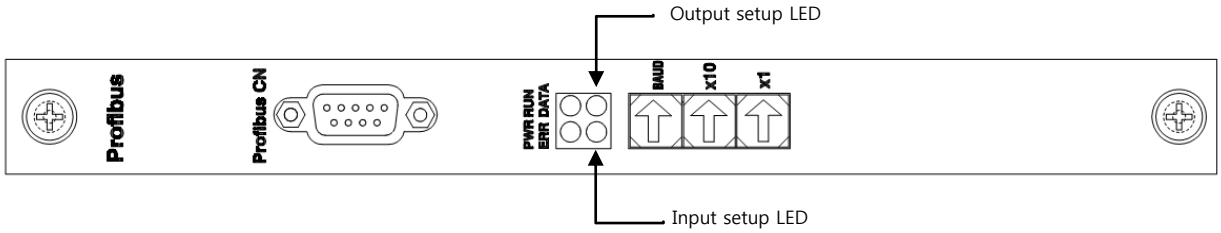


Fig. 3.6 Input/Output Setup LED

6) Repeat the above process to set Data Size for input/output.

3.6 Profibus Network Specifications

- Cable Specifications

Parameter	Condition
Overail code	a-core : green, b-core : red
Screen	Plastic coated aluminum tape, metallic surface outside in contact with a tinned copper drain wire and wire braid
Overail diameter	8.1±0.3mm
Max.pulling tension	80N
Min. bending radius	5x cable overail diameter
Temperature range	-40...+75℃ during operation, 5...+50℃ for installation
UV resistant	UL 1581 article 1200
Oil resistant	ICEA S-82-552
Flame propagation	UL 13 vertical tray test, IEC 60332-3
Smoke density	Low, IEC 60134
Halogenfree	Yes, IEC 60754-1, 0%
Degree of acidity of gases	IEC 607 54 part 2, (pH > 4.3, c > 10μS/mm)
Oxygen index of outer sheath	IEC 60332-3, min. 35%
Conductor resistance (Loop)	Max.110Ω/km
Screen resistance	Nom.9Ω/km
Attenuation at 0.25/0.625/ 1.25/3.125/16MHz	Nom.6/9/12/18/40dB/km
Inductance	Nom. 0.65mH/km
Mutual capacitance	Max. 30nF/km
Capacitance unbalance to earth	Max. 1500pF/km
Impendance 3MHz	150±15Ω
Test voltage (core/core and vore/screen)	1500V
Operation voltage	Max. 300V

Table 3.6 Line Parameter

Chapter 4. Installation and Operation Setting

4.1 How to Install Hardware

Take the following procedure to be able to use ProfiBus Option Board on N1 series controller.

1) Turn power to controller OFF.
2) Attach the profibus board to PCI slot on N1 series controller.

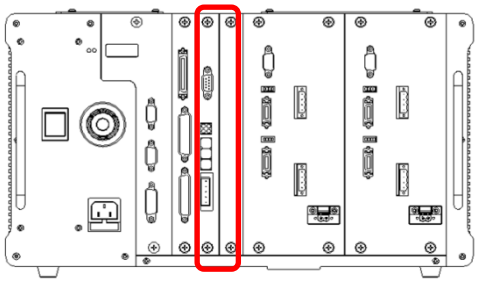


Fig. 4.1 How to Install Option Board

3) Turn power to controller ON.

4.2 How to Connect Profibus Network Cable

When wiring the profibus cable, make a connection suitable for pin map in Table 4.1. In high-speed communication, be sure to use cables and connectors in accordance with communication standards.

Pin No.	Signal	Description
3	RxD/TxD-P	Receive Data/Transmission Data+
5	CNTR-P	Ground in data transmission (5V ground)
6	VP	Voltage supplied to terminating resistance (P5V)
8	RxD/TxD-N	Receive Data/Transmission Data+

Table 4.1 Signals from Profibus Connector per Pin

For examples of how to connect the cable, refer to "Fig. 4.2 How to Wire Cable".

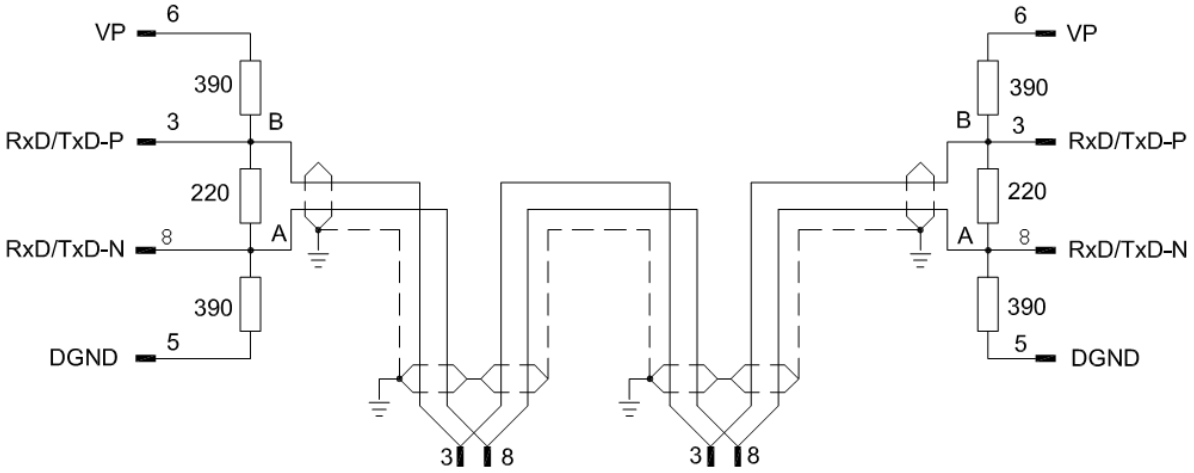


Fig. 4.2 How to Wire Cable

4.3 Controller Setting

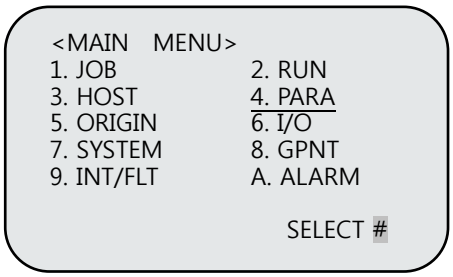
To use a profibus from N1 controller, the setting should be changed from the controller FieldBus setting to Profibus Mode.

4.3.1 FIELD BUS(Profibus) Setting

The following are how to set parameters for use of Profibus option card.

1. Setting Procedure

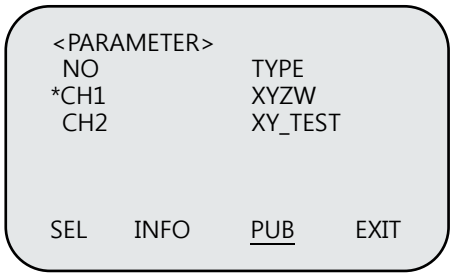
Step1. **Move to PARA screen**



Open initial menu screen

Select 4: PARA

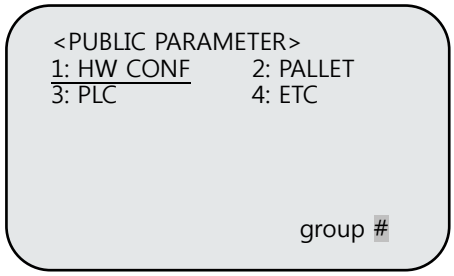
4
L



Open PUBLIC PARAMETER group screen

Press F3 button to move to PUB

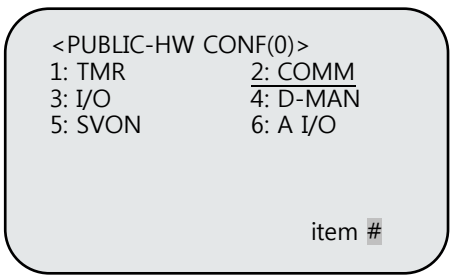
F3



Select 1:HW CONF

1
Q

Step2. **Move to OPT CARD screen**



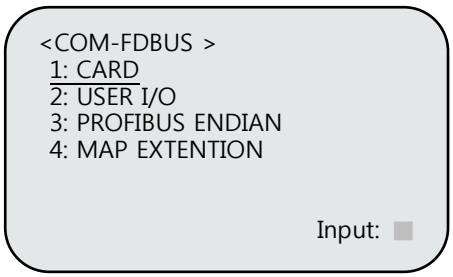
Select 2:COMM

2
R

Step3. **Move to OPT CARD screen**

Select 2: FIELD BUS

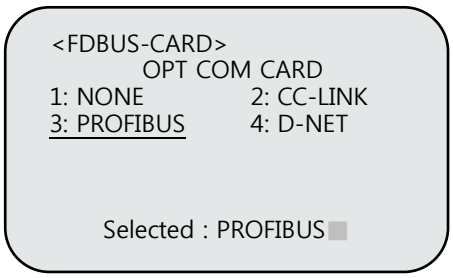
2
R



Select 1: CARD

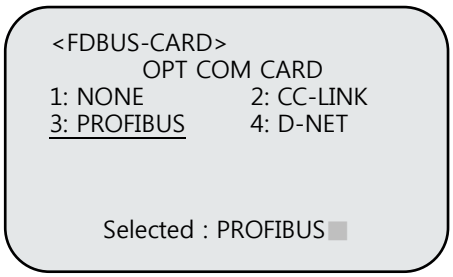
1
Q

Step4. **CARD setup screen**



Select 3: PROFIBUS

3
S



Press ESC and then ENTER to save

ESC ENTER

CAUTION

- **When there is no Profibus B/D, a message "Not Card!" comes up at bottom of T/P screen and fails to be saved.**

4.3.2 USER I/O Setting

Below is a setup method for using User I/O as communications.

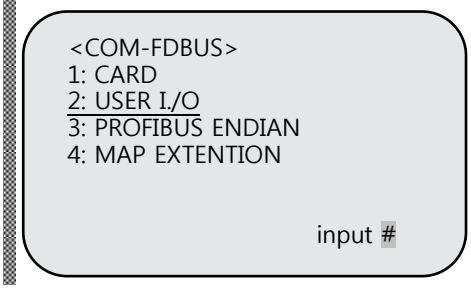
1. Setting Procedure

Step1. **Move to USER I/O screen**

2 R

Open COMM screen

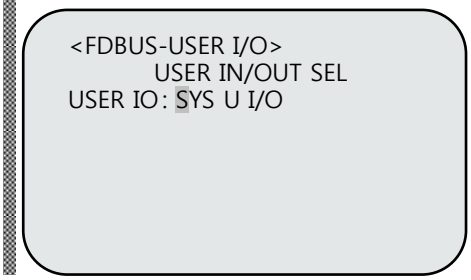
Select 2: FIELD BUS



2 R

Select 2: USER I/O

Step2. **USER I/O setup screen**



ENTER

Select SYS U I/O" or "FIELD U I/O

This provides how to use USER I/O when using Field Bus card.

Item	Description
SYS USER I/O	Input/output using USER I/O of N1 System IO B/D
FIELDBUS USER I/O	Input/output using USER I/O of Field Bus card

⚠CAUTION

- **Data(USER I/O area) input/output are restricted due to communications in setting SYS USER I/O.**
- **Data(User I/O) input/output are restricted through I/O Board in setting FIELDBUS USER I/O**
- **For further details about User I/O, refer to "Handling Manual 3.3.6".**

4.3.3 PROFIBUS ENDIAN

The following show how to set Endian for data in Profibus communication.

1. Setting Procedure

Step 1. **Move to PROFIBUS ENDIAN screen**

<HW CONF - COM>
COMMUNICATION SET
1: RS232C
2: FIELD BUS
3: LINE SEPARATOR

group #

Open COMM screen
Select 2: FIELD BUS

2
R

<COM-FDBUS>
1: CARD
2: DPRAM USER I./O
3: PROFIBUS ENDIAN
4: MAP EXTENTION

input #

Select 3: PROFIBUS ENDIAN

3
S

Step 2. **PROFIBUS EDIAN setup screen**

<FDBUS-ENDIAN>
1: Little Endian
2: Big Endian

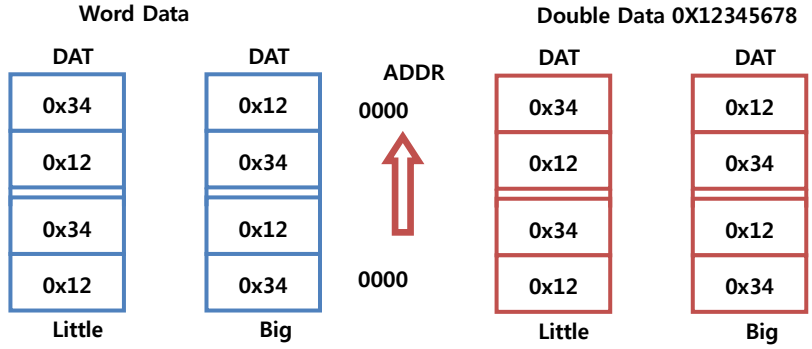
Selected: LITTLE

EDIAN setup screen
(Default value is Little Endian.)

1 Q or 2 R

- Setting procedures for transmitting and saving Word or Double Data in communication with Master PLC when selecting Profibus.

Items	Content
Little Endian	Saved by Byte, in order from low number
Big Endian	Upper Byte and Word value saved in lower number



Chapter 5. Examples of Profibus Setting

Step1.

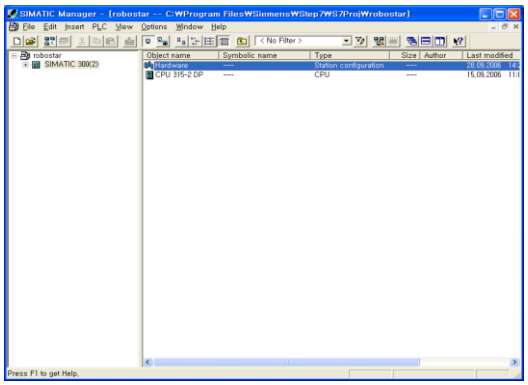


Fig. 5.1 SIMENS PLC

Run SIMATIC Manager and click Hardware (Station configuration) as shown in the figure below.

Step2.

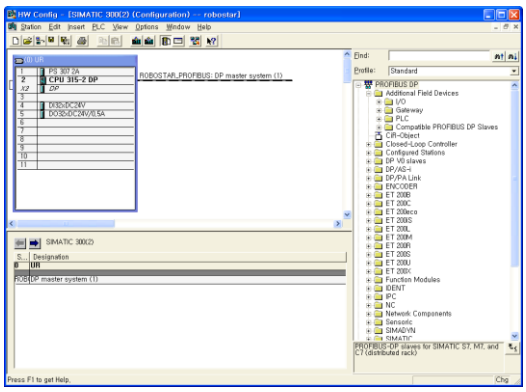


Fig. 5.2 SIMENS PLC

Get HW Config to be executed so Profibus DP Salve can be added.

Step3.

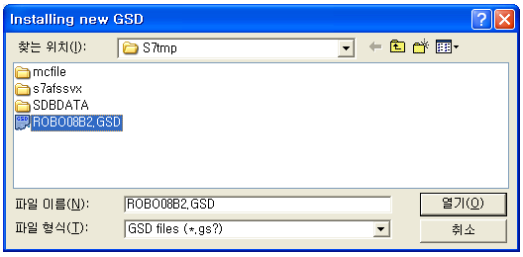


Fig. 5.3 SIMENS PLC

Select Options/Install New GSD menu and pick out the file provided as seen below.

Step4.

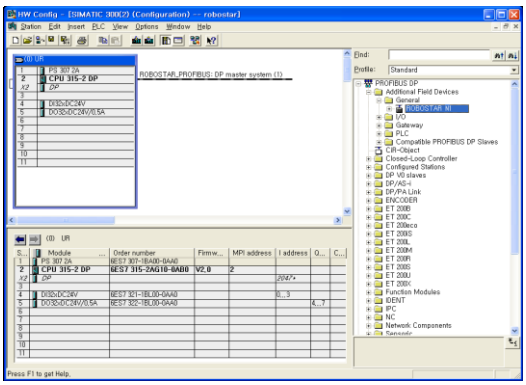


Fig. 5.4 SIMENS PLC

Fig. 5.4 shows ROBOSTAR N1 Device is registered into PROFIBUS DP.

Step5.

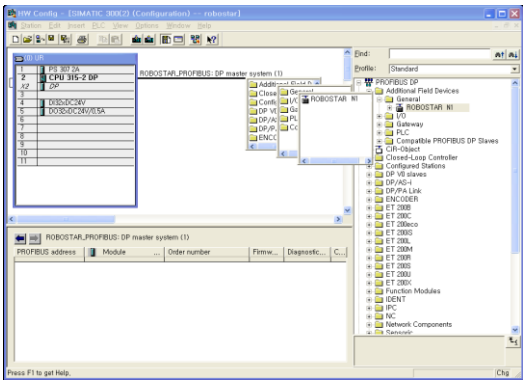


Fig. 5.5 SIMENS PLC

Right-mouse click at the connection point of DP master system to select Insert Object, and choose ROBOSTAR N1.

Step6.

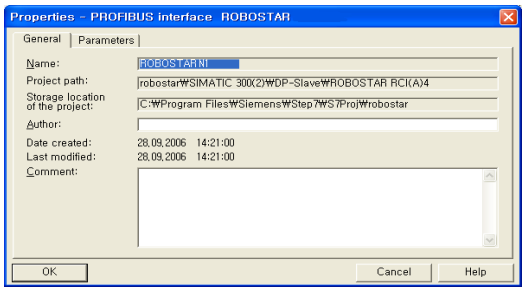


Fig. 5.6 SIMENS PLC

With registration completed, ROBOSTAR N1 properties come up as shown in Fig. 5.6.

Step7.

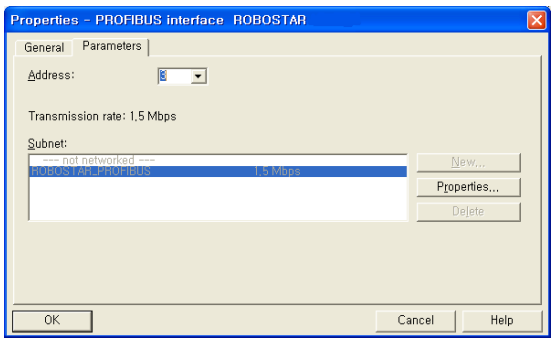


Fig. 5.7 SIMENS PLC

Select the Address as shown in Fig. 5.7. Slave prefix should be identical to Controller prefix.

Step8.

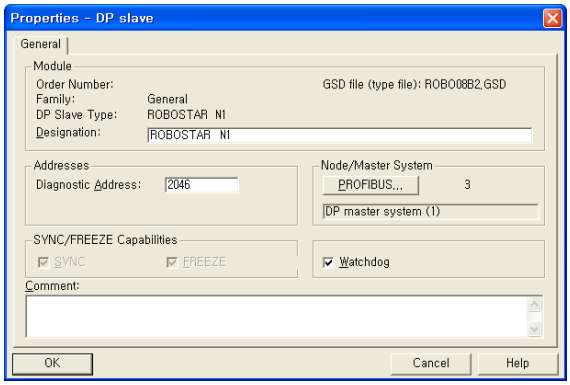


Fig. 5.8 SIMENS PLC

Press OK button and you can view properties of DP slave.

Step9.

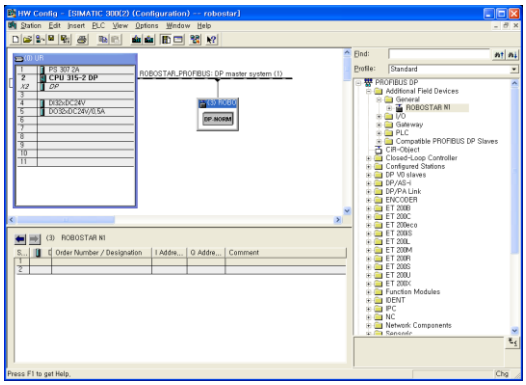


Fig. 5.9 SIMENS PLC

Fig. 5.9 is a screen with ROBOSTAR N1 registered as DP Slave.

Step10.

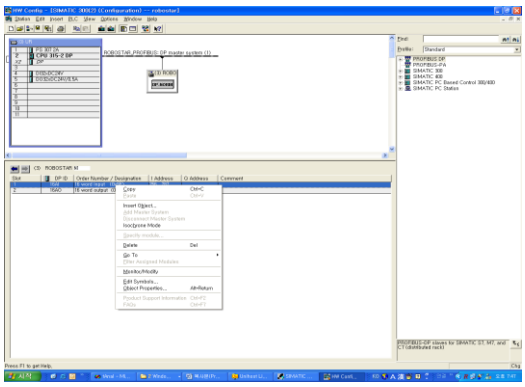


Fig. 5.10 SIMENS PLC

Select the ROBOSTAR N1 object and register Input/Output Address as shown in Fig. 5.12, Fig. 5.13. From Drop menus on right side of mouse, select Insert Object.

Step11.

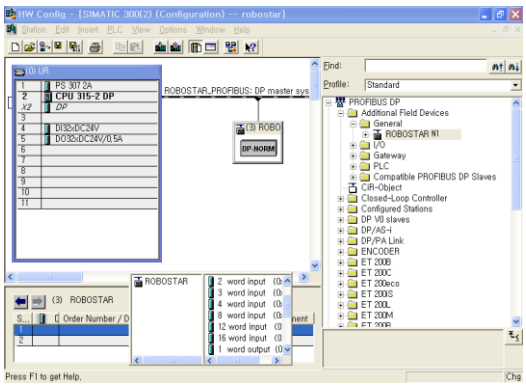


Fig. 5.11 SIMENS PLC

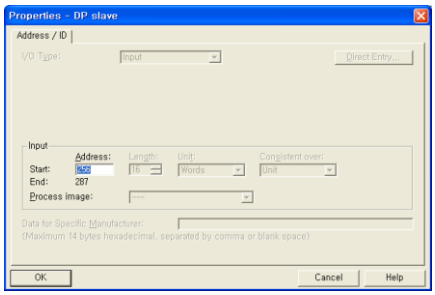


Fig. 5.12 SIMENS PLC

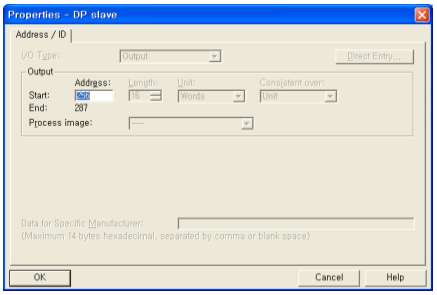


Fig. 5.13 SIMENS PLC

Chapter 6. Memory Mapping

6.1 N1 Controller Data Mapping

Controller Data Mapping			
Profibus Data	**Description**	**Profibus Data**	**Description**
RX00~RX01	System Input #1	RY00~RY01	System Output #1
RX02~RX03	User Input	RY02~RY03	User Output
RX04~RX05	Option Input 0	RY04~RY05	Option Output 0
RX06	System Input #2	RY06 ~ RY07	Error Code Read
RX07	FieldBus Input #1		
RX08~RX09	Option Input 1	RY08~RY09	Option Output 1
RX10~RX11	Option Input 2	RY10~RY11	Option Output 2
RX12~RX13	Option Input 3	RY12~RY13	Option Output 3
RX14~RX15	FieldBus Input #2	RY14~RY15	FieldBus Output #2
RX16 ~ RX19	1-axis Position Value Input	RY16 ~ RY19	Current 1-axis Position Value Output
RX20 ~ RX23	2-axis Position Value Input	RY20 ~ RY23	Current 2-axis Position Value Output
RX24 ~ RY27	3-axis Position Value Input	RY24 ~ RY27	Current 3-axis Position Value Output
RX28 ~ RY31	4-axis Position Value Input	RY28 ~ RY31	Current 4-axis Position Value Output
RX32~RX33	Global Integer Input	RY32~RY33	Global Integer Output
RX34~35	Global Integer Index	RY34 ~ RY37	Global Float Output
RX36~RX37	Global Point Index		
		RY38~RY39	Info Data 1 Output
RX38 ~ RX41	Global Float Input	RY40~RY41	Info Data 2 Output
		RY42~RY43	Info Data 3 Output
RX42~RX43	Global Float Index	RY44~RY45	Info Data 4 Output

Note) When using Option I/O, change Parameter I/0 EXT B/D value to 2. (Operation Manual" 1.3.1.3 Extension I/O Board Setting".)

6.1.1 N1 Series System Input #1

N1 series has System Bits commonly used between Robot Channel 1 and 2, and these bits operate differently between channels depending on CH_SEL Bit setting. If CH_SEL Bit set value is Low, it corresponds to Robot Channel 1, High to Robot Channel 2.

System Input #1			
0	CH SEL	8	MODE 1 / AXIS 1
1	PROG 0	9	MODE SEL
2	PROG 1	A	JOG VEL
3	PROG 2	B	VEL+ / MOV+
4	PROG 3	C	VEL- / MOV-
5	PROG 4	D	REBOOT
6	PROG SEL	E	ORG #1
7	MODE 0 / AXIS 0	F	START #1

Commonly-used bits are PROG_0 ~ PROG_4, PROG_SEL, MODE0/AXIS0, MODE1/AXIS1, MODE SEL, JOG VEL, VEL+/MOV+, VEL-/MOV- . Check the CH SEL Bit set value when using the commonly-used bits. When the CH SEL Bit set value is not correct, an unwanted robot channel may operation. The FieldBus timing diagram marked in this Manual is examples for Channel 1, and for handling and operating Channel 2 change CH_SEL Bit set value in Channel 1 timing diagram to High. Reading and writing Global Integer and Global Float Data CH_SEL Bit can be used regardless of setting.

CAUTION

- **For description of functions of each Bit, refer to Operation Manual "3.3.4 System Input/Output Functions".**

6.1.2 N1 Series System Input #2 & FIELDBUS INPUT#1

System Input #2		FieldBus Input #1	
0	STOP #1	8	DATA TYPE: XY Coordinates
1	Reserved	9	DATA TYPE: Angle Coordinates
2	SERVO ON #1	A	Data Type: Pulse (Read Only)
3	ORG #2	B	Mode Select (/Current OR GPNT)
4	START #2	C	Write Enable Flag(Position,GINT)
5	STOP #2	D	READ Enable Flag(Position, GINT)
6	Reserved	E	Reserved
7	SERVO ON #2	F	Reserved

6.1.3 N1 Series FIELDBUS INPUT #2

FieldBus Input #2			
0	JOG A(X)+	8	AUTO RUN MODE
1	JOG A(X)-	9	STEP RUN MODE
2	JOG B(Y)+	A	JOG MODE
3	JOG B(Y)-	B	JOG Forward SEL
4	JOG Z+	C	Reserved
5	JOG Z-	D	Reserved
6	JOG W+	E	Info Data Mode SEL #0
7	JOG W-	F	Info Data Mode SEL #1

6.1.4 N1 Series System Output #1

System Output #1			
0	CH SEL	8	ORG OK #2
1	ALL ALARM	9	RUNNING #2
2	READY #1	A	INPOS/INRNG #2
3	ORG OK #1	B	SERVO ON #2
4	RUNNING #1	C	Reserved
5	INPOS/INRNG #1	D	Reserved
6	SERVO ON #1	E	Reserved
7	READY #2	F	Reserved

6.1.5 N1 Series FIELDBUS Output #2

FieldBus Output #2			
0	Write Complete Flag	8	Auto Run Mode DIS
1	Read Complete Flag	9	Step Run Mode DIS
2	Reserved	A	JOG Mode DIS
3	Forward Moving State DIS	B	Reserved
4	Reserved	C	TRQ Info Data Mode
5	Brake State DIS	D	RPM Info Data Mode
6	Reserved	E	Reserved
7	Reserved	F	Reserved

6.2 Precautions for Use in N1 Series System Mode

1. < Precaution for Use in Auto Mode >

① As GINT, GFLOAT and GPNT commonly use Read / Write Enable Flag, the index values of unused variables are allocated at a time when no change is desired.

② Of Data types, XYZW and ABZW are only Coordinate Write functions available for use.

2. < Precautions for use in JOG Mode >

① Pulse inputs should be made to enter AUTO RUN MODE, STEP RUN MODE and JOG MODE in Field Bus Input #2. (When each mode is set to High, the selected bit on Jog axis in FieldBus Input #2 is operated under abnormal conditions.)

⚠ CAUTION

- **Times displayed in Field Bus timing diagram are as follow.**
  T1: 20ms, T2: 30ms, T3: 40ms.
- **The pulse width entered when applying Field Bus should be kept over a minimum of 20ms.**
- **The time interval between signals entered when applying Field Bus should be over at least 20ms.**

6.3 N1 Series FieldBus(CC_Link) Timing Diagram

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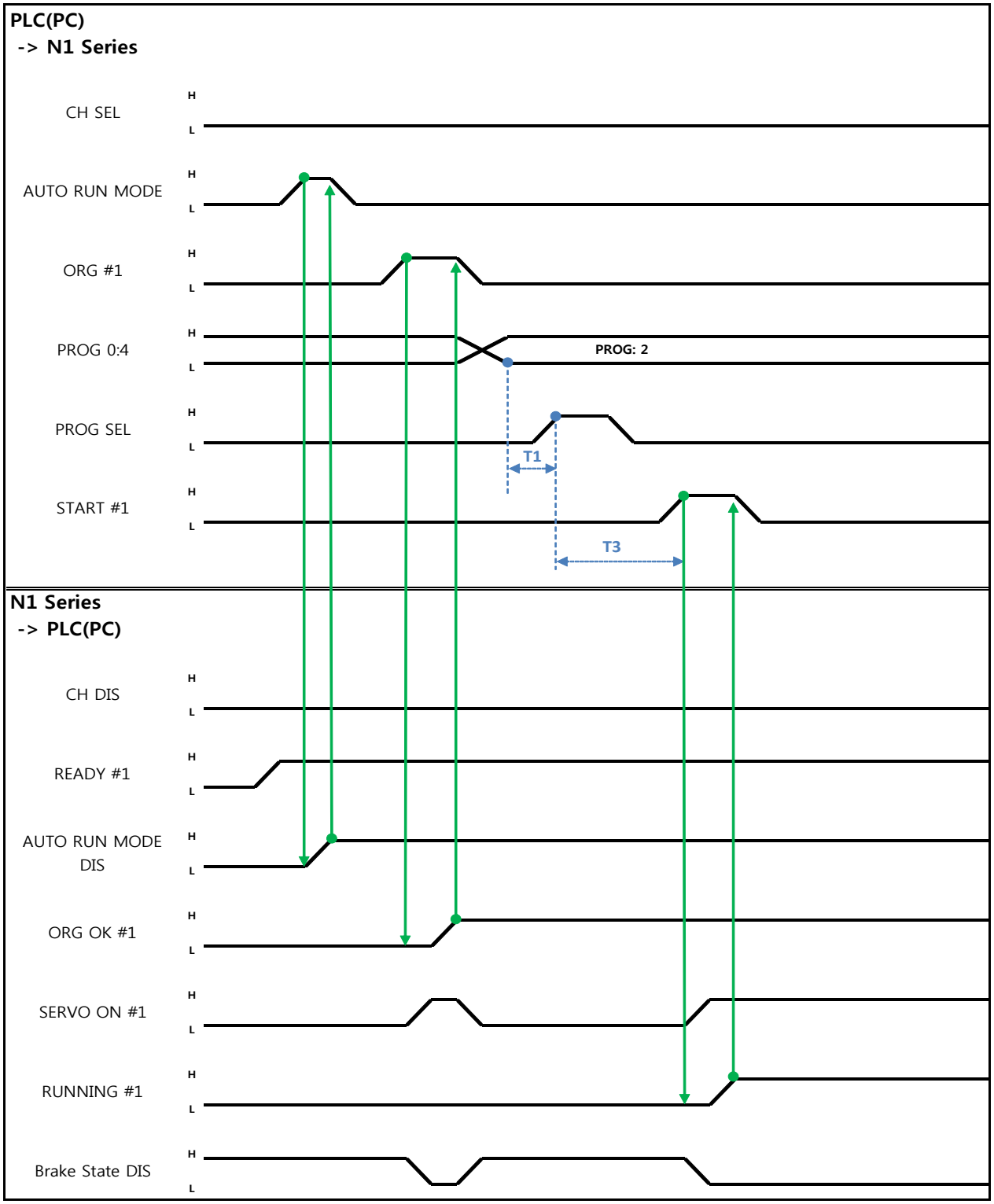
6.3.1 Operation in AUTO RUN MODE



When in Auto Servo ON

Description :

- Set CH SEL Bit. (Low: Channel 1, High: Channel 2)
- Enter AUTO RUN MODE Bit into pulse format. (High status should be kept over 20ms.)
- When ORG OK#1 Signal is Low in N1 Series, set ORG #1 Bit to High.
- When ORG OK #1 is changed to High, combine PROG 0~4 Bits to set the desired JOB Program num. (PROG0 Bit is the lowest (LSB) Bit and PROG4 Bit is the highest (MSB) Bit.)
- With completion of setting JOB Program num, set PROG SEL Bit to High.
- Set START #1 Bit to High.

When not in Auto Servo ON

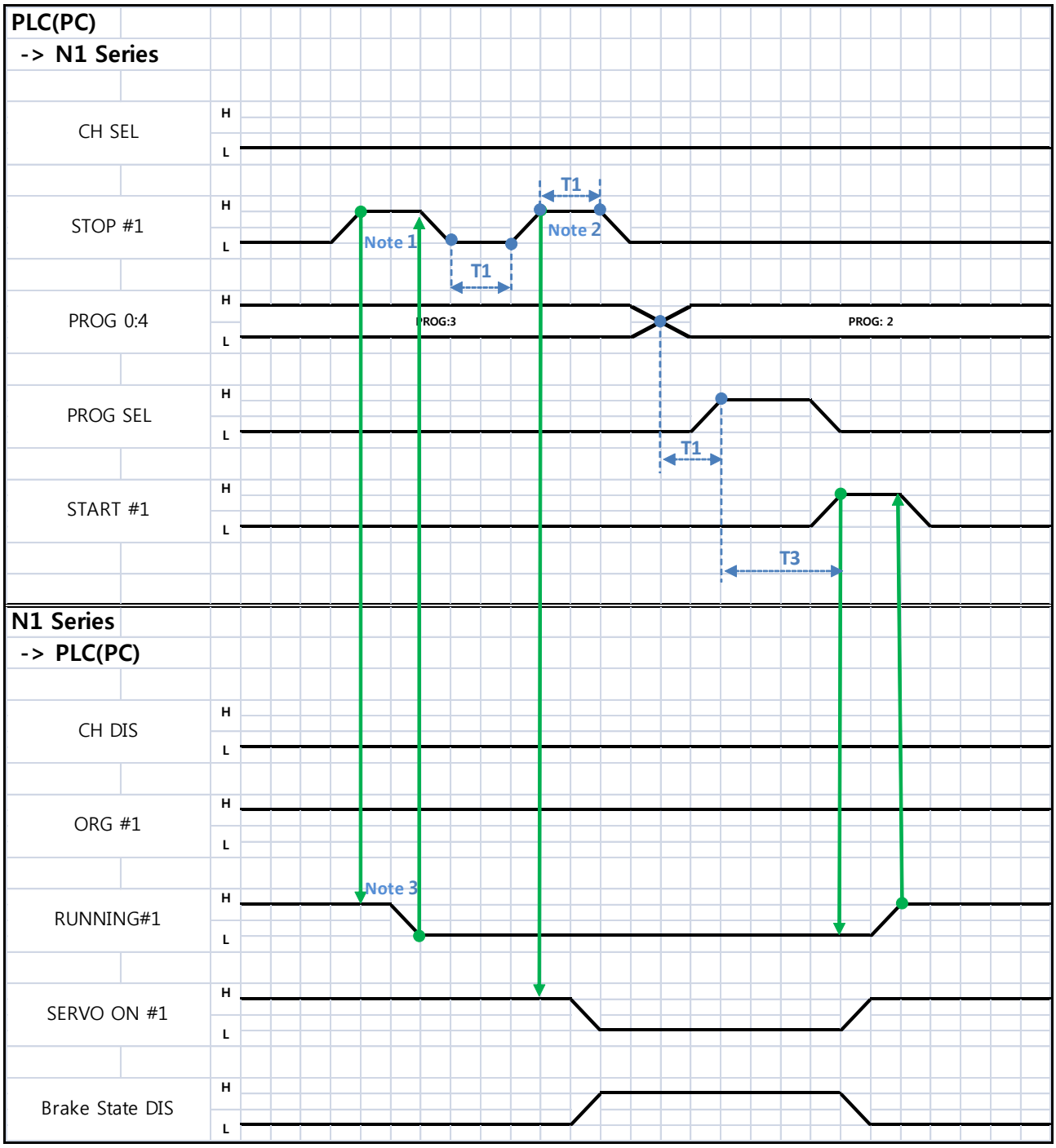
Description :

- Set CH SEL Bit. (Low: Channel 1, High: Channel 2)
- Set AUTO RUN MODE Bit into pulse format. (High status should be kept over 20ms.)
- When ORG OK#1 Signal is not set to High in N1 Series, set ORG #1 Bit to High.
- When ORG OK #1 is changed to High, combine PROG 0~4 Bits to set the desired JOB Program num. (PROG0 Bit is the lowest (LSB) Bit and PROG4 Bit is the highest (MSB) Bit.)
- With completion of setting JOB Program num, set PROG SEL Bit to High.
- Enter SERVO ON#1 Bit in Pulse format. Check SERVO ON#1 of System Output #1 in N1 Series to see if SERVO is ON. (High status should be kept over 20ms.)
- set START #1 Bit to High.

CAUTION

- **Check AUTO SERVO ON for setting in Parameter of N1 Series. (Refer to Operation Manual "1.3.1.5 Auto Servo On".)**
- **When Auto Servo ON is not set, output SERVO ON #1 Bit as High prior to sending out START #1 Signal.**

6.3.2 JOB Program Change during JOB Operation



When in Auto Servo ON

Description :

- Enter STOP #1 Signal into pulse. (High status should be kept over 20ms.)
- Combine PROG 0~4 Bits to enter the desired JOB Program num. (PROG0 Bit is the lowest (LSB) Bit and PROG4 Bit is the highest (MSB) Bit.)
- With completion of setting JOB Program num, set PROG SEL Bit to High.
- set START #1 to High.

Note 1) Signal for stopping JOB Program from operating while running JOB Program.

Note 2) Signal for changing SERVO OFF status and initializing JOB Program.

Note 3) Robot Moving speed may lead to a difference in time taken for change to Low.
(Maximum delay time lasts as At time as set in Joint/Linear Motion Parameter.)

When not in Auto Servo ON

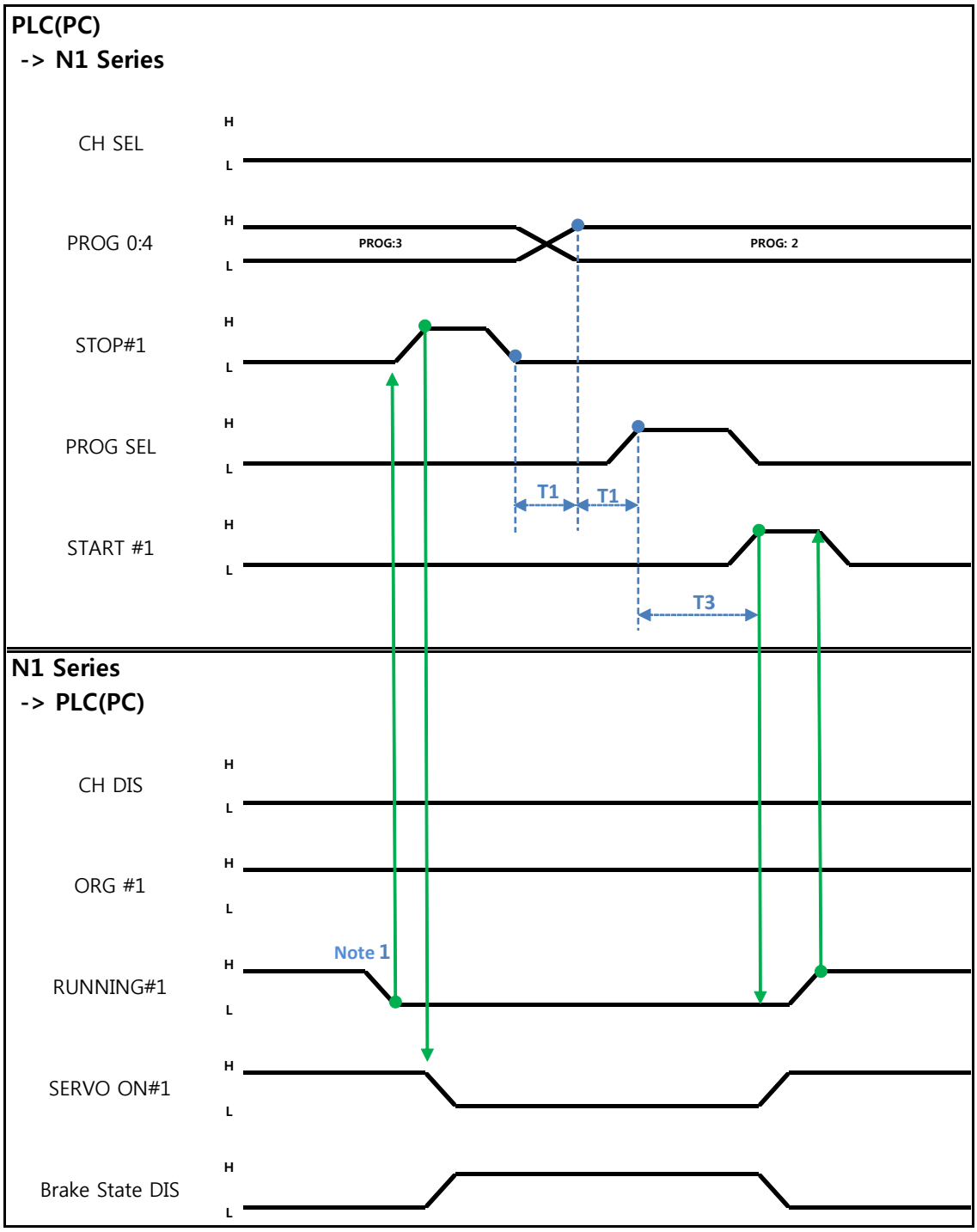
Description :

- Enter STOP #1 Signal into pulse. (High status should be kept over 20ms.)
- Instead of entering the 2nd STOP #1 Signal, enter SERVO ON #1 Signal in Pulse. (High status should be kept over 20ms.)
- Combine PROG 0~4 Bits to enter the desired JOB Program num. (PROG0 Bit is the lowest (LSB) Bit and PROG4 Bit is the highest (MSB) Bit.)
- With completion of setting JOB Program num, set PROG SEL Bit to High.
- Enter SERVO ON #1 Signal into Pulse. (High status should be maintained over 20ms.)
- Set START #1 to High.

CAUTION

- **Changing JOB Program can only be made with Servo OFF. Prior to changing JOB Program, check the Servo OFF status.**

6.3.3 JOB Program Change after Completing JOB Program



When in Auto Servo ON

Description :

- Check if RUNNING#1 Bit is Low.
- Enter STOP #1 Signal into pulse. (High status should be kept over 20ms.)
- Combine PROG 0~4 Bits to enter the desired JOB Program num. (PROG0 Bit is the lowest (LSB) Bit and PROG4 Bit is the highest (MSB) Bit.)
- With completion of setting JOB Program num, set PROG SEL Bit to High.
- set START #1 to High.

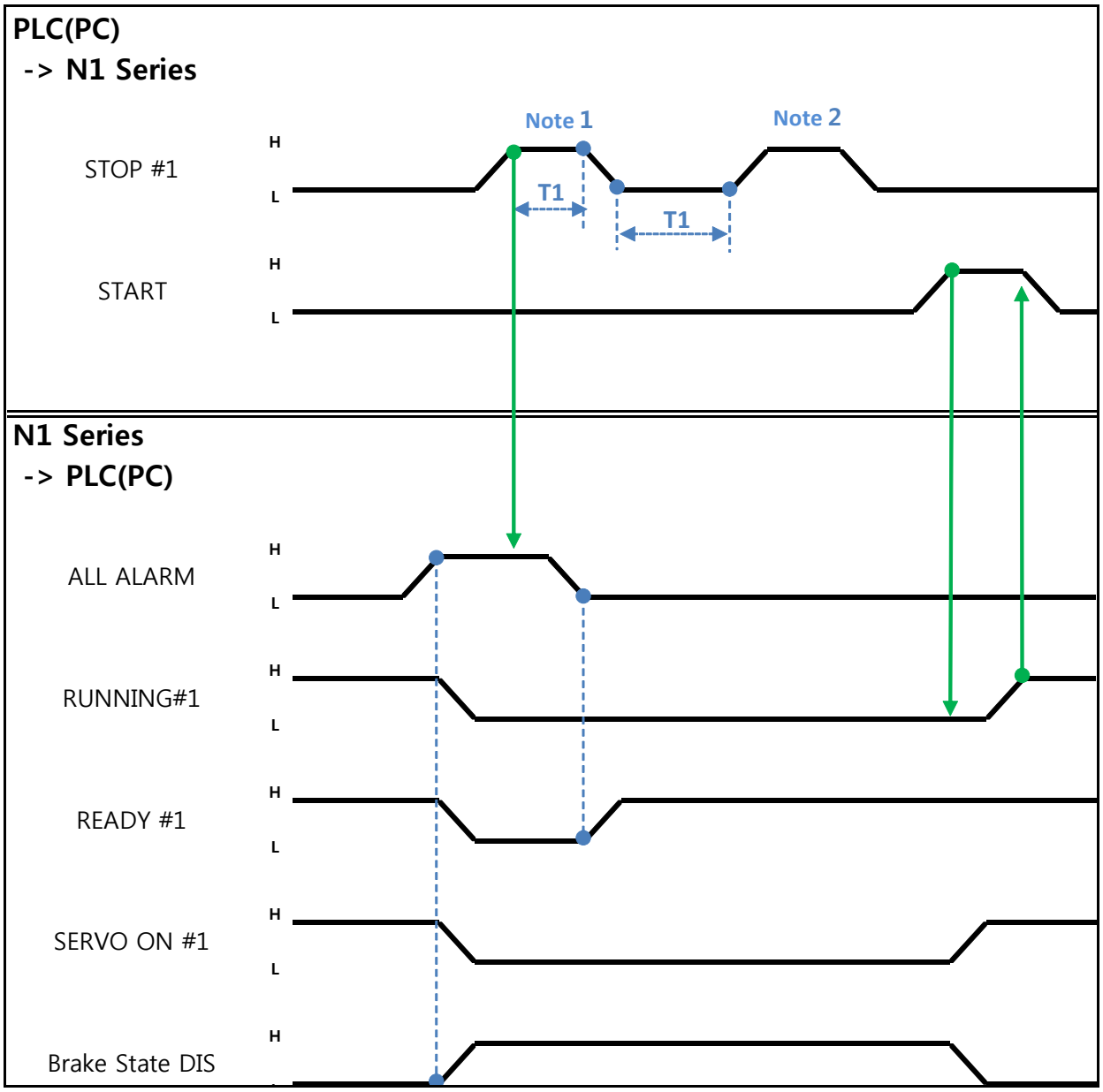
Note 1) When JOB ends in JOB Program by EOP, RUNNING#1 Bit is changed into Low.

When not in Auto Servo ON

Description :

- Instead of STOP #1 Signal, enter SERVO ON#1 Signal into pulse. (High status should be kept over 20ms.)
- Combine PROG 0~4 Bits to enter the desired JOB Program num. (PROG0 Bit is the lowest (LSB) Bit and PROG4 Bit is the highest (MSB) Bit.)
- With completion of setting JOB Program num, set PROG SEL Bit to High.
- Enter SERVO ON #1 Signal into Pulse. (High status should be maintained over 20ms.)
- Set START #1 to High.

6.3.4 JOB Program START after Disabling Alarm



When in Auto Servo ON

Description :

- Enter STOP #1 Signal into pulse twice. (High status should be kept over 20ms.)
- Set START #1 to High.

Note 1) Signal for disabling an alarm.

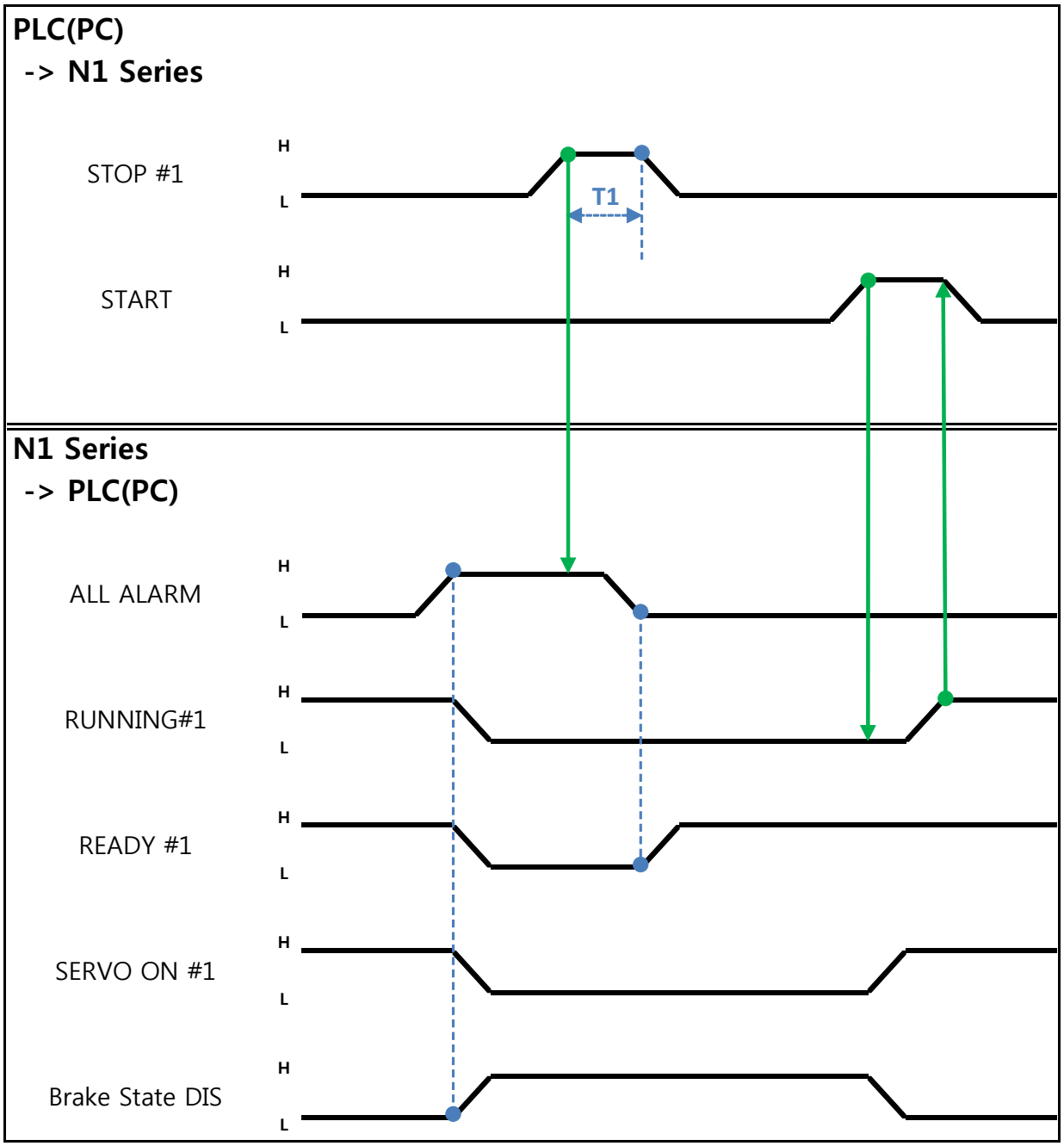
Note 2) Set JOB Program STEP Line for the first time.

When not in Auto Servo ON

Description :

- Enter STOP #1 Signal into pulse twice. (High status should be kept over 20ms.)
- Set START #1 to High.

6.3.5 JOB Program Restart after Disabling Alarm



When in Auto Servo ON

Description :

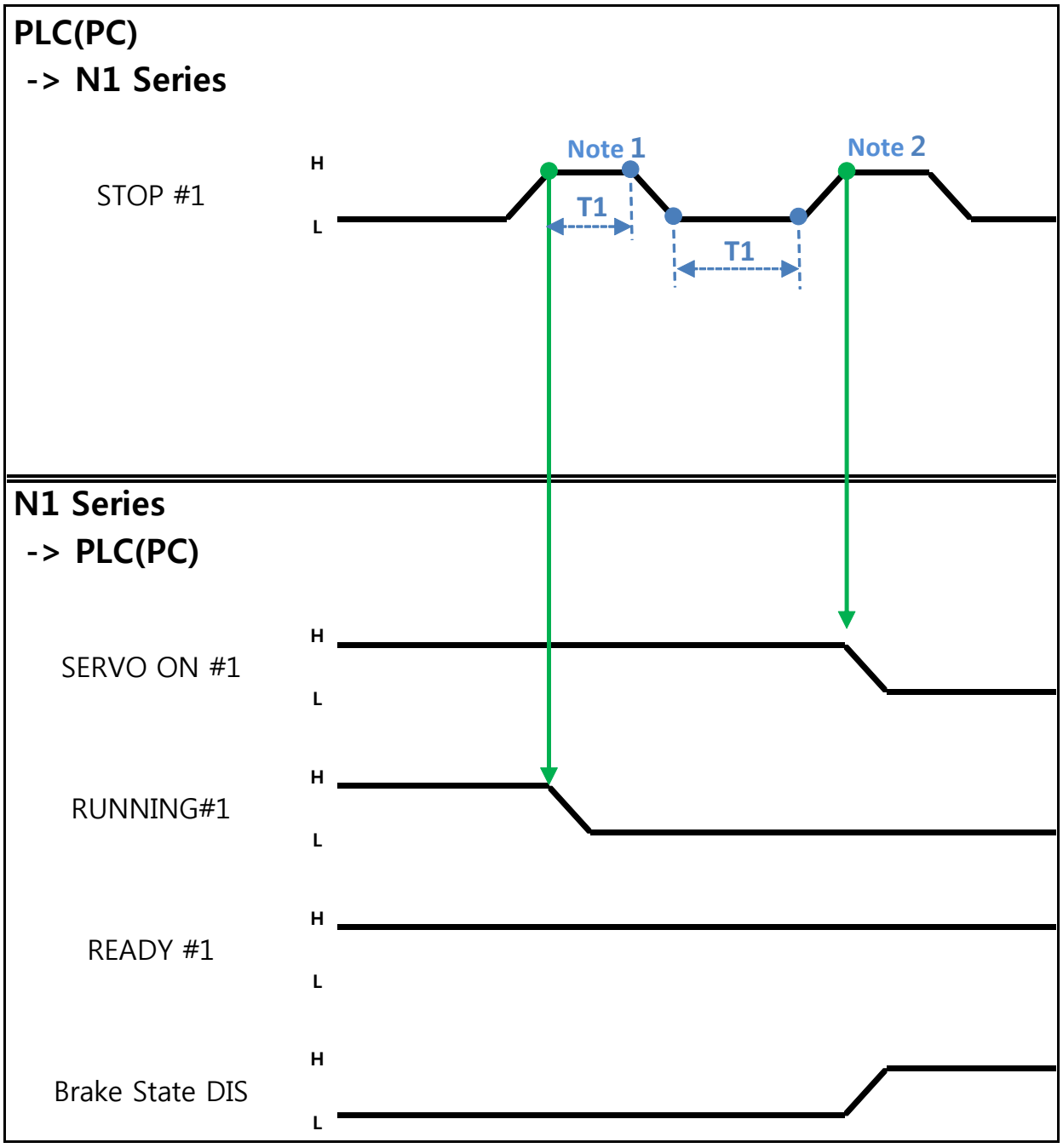
- Enter STOP #1 Signal into pulse. (High status should be kept over 20ms.)
- Set START #1 to High.

When not in Auto Servo ON

Description :

- Enter STOP #1 Signal into pulse. (High status should be kept over 20ms.)
- Enter SERVO ON #1 Signal into pulse. (High status should be kept over 20ms.)
- After checking SERVO ON, set START #1 to High.

6.3.6 SERVO OFF



When in Auto Servo ON

Description :

- Enter STOP #1 Signal into pulse. (High status should be kept over 20ms.)

Note 1) Signal for stopping JOB Program from operating.

Note 2) Signal for turning SERVO OFF.

When not in Auto Servo ON

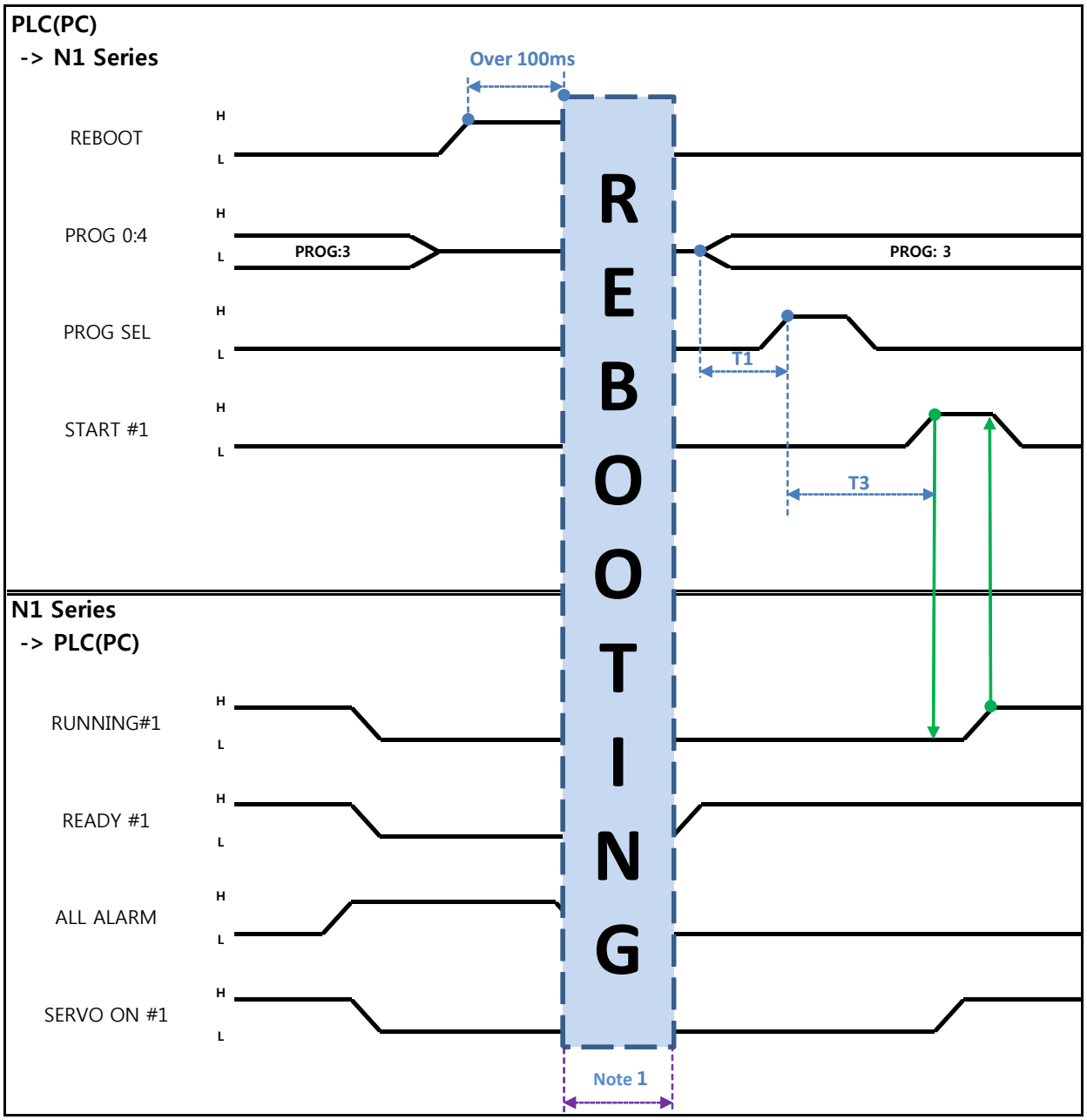
Description :

- Enter STOP #1 Signal into pulse. (High status should be kept over 20ms.)
- Instead of the 2nd STOP #1 Signal ₩, enter SERVO ON #1 Signal into pulse. (High status should be kept over 20ms.)

CAUTION

- When not in Auto Servo ON, Servo OFF does not apply though the 2nd STOP #1 Signal is sent out.
- To keep Servo OFF, send SERVO ON #1 Signal via Pulse.

6.3.7 Rebooting



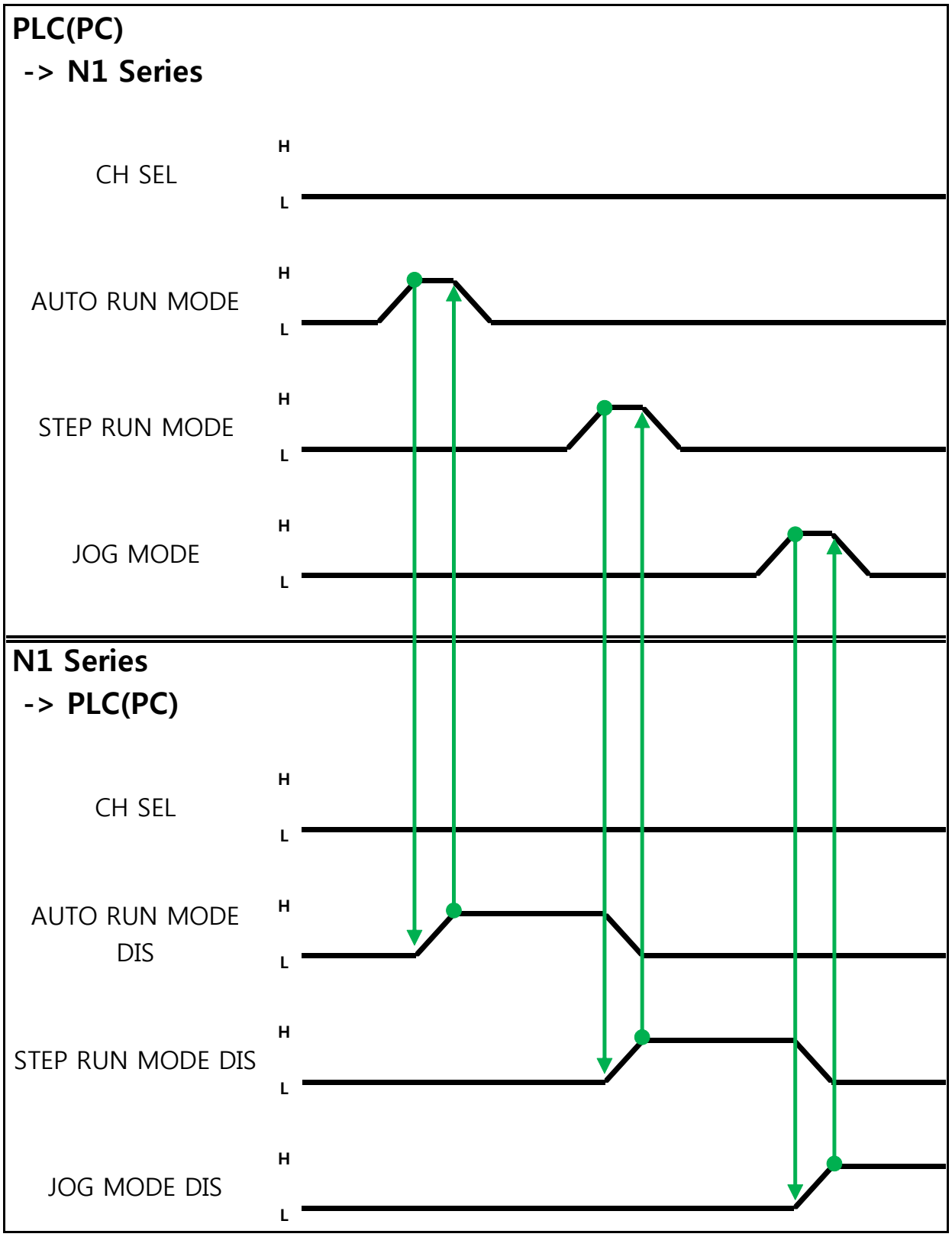
Description :

- Set REBOOT Bit to High. Rebooting becomes available only when High status is kept over 100ms. When kept below 100ms, Rebooting may not be performed.
- When Rebooting is complete yet alarm conditions are not disabled, ALARM Bit maintains High status. In this case, disable all alarm conditions and retry Rebooting.
- When Rebooting is complete, READY #1 Signal turns into High, when JOB Program num is set.
- set START #1 Bit to High.

CAUTION

- Note 1) When Rebooting, Signals may malfunction so use caution.
- A timing diagram upon completion of Rebooting is identical to "6.3.2 AUTO RUN.

6.3.8 MODE(AUTO, STEP, JOG) Change



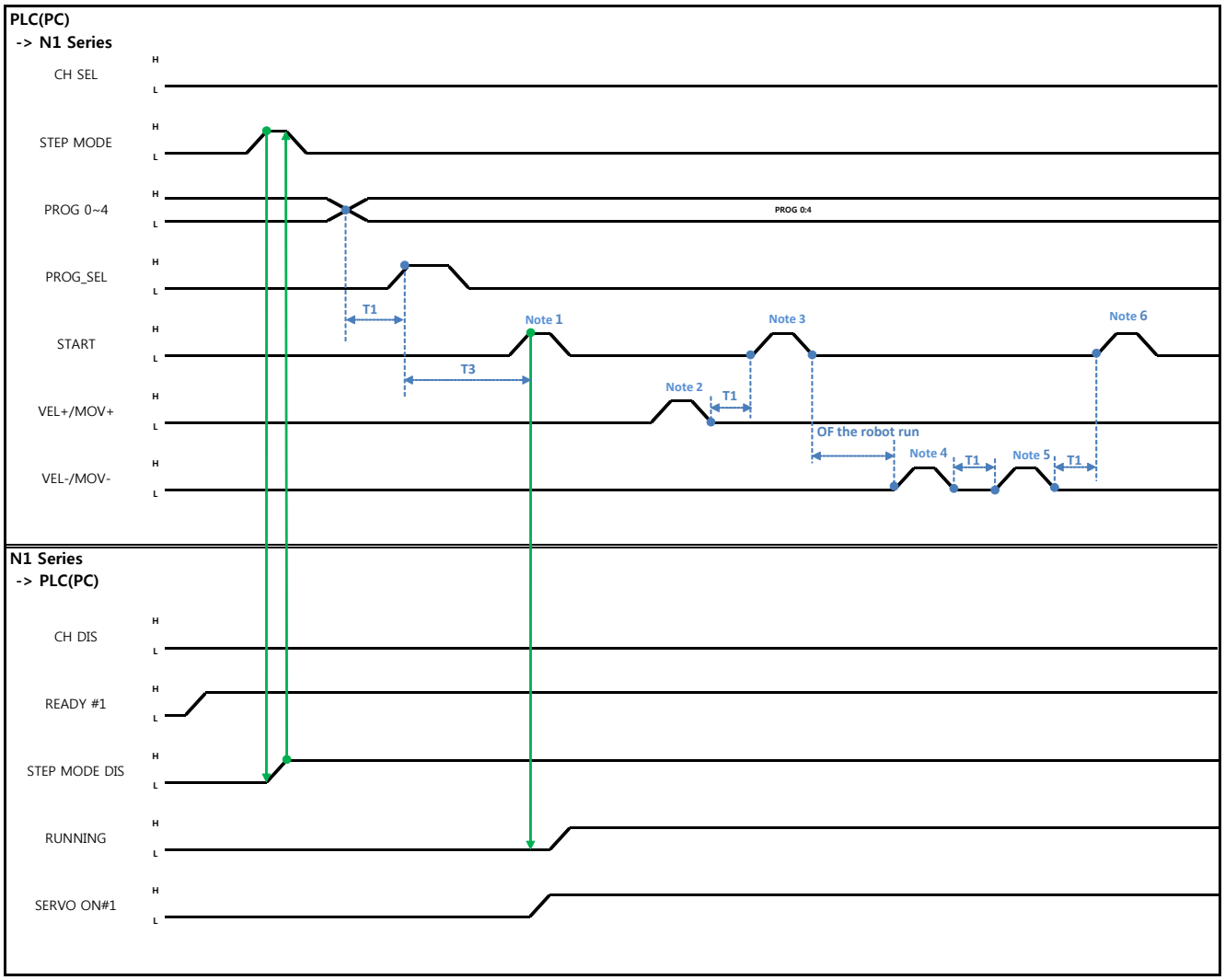
Description :

- Use CH SEL Bit to select the desired Channel. (Low: Channel 1, High: Channel 2)
- Select the desired operation MODE(AUTO RUN, STEP RUN, JOG).
  Enter MODE Signal in Pulse format when High status should be kept over 20ms.

CAUTION

- MODE can be converted only with SERVO OFF.
- Check CH SEL Bit before changing MODE.
- When CH SEL Bit is wrongly set, another Channel MODE changes.

6.3.9 STEP MODE



When in Auto Servo ON

Description:

- Enter STEP MODE Bit in System Input #2 into pulse. (High status should be kept over 20ms.)
- Once STEP MODE has been set, STEP MODE DIS is set to High.
- Combine PROG 0~4 Bits to set the desired JOB Program num. (PROG0 Bit is the lowest (LSB) Bit and PROG4 Bit is the highest (MSB) Bit.)
- Once JOB Program num setting is complete, set PROG SEL Bit to High.
- Use START Bit in System Input #1 to run JOB.
- Use VEL+/ VEL- Bit in System Input #1 to select the desired JOB step.
- Select the desired STEP to operate, enter START#1 Bit into pulse.
- Use START Bit and run it with one STEP increase at a time.

- To view the only desired motion, use VEL+/VEL- Bit, set to the desired motion STEP Line, use START #1 Bit for operation.

Note 1) Means JOB Program START. (Currently Step Line: 1)

Note 2) Add +1 to JOB program Step. (Currently Step Line: 2)

Note 3) Run the current Step Line. Add +1 to Step. (Step Line: 3)

Note 4) Subtract -1 from the current Step. (Step Line: 2)

Note 5) Subtract -1 from the current Step. (Step Line: 1)

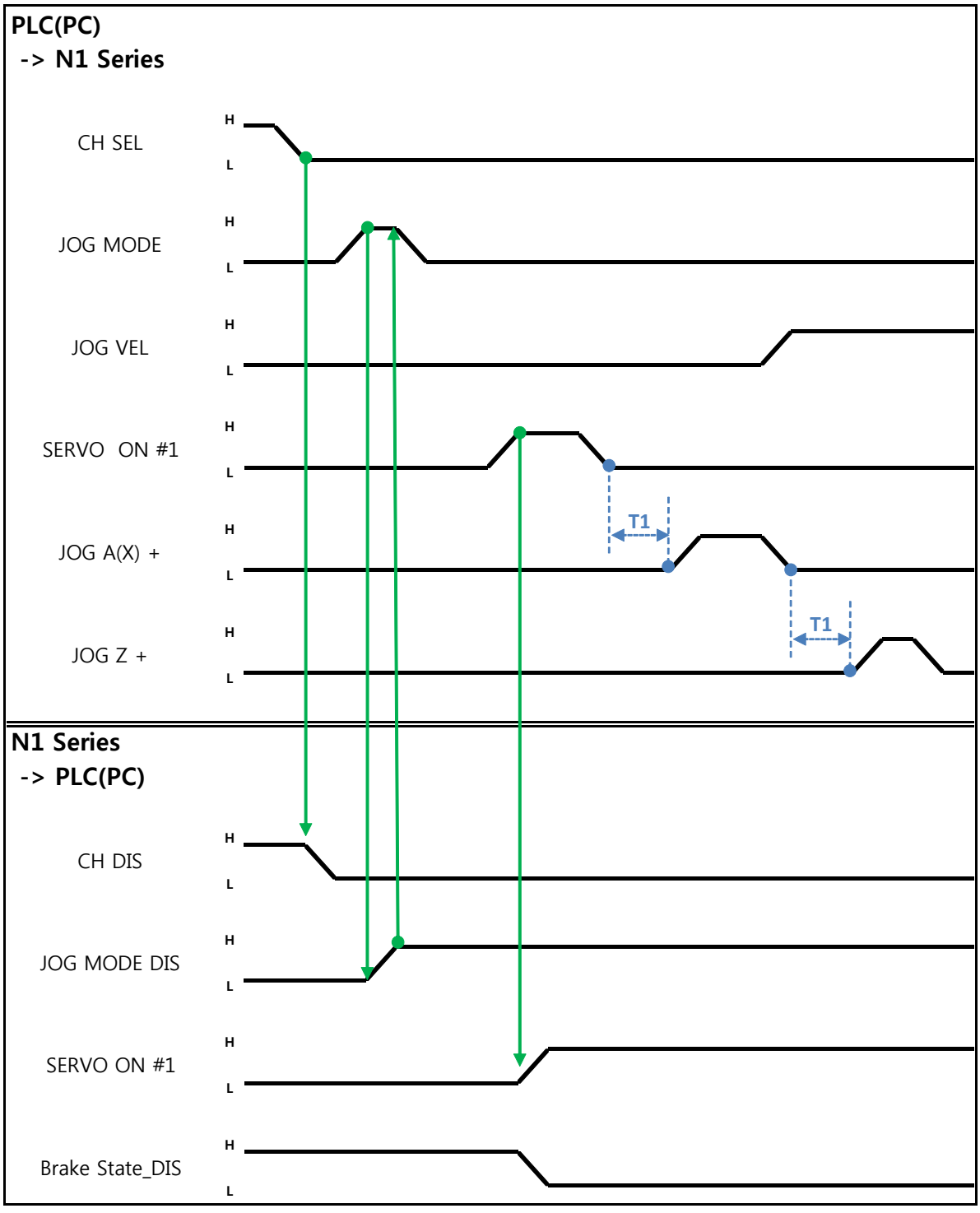
Note 6) Run the current Step Line. Add +1 to Step. (Step Line: 2)

When not in Auto Servo ON

Description :

- Enter STEP MODE Bit in System Input #2 into pulse. (High status should be kept over 20ms.)
- Once STEP MODE has been set, STEP MODE DIS is changed to High.
- Combine PROG 0~4 Bits to set the desired JOB Program num. (PROG0 Bit is the lowest (LSB) Bit and PROG4 Bit is the highest (MSB) Bit.)
- Once JOB Program num is complete, change PROG SEL Bit to High.
- Enter SERVO ON#1 Bit into pulse. Check SERVO ON#1 in System output # on N1 Series to see if it is in SERVO ON.
- Use START Bit in System Input #1 to operate JOB.
- Use VEL+/ VEL- Bit in System Input #1 to select the desired JOB step.
- Select the desired STEP to operate and enter START#1 Bit into Pulse.
- Use START Bit and run it with one STEP increase at a time.

6.3.10 Operation in JOG MODE



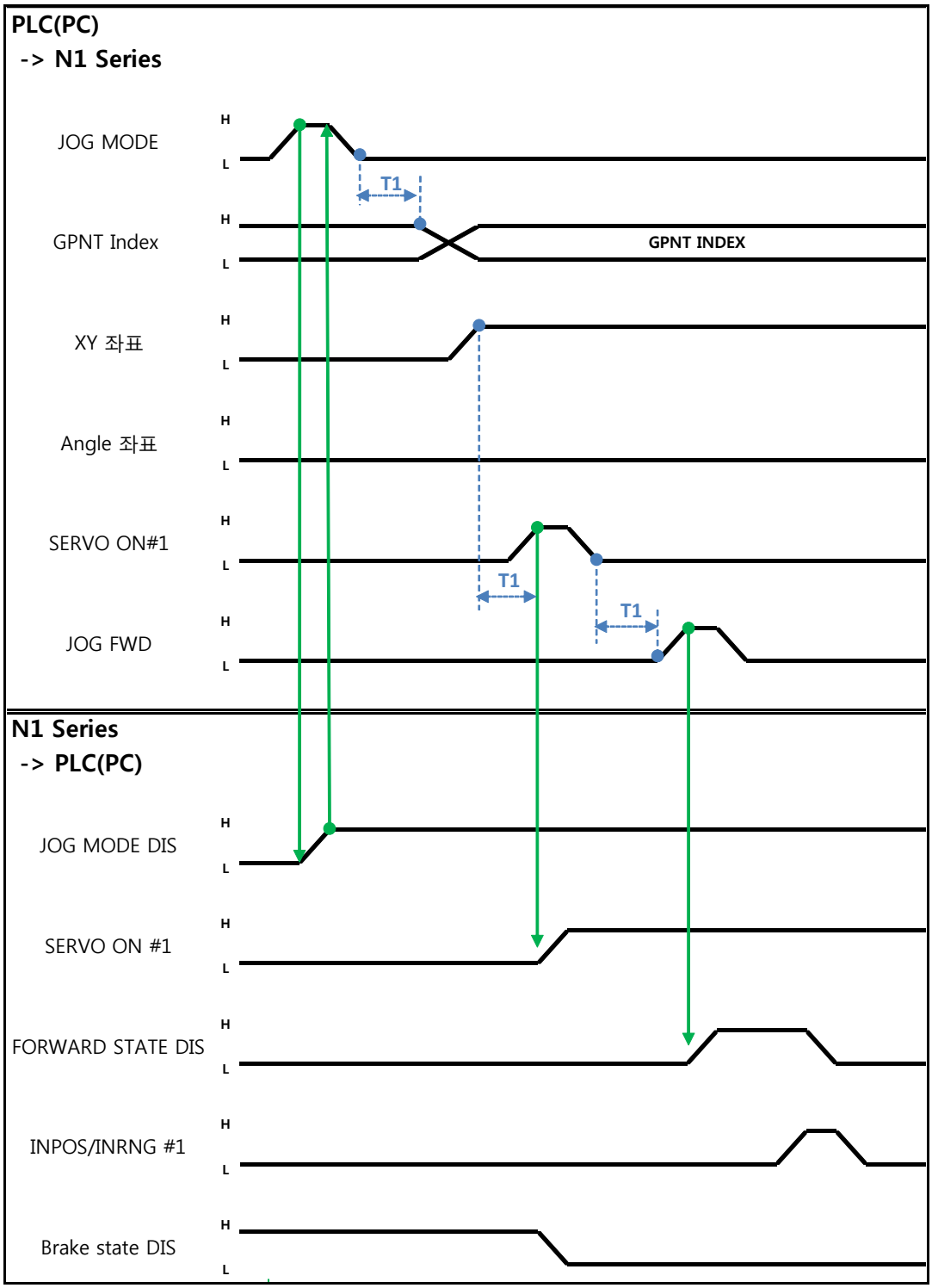
Description:

- Enter JOG MODE Bit in FIELDBUS INPUT #2 into Pulse.
- Once JOG MODE has been set, JOG MODE DIS is set to High.
- Use JOG MODE DIS for details about the currently selected MODE, maintaining its state until AUTO MODE or STEP MODE is selected.
- Setting is done selectively among JOG X(A)+ ~ JOG W- in FIELDBUS INPUT #2.
- When setting JOG VEL Bit to Low, operation is performed at $\frac{1}{2}$ speed of the set value for JOG VEL RATE.

⚠CAUTION

- **Robot operates at 30% speed. (It operates at 30% of Jv set value of JOINT MOTION parameters per axis. For how to set, refer to Handling Manual "1.2.2.2 Set Variables related to Joint Motion".)**
- **In JOG MODE SET BIT, enter PULSE.**
- **When operating JOG, Auto Servo ON does not apply regardless of setting Auto Servo ON.**
- **When operating JOG, be sure to send out SERVO ON #1 Signal to turn into Servo ON.**
- **When not selecting a coordinate, it operates by Angle coordinate.**

6.3.11 Forward Operation in JOG MODE



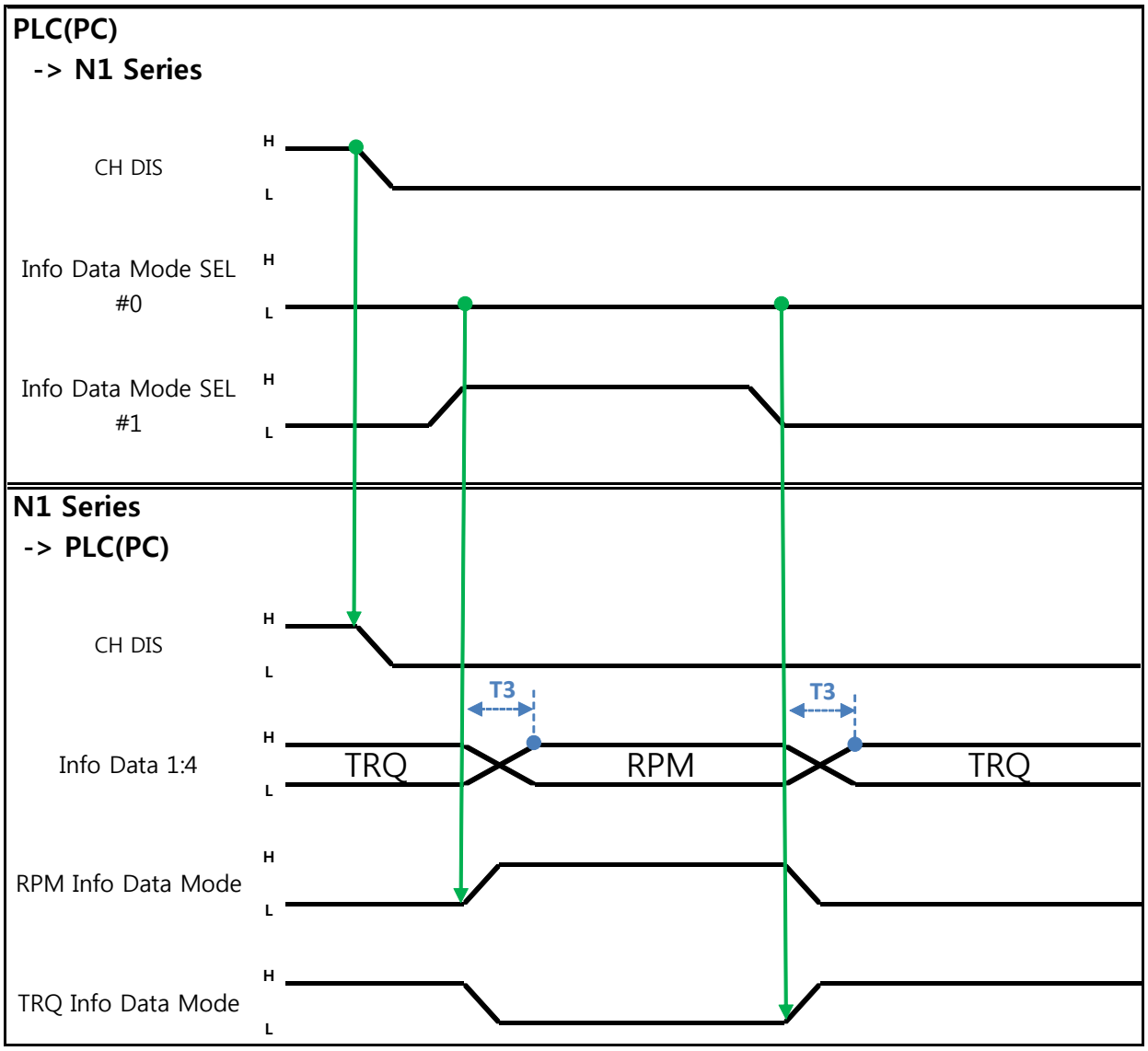
Description:

- Use JOG MODE DIS state Bit for details about the currently selected MODE, maintaining its state until selecting AUTO MODE or STEP MODE.
- Set the GP Point Index to move.
- Enter JOG FWD Bit in FIELDBUS INPUT #2 into Pulse.
- When running Forward operation, Forward State DIS bit is set to High and turns into Low with completion of operation.

⚠CAUTION

- **Robot operates at 30% speed. (It operates at 30% of Jv set value of JOINT MOTION parameters per axis. For how to set, refer to Handling Manual "1.2.2.2 Set Variables related to Joint Motion".)**
- **In JOG MODE SET BIT, enter PULSE.**
- **When operating JOG, Auto Servo ON does not apply regardless of setting Auto Servo ON.**
- **When operating JOG, be sure to send out SERVO ON #1 Signal to turn into Servo ON.**
- **When selecting Angle coordinate from Scara Robot Type, JMOV operates and when selecting XY coordinates operation is performed by LMOV.**
- **'Pull up' function may not be used in Forward movement.**

6.3.12 Read RPM, TRQ

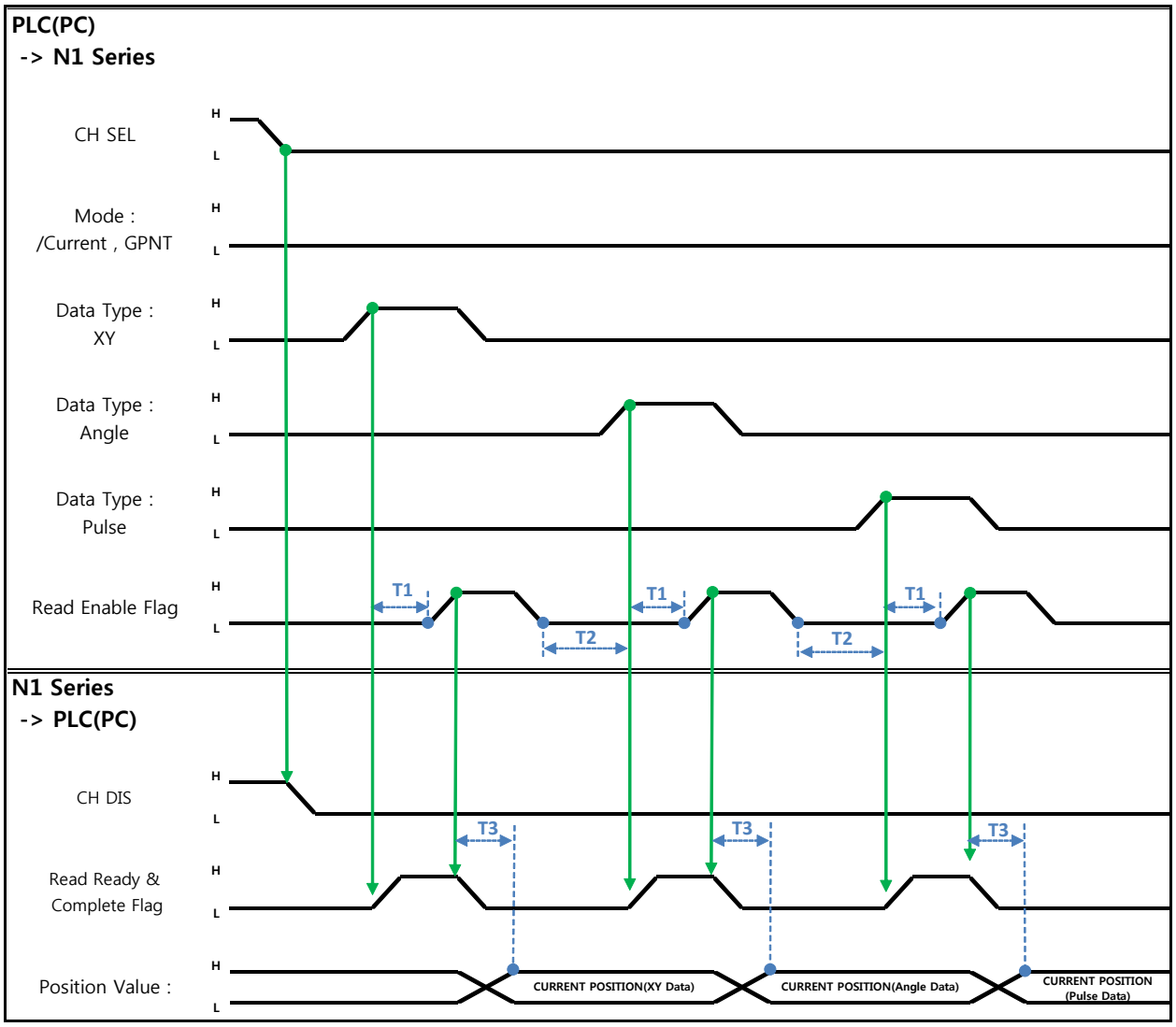


Description:

- Sends out TRQ or RPM value according to Info Data Mode 0:1 setting.
- Information about current output values can be confirmed via TRQ Info Data Mode Bit and RPM Info Data Mode Bit.

	TRQ	RPM
Info Data Mode SEL #0	LOW	LOW
Info Data Mode SEL #1	LOW	HIGH

6.3.13 Read Current Position



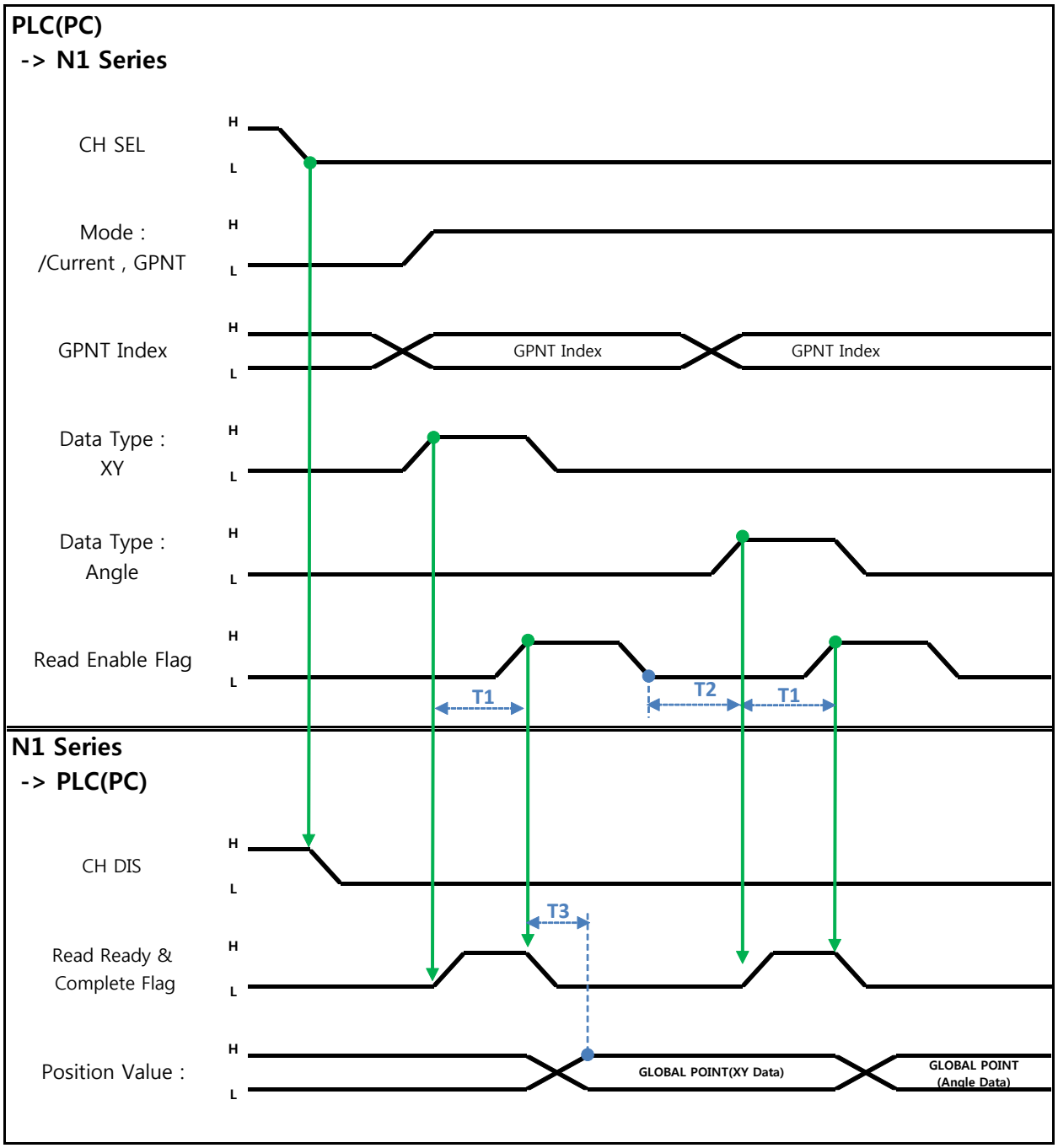
Description:

- Sets CH SEL Bit. (Low: Channel 1, High: Channel 2)
- Set Data Type(XYZW, ABZW) for reading the Current Position.
- To read the current position, set Mode Select bit to Low. (Low: Reads robot's current coordinate, High: Reads Global Point)
- Enable determining if readable using Read Ready & Complete Flag Bit in System OUT2.
- Use Read Enable Flag to be able to read the current position value.
- The minimum standby time (T2:30ms) is needed when reading the current position in accordance with change to Data Type.

⚠ CAUTION

- **If Data Type is not changed to Low in Read Enable Flag High, Read Ready & Complete Flag instantly turns back into High.**
- **The minimum standby time is required in Current Position Read following change to Data Type.**

6.3.14 Read GLOBAL Point



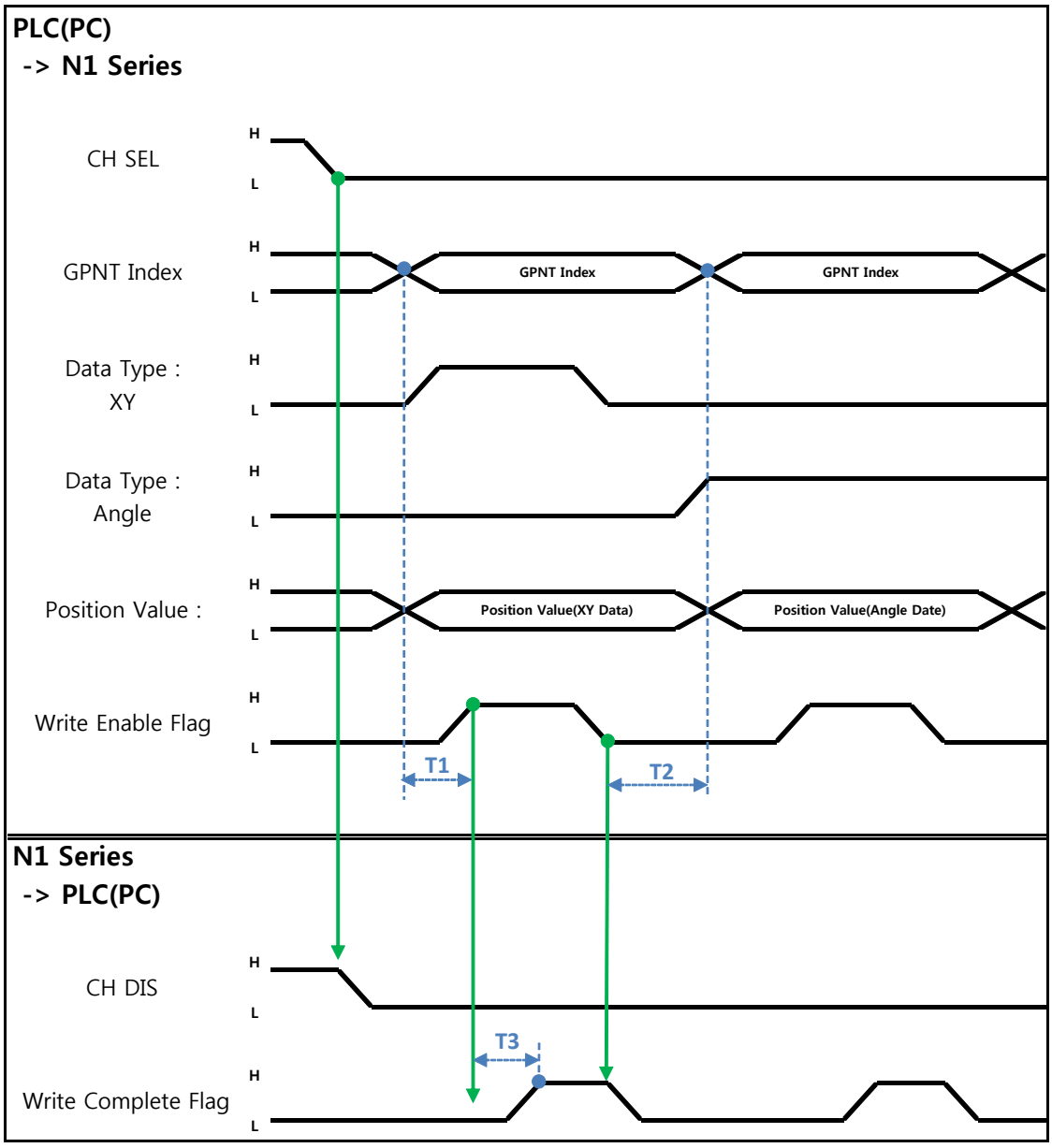
Description :

- Set CH SEL Bit. (Low: Channel 1, High: Channel 2)
- Set Mode Select bit to High. (Low: (Low: Reads robot's current coordinate, High: Reads Global Point)
- Set GPNT Index.
- After delaying as much time as T1(20ms), set Read Enable Flag Bit to High, when Read Ready&Complete Flag state should be High.
- Depending on a Data Type choice, the values saved in Global Point can be read by XY coordinate value or Angle value.
- When Read Enable Flag Bit in Field Bus Input #1 is set to High, GLOBAL Point of N1 Series is set.
- When Global Point Read occurs continually, a delay time of T2(30ms) is needed.

⚠CAUTION

- **If Data Type is not changed to Low in Read Enable Flag Signal High, Read Ready & Complete Flag instantly turns back into High.**
- **The minimum standby time is required in continual Global Point Read.**

6.3.15 Write GLOBAL Point



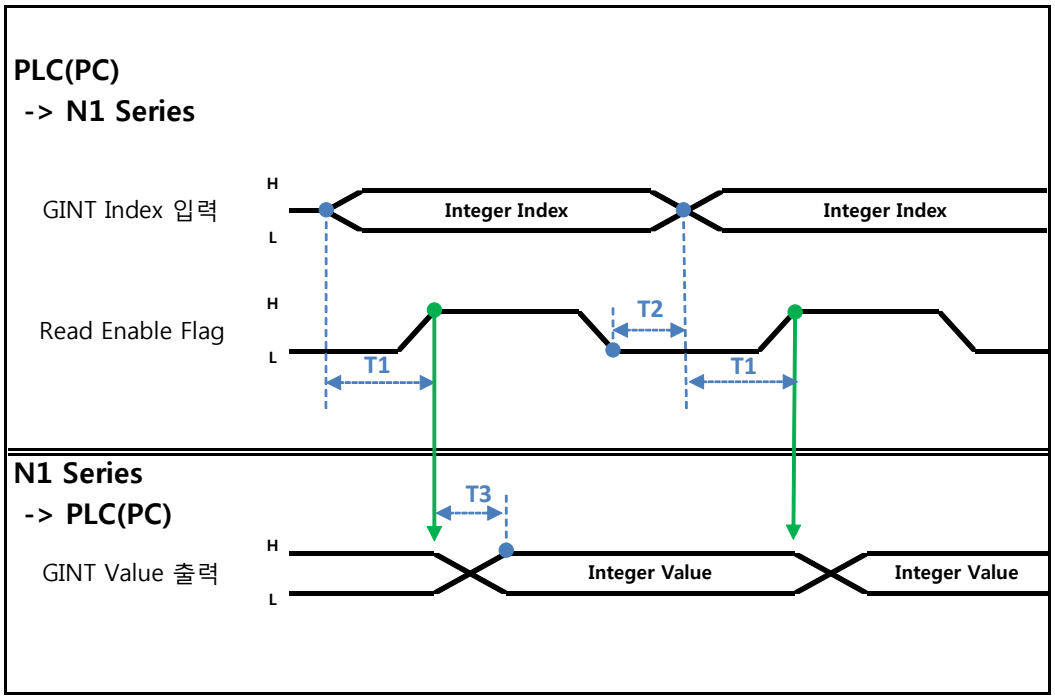
Description:

- Set CH SEL Bit. (Low: Channel 1, High: Channel 2)
- Set Global Point Index and Data Type(XYZW, ABZW).
- Set the position data of each axis to save.
- With completion of setting GPNT Index and Data Type, set Write Enable Flag Bit in Field Bus Input #1 to High.
- When the saving process is complete in N1 Series, Write Complete Flag is changed into High.
- When Write Enable Flag Bit is set to Low, Write Complete Flag is also changed to Low.
- When saving the continual Global Point, a delay time of T2(30ms) is needed.

⚠ CAUTION

- **Data Type is available only in XY coordinates and Angle coordinate.**
- **GINT, GFLOAT and GPOINT commonly use Read Enable Flag so the Index value of an unused variable is allocated at a time when no change is desired.**
- **The minimum standby time is required in continual GPOINT Write.**

6.3.16 Read GLOBAL Integer



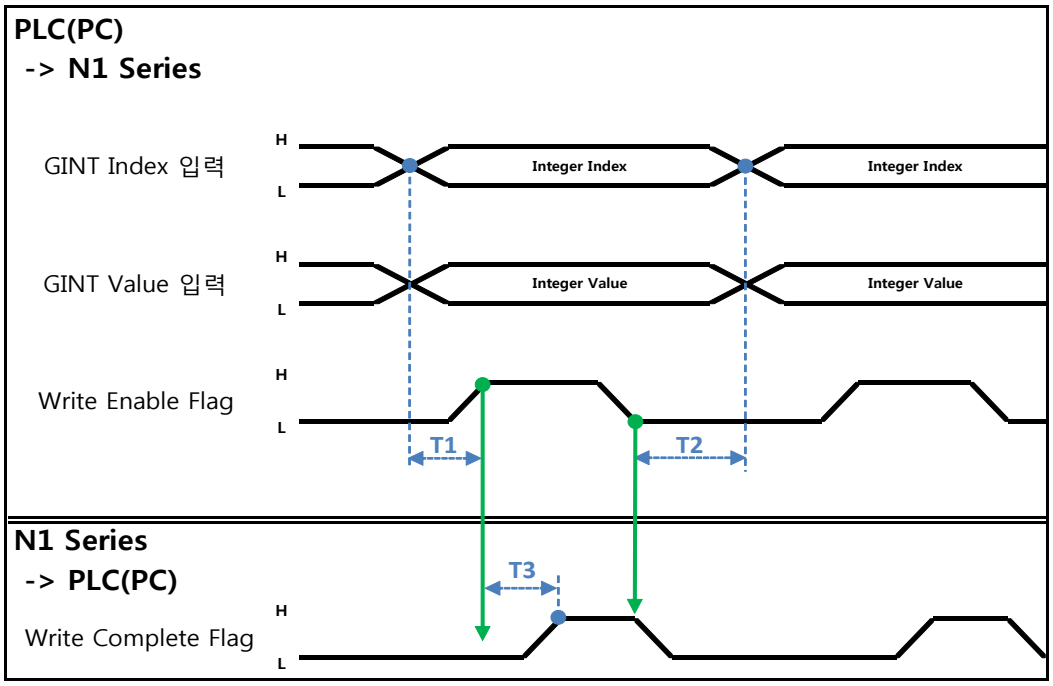
Description :

- Set the Index of a Global Integer to read.
- After setting the Index, set Read Enable Flag Bit in Field bus Input#1 to High.
- Check the Global Integer value sent from N1 Series.
- When continually reading Global Integer value, as much delay time as T2(30ms) is needed.

CAUTION

> ➢ **GLOBAL Integer, GLOBAL Float, and GLOBAL Point commonly use Read Enable Flag so caution should be taken in setting the Index value of an unused variable at a time when no change is desired.**

6.3.17 Write GLOBAL Integer



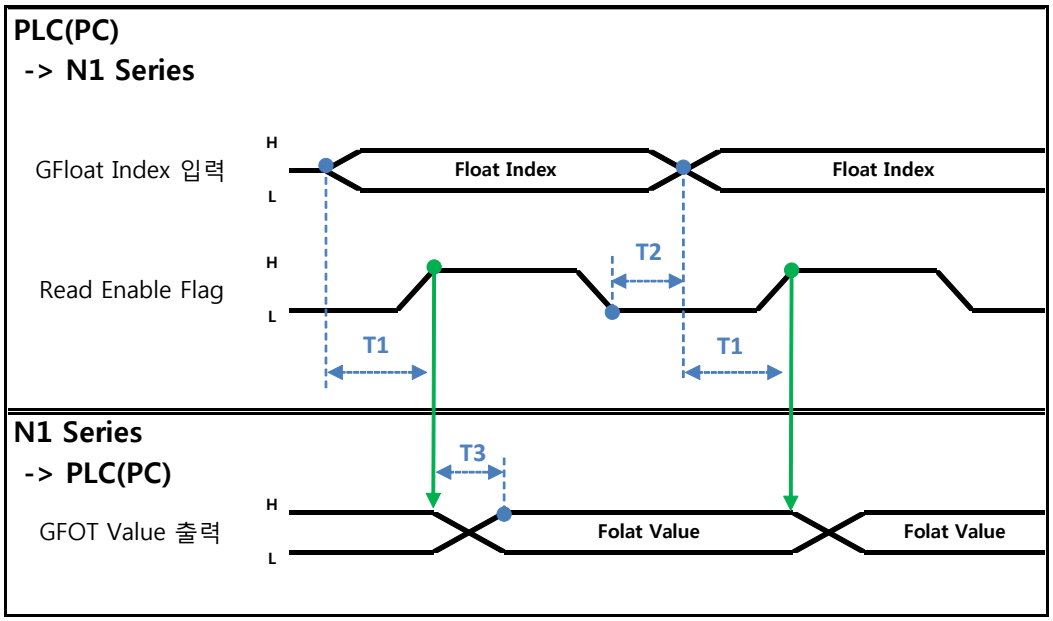
Description :

- Set the values of Global Integer Index and Global Integer to write.
- Set Write Enable Flag to High.
- When the saving process is completed in N1 Series, Write complete Flag changes from Low to High.
- When setting Write Enable Flag to Low, Write Complete Flag Bit is changed to Low.
- In case of saving Global Integer values continually, a delay time of T2(30ms) is required.

CAUTION

> ➢ **GLOBAL Integer, GLOBAL Float, GLOBAL Point commonly use Read Enable Flag so caution should be taken in setting the Index value of an unused variable at a time when no change is desired.**

6.3.18 Read GLOBAL Float



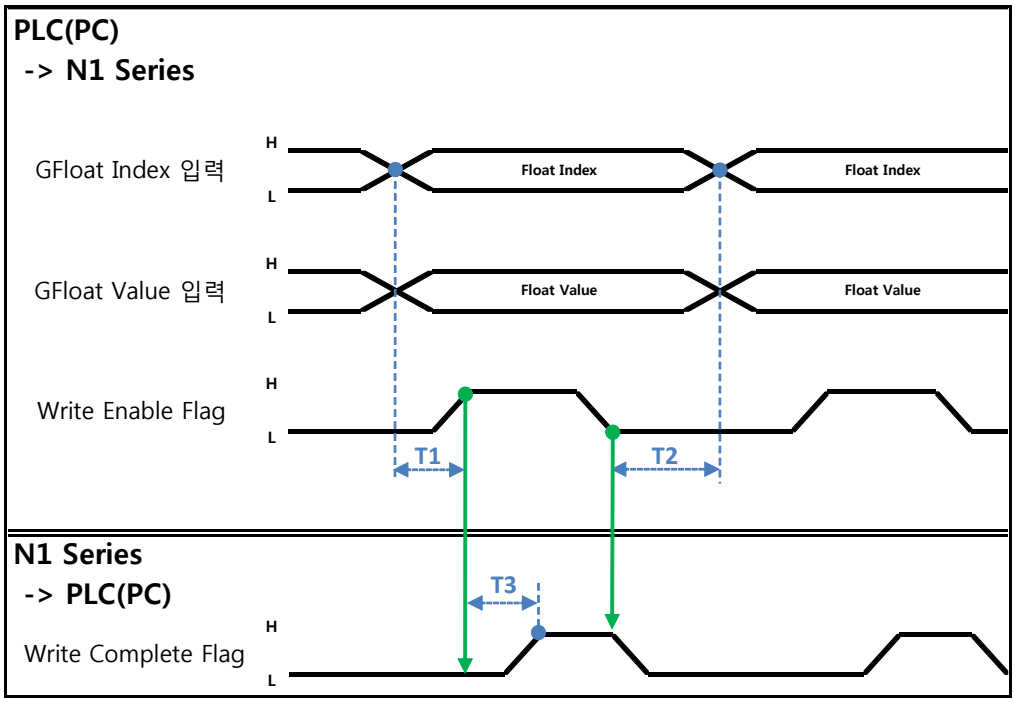
Description:

- Set the Index of Global Float to read.
- After setting Index, set Read Enable Flag Bit in Field bus Input#1 to High.
- Check the Global Float value sent from N1 Series.
- When continually reading Global Integer values, as much delay time as T2(30ms) is needed.

CAUTION

- **GLOBAL Integer, GLOBAL Float, GLOBAL Point commonly use Read Enable Flag so caution should be taken in setting the Index value of an unused variable at a time when no change is desired.**

6.3.19 Write GLOBAL Float



Description :

- Set the values of Global Float Index and Global Float to write.
- Set Write Enable Flag to High.
- When the saving process is complete in N1 Series, Write complete Flag changes from Low to High.
- When setting Write Enable Flag to Low, Write Complete Flag Bit changes into Low.
- In case of saving Global Integer values continually, a delay time of T2(30ms) is required.

⚠CAUTION

> ➢ **GLOBAL Integer, GLOBAL Float, GLOBAL Point commonly use Write Enable Flag so caution should be taken in setting the Index value of an unused variable at a time when no change is desired.**

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