Robostar Robot

N1 Series Option

DeviceNet

☑ Option Module

- DeviceNet

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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 to 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.

■ **DeviceNet**

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

Table of Contents

Chapter 1. Overview

1.1 What is a DeviceNet Option Board?

A DeviceNet Option Board is a board in charge of DeviceNet field network system communication of Robostar N1 controller. N1 controller allows the use of a DeviceNet Option Board to enable communicating with systems such as PC or PLC using DeviceNet protocols. DeviceNet, one of fieldbus communication methods getting the most spotlight over recent years, is considered the most successful technology among a variety of fieldbuses due to its short system response time and high reliability through the use of CAN (Controller Area Network) protocols.

1.2 System Configuration

The upper network can be interfaced with a DeviceNet master station such as PC or PLC, while a master station utilizes DeviceNet field network to communicate with sub-slave stations.

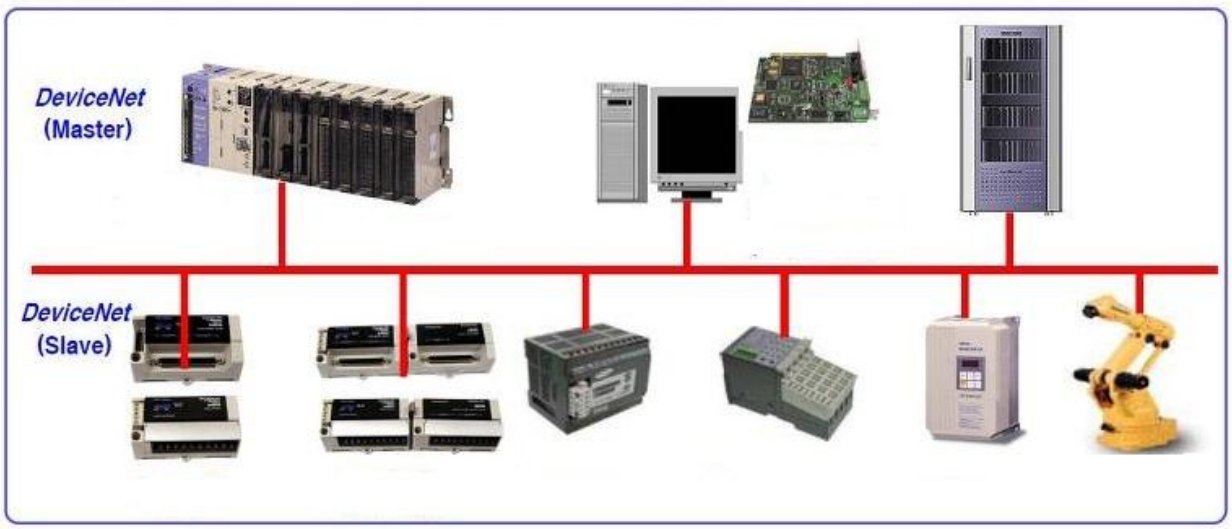


Fig. 1.1 DeviceNet System Configuration

Chapter 2. Function

2.1 Specifications of DeviceNet Option Board

DeviceNet connections	Connector	Pluggable connector(5.08mm, 5-pin)
	Data Transfer Method	CAN(Controller Area Network)
	Transfer Cable	DeviceNet dedicated cable (4-wire shield cable)
	Withstand Voltage	500VDC
	Terminating Resistance	120 Ohm
Communications	Communication Protocol	ODVA 2.0
	Communication Speed	125/250/500Kbaud (Set automatically depending on master)
	Product Code	0x10/0x11
	Product Type	0(Generic)
	Vendor ID	1055
Electrical	Communication Power	11~25V DC
	Communication Current	Below 30mA
	Control Power	5V DC(Provided from Robostar controller)
Environment	Operating Temperature	0 ~ 40℃
	Storage Temperature	-15 ~ 60℃
	Operating Humidity	20~80% PH

2.2 Characteristics and Functions of DeviceNet

Max Number of Stations to use	64 stations (0-63)	
Communication Distance per Speed	125Kbps	500m
	250Kbps	250m
	500Kbps	100m
Data Transmit/Receive Methods	Explicit Message(Parameter input/output data)	
	Polled I/O Message(Real-time input/output data)	
Transmit/Receive Length	Explicit Message: Flexible depending on parameter length	
	Polled I/O Message: Max 32Byte(Default:8Byte)	
Device Type	Group2 Only Server(Predefined Master/Slave Connection Set)	

Chapter 3. Specifications

3.1 DeviceNet Specifications

DeviceNet Option Board is connected to the external fieldbus through a 5-pin connector and connected to Robostar N1 controller through a built-in Dual_Port memory. DeviceNet Option Board consists of DeviceNet 5-pin connector, module status display LED, network status display LED, prefix setup switch, I/O SIZE setup switch, and RS-232 connector(DB9).

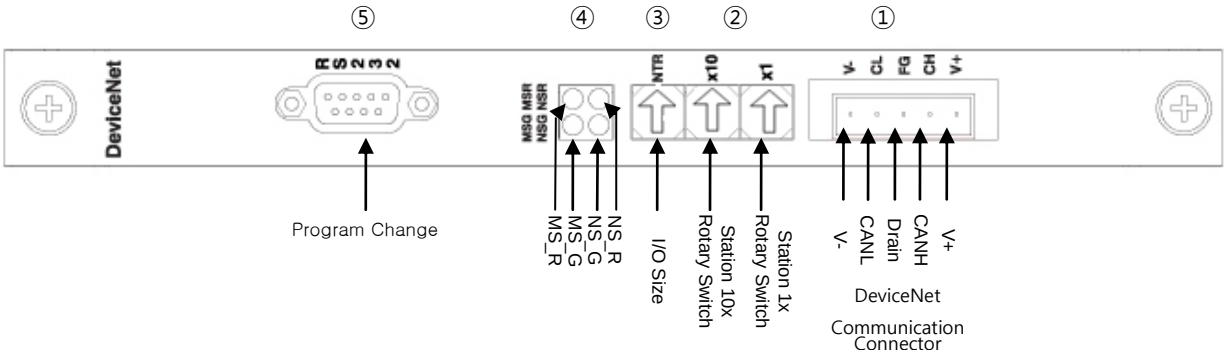


Fig. 3.1 DeviceNet Board Block-diagram

Signal	Connector	Description
V-	1	Communication Power, Ground(0V)
CAN_L	2	Communication Signal, Low
Drain	3	Shield
CAN_H	4	Communication Signal , High
V+	5	Communication Power , +24V DC

Table 3.1 DeviceNet Connector Setting

3.2 Status Display LED

DeviceNet Option Board has two LEDs – a module status display LED(MS_R, MS_G) indicating the Board status and a network status display LED(NS_R, NS_G) indicating the communication status.

LED Status		Description
NS_R(Red)	NS_G(Green)	
Off	Off	DeviceNet Option Board not On-line. -.Board not connected to master yet. -. Power to Module status display not provided with LED OFF.
Off	On	Board is On-line, connecting normally to master.
Off	Blinking	Board is On-line by passing check for a duplicate node but not in communication with master.
Blinking	Off	I/O Connection(Poll I/O) in Time-Out.
On	Off	Board unable to connect to network. (ID duplicated or Bus-Off)

Table 3.2 Network Status Display LED

LED Status		Description
MS_R(Red)	MS_G(Green)	
Off	Off	Power not provided.
Off	On	Board under normal operation.
Off	Blinking	Board is on Stand-by or a certain error occurred in the course of initializing network parameters.
Blinking	Off	Error generated on Board which is likely to go back to normal.
On	Off	Error generated on Board which is unable to go back to normal.

Table 3.3 Module Status Display LED

- **LED Check**

When DeviceNet Option Board is powered, LED check is done with the following procedure.

1. Turn all LEDs Off
2. Turn all Green LEDs On(25ms)
3. Turn all Red LEDs On(25ms)
4. Turn all LEDs Off
5. Under normal operation

3.3 Station Number Setting

Use the Station 10x Rotary Switch and Station 1x Rotary Switch in Fig. 3.1 ② and change into Station Number set in Master to have communication with DeviceNet 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.

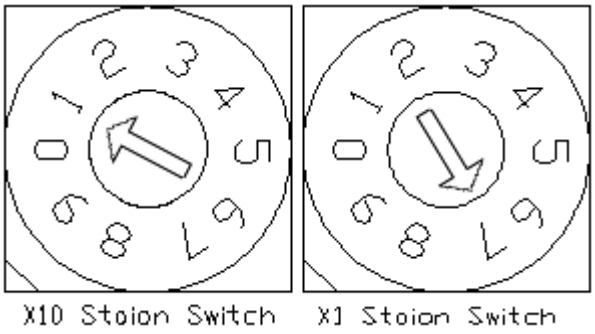


Fig. 3.2 Examples of Station Number Setting

Station Number setting can be done from Station 0 to 64, where the remote device station where DeviceNet Option Board belongs is capable of setting from Station 1 to 64. Fig. 3.2 shows an example set by 17 stations. When resetting a prefix, be sure to change the power from OFF->On.

3.4 Display of Communication Power and Communication Line

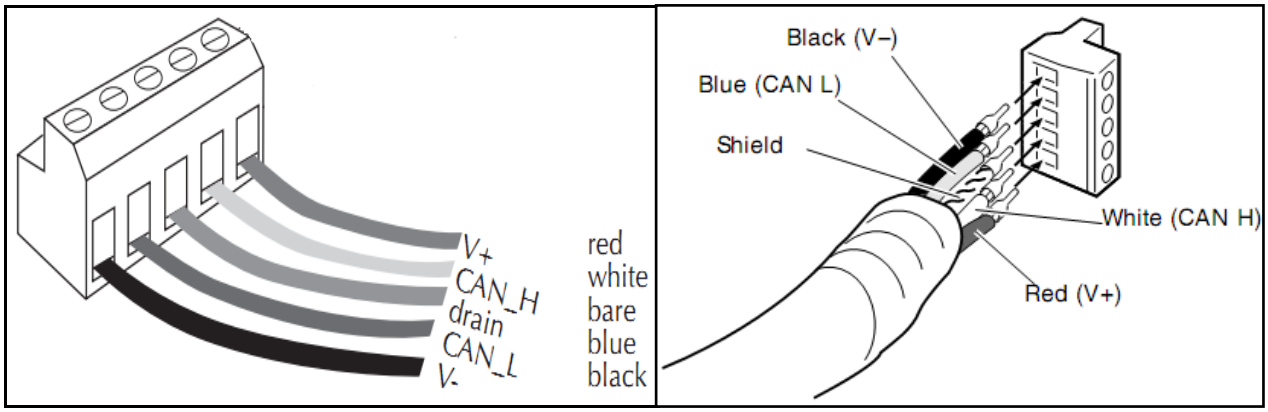


Fig. 3.3 Connector Pin Layout

Communication Power	Connect to Terminal 1 (-V, Black) and 5 (+V, Red).
Communication Line	Connect to Terminal 2(CANL, Blue) and 4 (CANH, White).

Upon completion of wiring, check that the wiring has been properly conducted by measuring the resistance value on both ends (CANH, CANL) of the communication line.

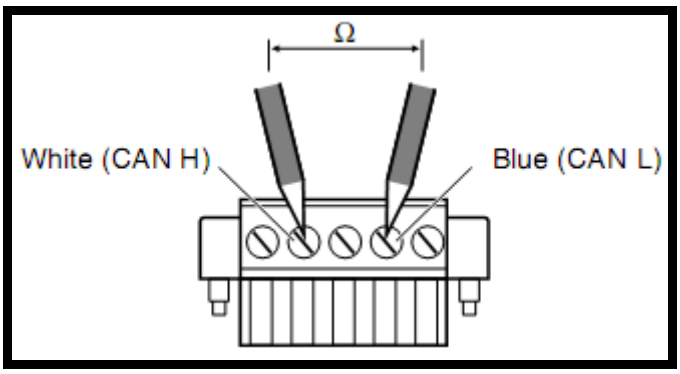


Fig. 3.4 Resistance Measurement

See Table 3.4 for reference for details about the resistance values measured.

Measured Value	Measures
Below 50 Ω	Possible error is on the board connected. Remove error by checking the terminating resistance.
50 – 70 Ω	Under normal condition
70 – 125 Ω	Either CANH or CANL disconnected, or the terminating resistance is installed only at one end.
Over 125 Ω	The terminating resistance is not installed, or CANH or CANL disconnected.

Table 3.4 Resistance Measurement for Presence of Connection Error

Terminating resistance (120Ω, ±1%) is connected between Connector CANL(2PIN) and CANH(4PIN). For how to connect, refer to "Fig. 3.5 How to Connect Terminating Resistance".

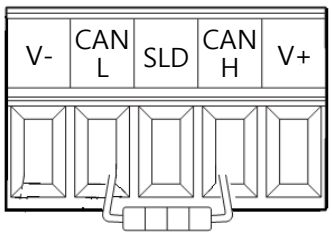


Fig. 3.5 How to Connect Terminating Resistance (120Ω)

⚠CAUTION

Terminating resistance (120 Ω) should be installed in termination of communication.

3.5 I/O SIZE Setting

This product allows an easy I/O SIZE setting with a choice of switches. I/O SIZE can change depending on the location of Switch 3. If Switch3 is positioned in 0, I/O SIZE is 48X48 SIZE and if 1, I/O SIZE is 46X40 for use.

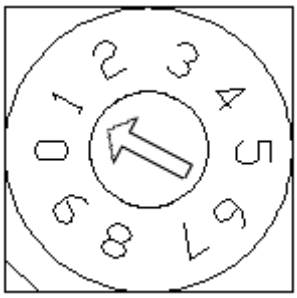


Fig. 3.6 Example of Data Size Setting

Input/Output Data Size Setting Value		
Value	IN Data Size	OUT Data Size
0	48 Kbyte	48 Kbyte
1	46 Kbyte	40 Kbyte
2	8 Kbyte	8 Kbyte
Values other than the above values	Error	

Table 3.5 Input/Output Size Setting Value

3.6 Cable Spec

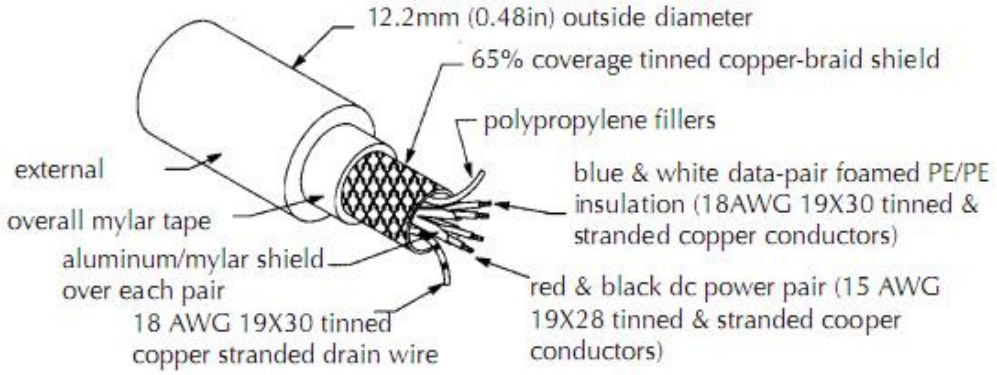


Fig. 3.7 Thick Cable

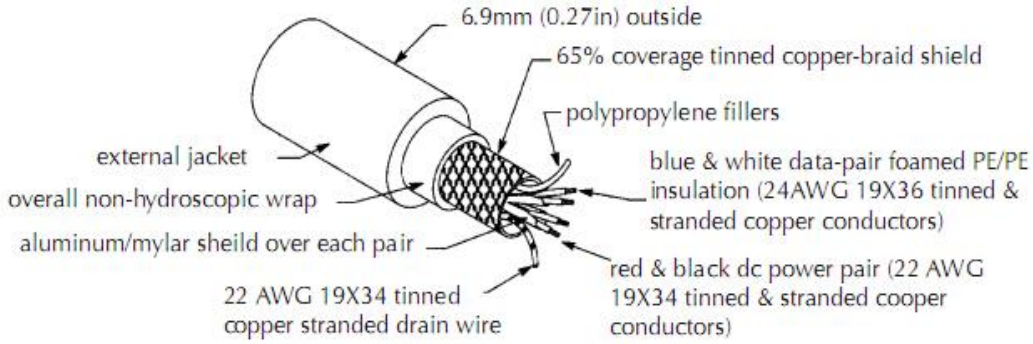


Fig. 3.8 Thin Cable

- When using 24 Volts DC on a thick cable or flat cable, the maximum for use is 8A but NEC Class 2 requirements permit only 4A. (Applies only to North America)

- A maximum of 3A is possible when using 24 Volts DC on a thin cable.

3.7 How to Install Hardware

Take the following procedure to be able to use DeviceNet Option Board of N1 series controller.

1) Turn power OFF.
2) Attach DeviceNet Option Board to PCI slot on N1 Controller.

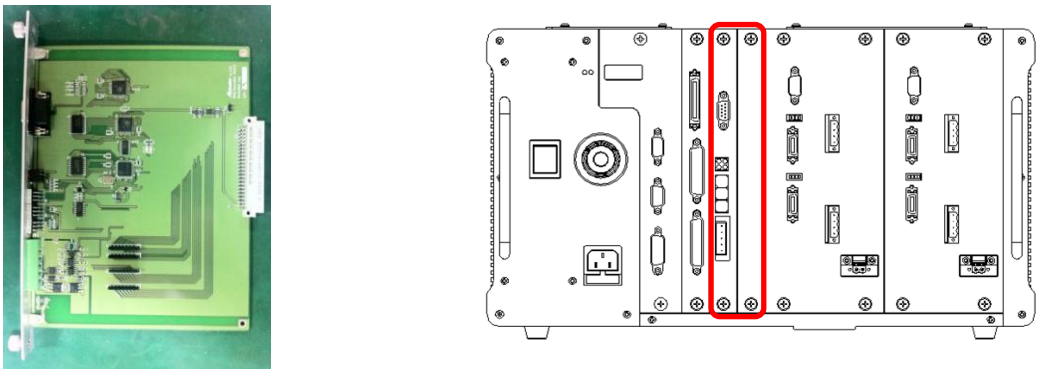


Fig. 4.1 How to Install Option Board

3) Turn power back ON.

Chapter 4. Installation and Operation Setting

4.1 How to Connect DeviceNet Field Network Cable

A STL(Z) 950 5-pin OPEN Connector is used for how to connect between Cable and Connector DeviceNet Option Card, therefore a screw driver is used to fix 4 wires on DeviceNet field network --- V+(Red), CANH(White), CANL(Blue), V-(Black). Basically use a certified DeviceNet cable. For wiring between cable and Connector, refer to "Fig. 4.2", "Fig. 3.3".

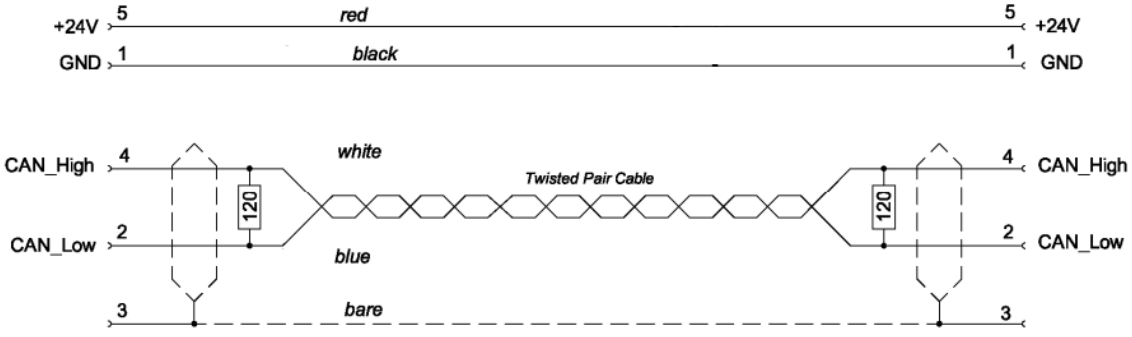


Fig. 4.2 How to Connect Network Cable

CAUTION

- **For FieldBus network cable, use a certified DeviceNet cable.**
- **When using a non-dedicated cable, it may lead to malfunction due to noise.**

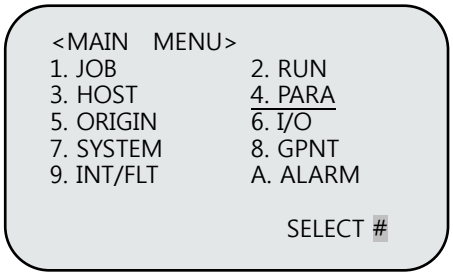
4.2 Controller Setting

To use DeviceNet from N1 Controller, the following Software setup is required.

4.2.1 FIELD BUS(DeviceNet) Setting

1. Setting Procedure

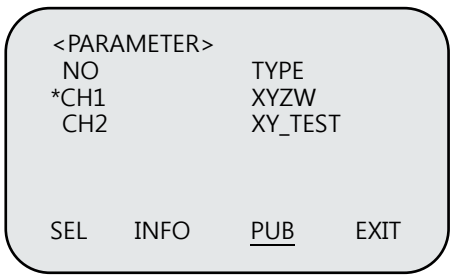
Step1. Move to PUBLIC Parameter screen



Open initial MAIN screen

Select 4: PARA

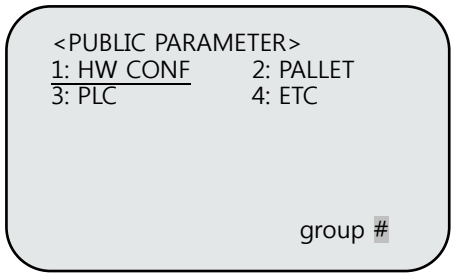
4
L



Open PUBLIC PARAMETER group screen

Press F3 button to move to PUB

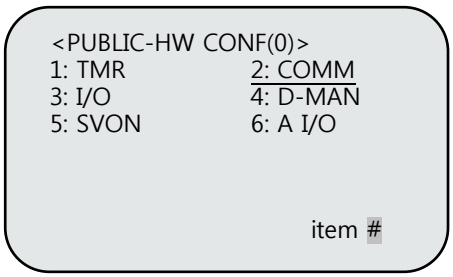
F3



Select 1:HW CONF

1
Q

Step2. **Move to FIELD BUS screen**

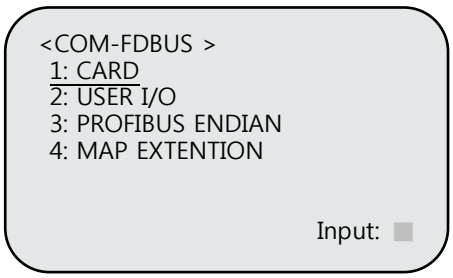


Select 2:COMM

2
R

Select 2: FIELD BUS

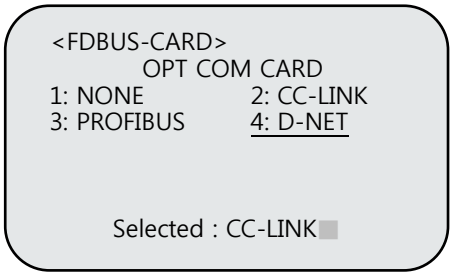
2
R



Select 1: CARD

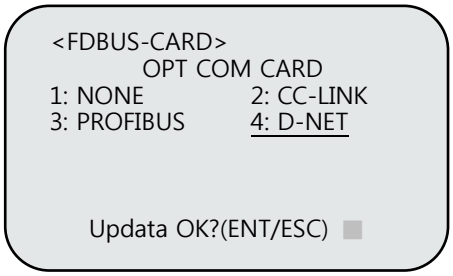
1
Q

Step3. **OPTION CARD setup screen**



Select 2: D-NET

4
L



Press ESC and then ENTER to save

ESC ENTER

CAUTION

When there is no DeviceNet B/D, a message “Not Card!” comes up at bottom of T/P screen and fails to be saved.

4.2.2 USER I/O Setting

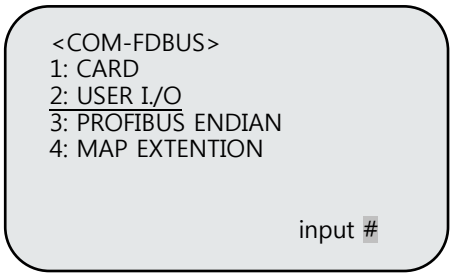
1. Setting Procedure

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

2 R

Open COMM screen

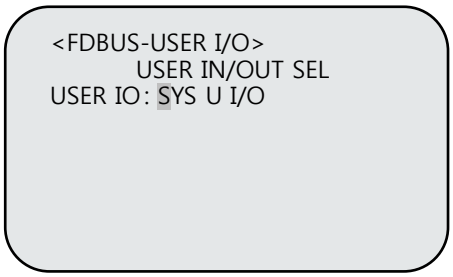
Select 2: FIELD BUS



2 R

Select 2: USER I/O

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



ENTER

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

When using a Field Bus card, a method of using USER I/O is set.

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 in Field Bus card

⚠ CAUTION

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

4.3 PLC Data Transfer Speed

When transmitting data from PLC, a maximum of 10ms delay time may occur. As the Controller takes20ms for data scanning time, an accurate operation may not be guaranteed if a data value is changed for less than 20ms.

Thick Trunk

Transfer Rate	125 Kbps	250 Kbps	500 Kbps
Transfer Distance	500m	250m	100m
Longest Drop Length	6m	6m	6m
Cumulative Drop Length	153m	77m	38m
Number of Nodes	64	64	64

Thin Trunk

Transfer Rate	125 Kbps	250 Kbps	500 Kbps
Transfer Distance	100m	100m	100m
Longest Drop Length	6m	6m	6m
Cumulative Drop Length	153m	77m	38m
Number of Nodes	64	64	64

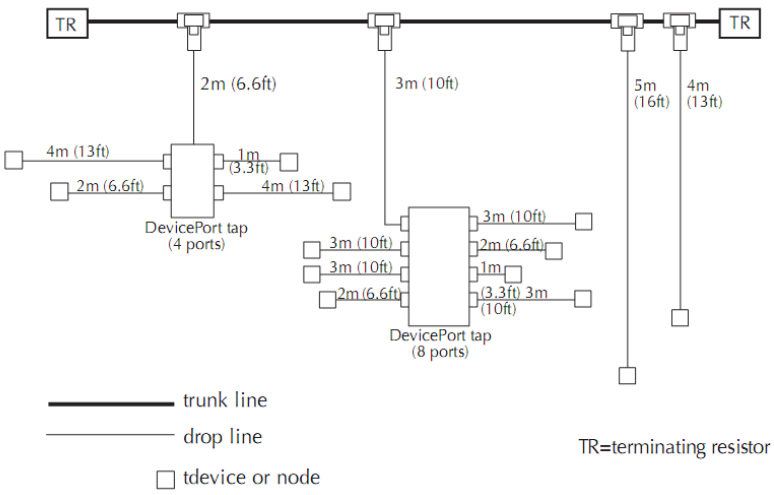


Fig. 4.3 Example of Drop Line

CAUTION

- **DeviceNet communication speed can be set on a PLC.**

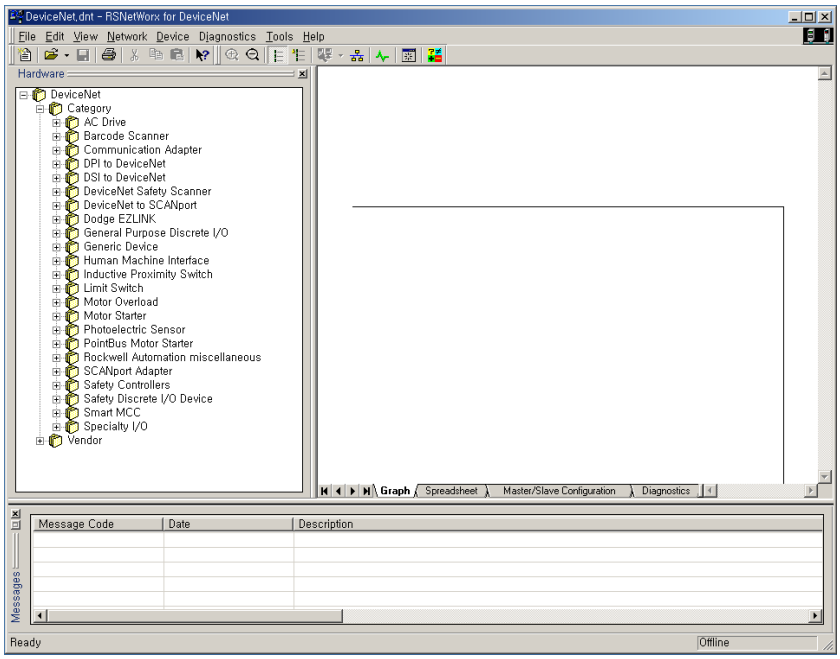
For other details about DeviceNet, refer to ODVA (WWW.ODVA.OR.KR).

Chapter 5. Examples of DeviceNet Setting

5.1 Examples of AB PLC RSNetwork Setting

How to set DeviceNet stated in this Manual made use of PLC model 1756 Compactlogix made by AB as a PLC, and used RSLinx, RSNetworx and RSLogix 5000 made by AB as software.

1) Set the N1 node address.
2) Confirm the connection to DeviceNet network before running RsNetworx. With RsNetwor running, a screen opens up as shown below.



[Fig. 5.1 RSNetwork In-progress Screen]

3) Click Tools -> EDS Wizard on the menu, the EDS Wizard screen comes up. Then, click 

icon at the screen. When the Option screen comes up, a Register an EDS File is checked as default.
4) Click 

once again, a Registration screen comes up. Click the 

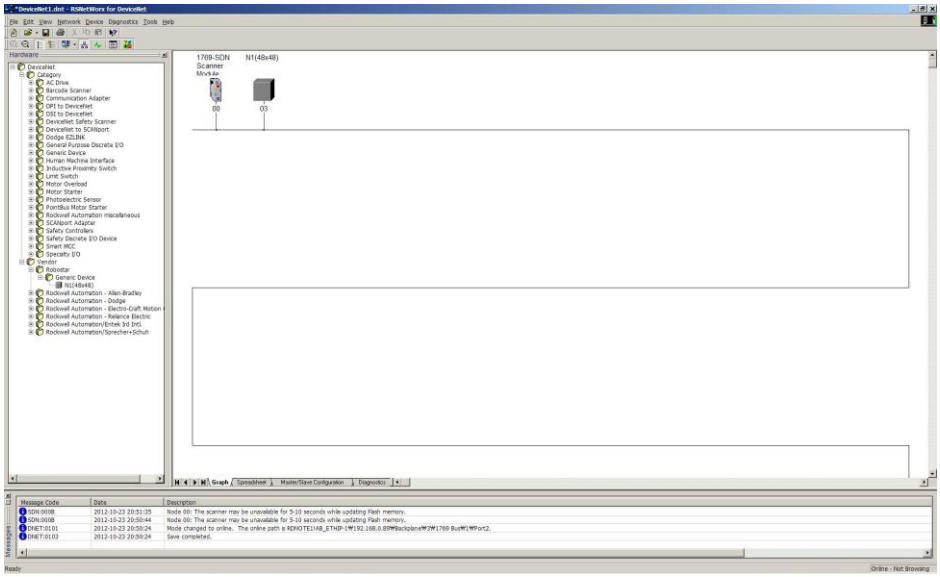
icon, find N1.EDS and click 

, then the EDS File Installation Test Results window appears.
5) Click 

three times in a row when no error is found in this window, click 

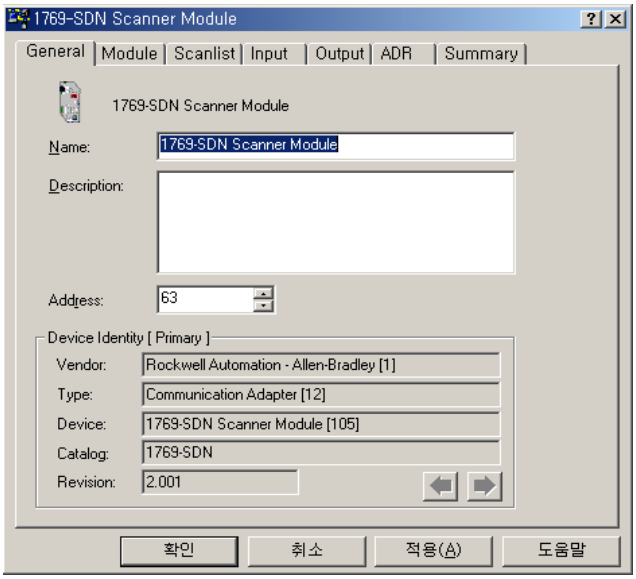
lastly, then the EDS file Install is complete. Once the EDS file has been normally installed, you can check a directory Robostar has been created at lower end of the Vendor directory at the Hardware window on the left in Fig. 5.2, with N1 generated in its sub directory.

6) In Fig. 5.2, click  (Online) icon and a window comes up. Click Check button and RsNetworx automatically begins to scan Network to find out DeviceNet modules, and a window showing the results of the scanning, as shown below, according to NODE numbers set to N1. (The set value for SW3 in Fig. 5.2 is 0(48x48). The node values of the two examples are set to 3.)



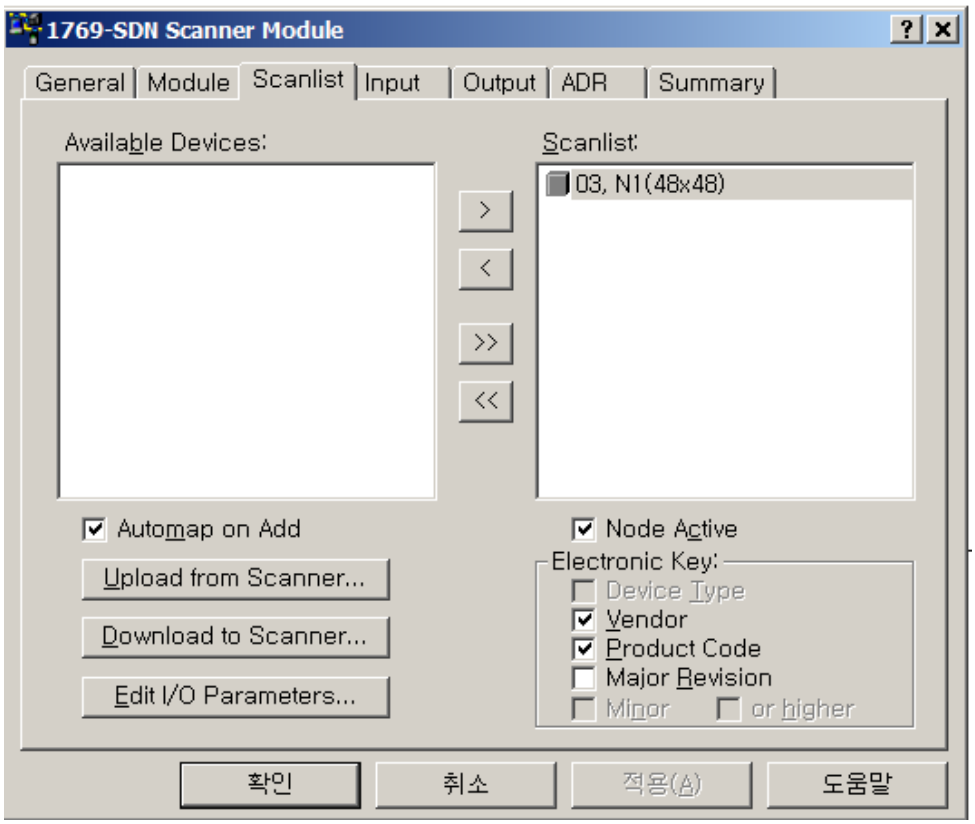
[Fig. 5.2 Screen I/O Allocation 48x48 after Auto Scan]

7) Double-click the 1796-SDN Scanner module and the Fig. 5.4 screen comes up. Click the Module tab and select CompactLogix used as the example when asked to pick a 1769-SDN Platform.



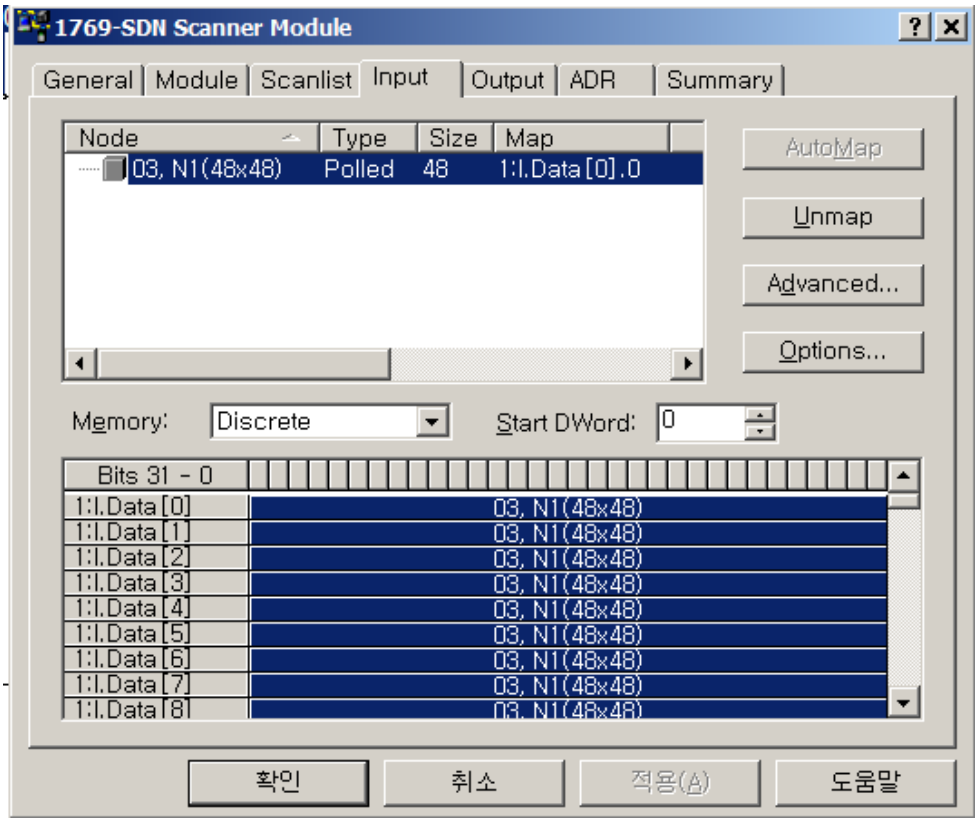
[Fig. 5.4 Scanner Setup Screen]

8) Click the Scanlist tab and the Fig. 5.5 screen pops up. Select the N1 in Available Devices and click [>], and N1 moves to Scanlist. Click the Download to Scanner on the bottom left and N1 is registered in the 1769-SDN Scanlist.



[Fig. 5.5 Scanlist Setup Screen]

9) Click the Input tab and you can check the tag numbers in which Input data of N1 is allocated as shown below. Click the Output tab and you can check the allocated tag numbers as done in Input data. To modify the tag number manually, click the [Advanced...] icon.



[Fig. 5.6 Screen for setting Input data area]

10) Run Rslogix 5000, select File -> New to create a new project. Once a new project has been created, a screen comes up as shown in Fig. 5.7, in which when you right-mouse click a New module from CompactBus Local on the bottom left of the screen, a Select module window comes up. Click the Communications tab and 1769-SDN Scanner pops up. When clicking and selecting it, you can see 1769-SDN has been created below CompactBus Local tab and Fig. 5.8 screen comes up.

11) In Fig. 5.8, write a name for module management in the 'name' section, putting in the I/O size to use in Devicenet Network when asked about Input size and Output size. In the example program, Input size is set to 12(46byte) and Output size to 10(40byte) as one N1 module is connected. For reference purpose, Input size and Output size should be set identically to I/O size set to Scanlist in RSNetworx. Click the Confirm button and RSNetworx tab to configure the path of the RSNetworx file set and saved in Ch.5 "6)".

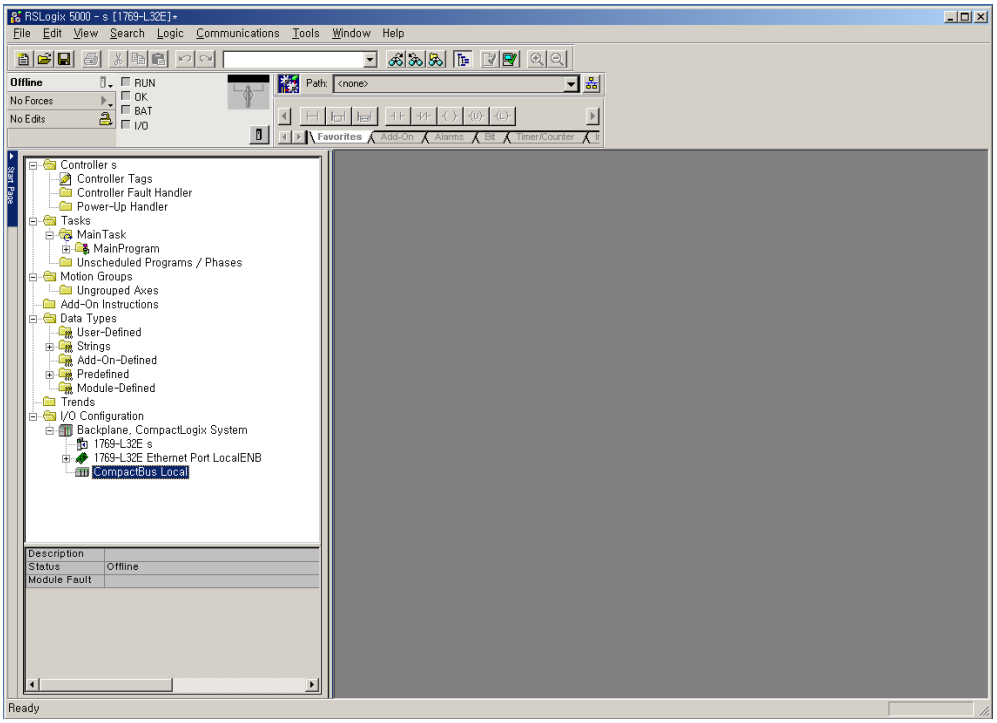


Fig. 5.7 In-progress RsLogix 5000 Screen

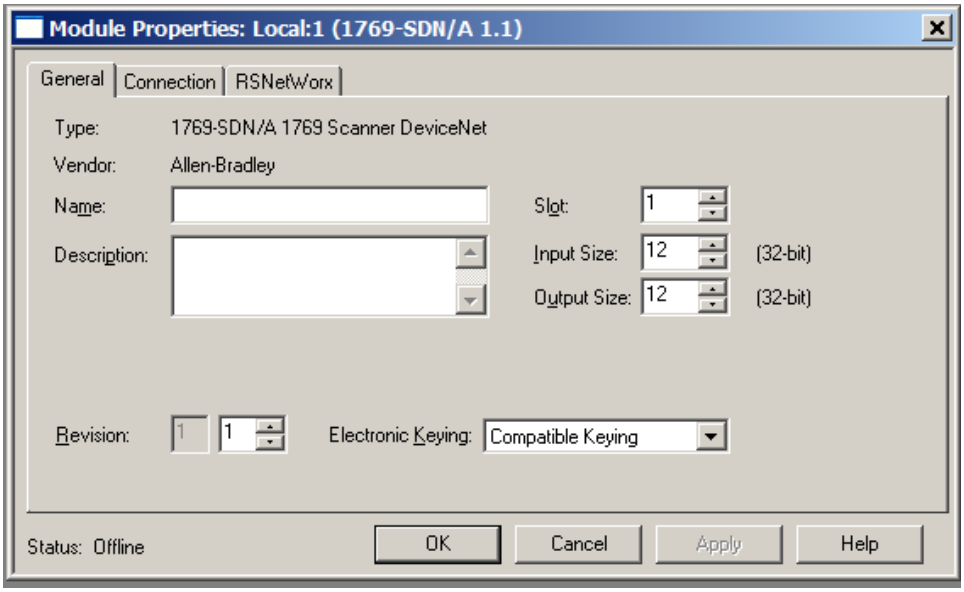


Fig. 5.8 1769-SDN Setup Screen

12) Click the Controller Tags on top left in Fig. 5.7 and a screen in Fig. 5-9 comes up, enabling you to check that the I/O tag values set in Fig. 5.6 found matching and were displayed on the screen accordingly.

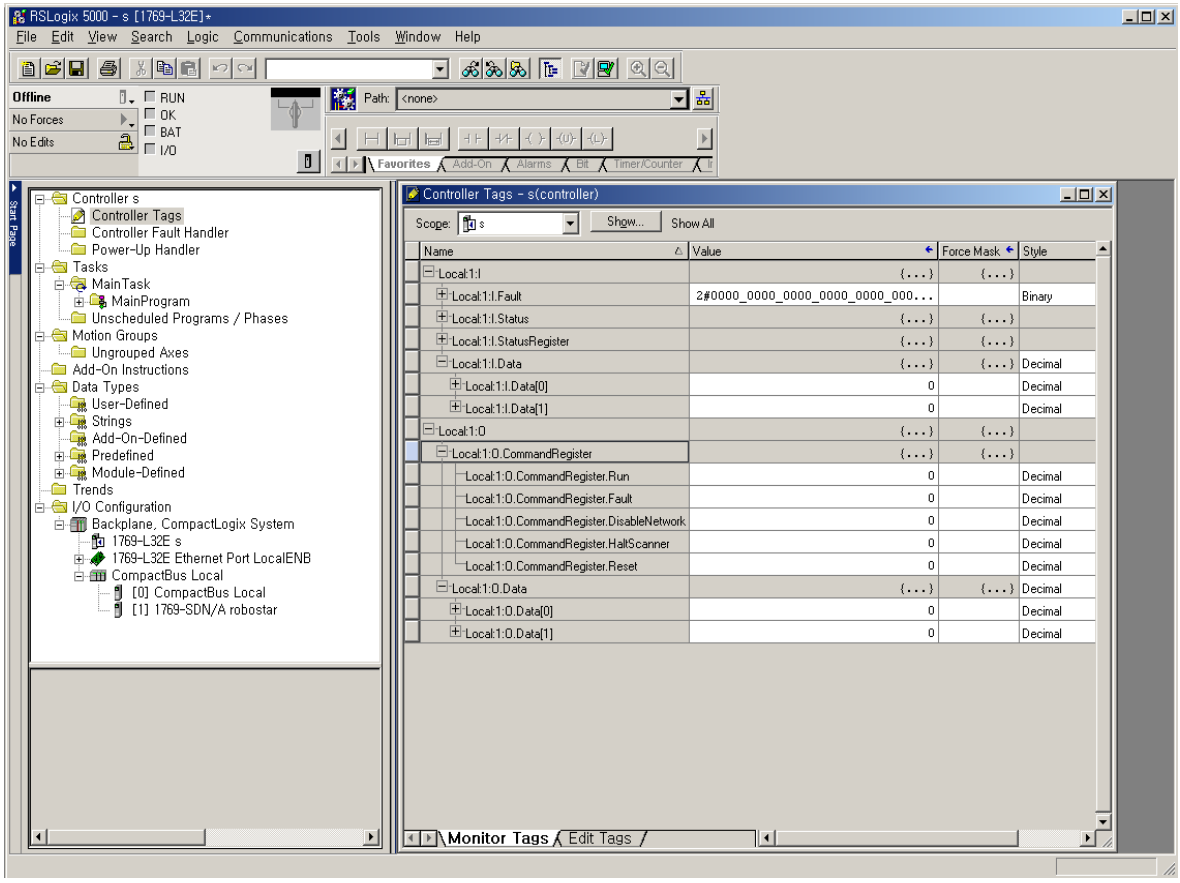


Fig. 5.9 DeviceNet I/O tag screen

13) In the OMROM PLC, I/O data is connected for a real-time exchange upon registering DeviceNet modules on the Scanlist using Configuration tool. But, the AB PLC allows you to exchange I/O data only by enabling CommandRegister.Run bit in Fig. 5.10 though registered on Scanlist.

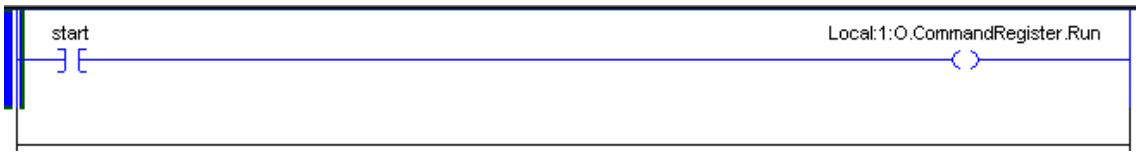


Fig. 5.10 I/O Run Program

Chapter 6. Memory Mapping

6.1 N1 Controller Data Mapping

Controller Data Mapping			
DeviceNet Data	**Description**	**DeviceNet Data**	**Description**
INPUT0	System Input #1	OUTPUT0	System Output #1
INPUT1	User Input	OUTPUT1	User Output
INPUT2	Option Input 0	OUTPUT2	Option Output 0
INPUT3	System Input #2	OUTPUT3	Error Code Read
INPUT3	FieldBus Input #1		
INPUT4	Option Input 1	OUTPUT4	Option Output 1
INPUT5	Option Input 2	OUTPUT5	Option Output 2
INPUT6	Option Input 3	OUTPUT6	Option Output 3
INPUT7	FieldBus Input #2	OUTPUT7	FieldBus Output #2
INPUT8	1-axis Position Value Input	OUTPUT8	Current 1-axis Position Value Output
INPUT9		OUTPUT9	
INPUT10	2-axis Position Value Input	OUTPUT10	Current 2-axis Position Value Output
INPUT11		OUTPUT11	
INPUT12	3-axis Position Value Input	OUTPUT12	Current 3-axis Position Value Output
INPUT13		OUTPUT13	
INPUT14	4-axis Position Value Input	OUTPUT14	Current 4-axis Position Value Output
INPUT15		OUTPUT15	
INPUT16	Global Integer Input	OUTPUT16	Global Integer Output
INPUT17	Global Integer Index	OUTPUT17	Global Float Output
INPUT18	JOG VEL Rate Input	OUTPUT18	
INPUT19	Global Point Index	OUTPUT19	Info Data 1 Output
INPUT20	Pull Up Value Input	OUTPUT20	Info Data 2 Output
INPUT21	Global Float Input	OUTPUT21	Info Data 3 Output
INPUT22		OUTPUT22	Info Data 4 Output
INPUT23	Global Float Index	OUTPUT23	Program Num 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".)

Note) JOG Velocity Rate Input of RWw10 applies when in JOG Mode, with a setting range from 1 to 100%. The value set is converted by percent per axis based on the Jv values of JOINT

MOTION parameters.

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.**

③ **PROGRAM NUM output generates only the PROGRAM NUM entered in SYSTEM MODE.**

④ **VEL output is capable of generating robot's moving speed in JOG MODE and AUTO MODE.**

2. < Precautions for use in JOG Mode >

① **JOG_VEL input is available for use only in JOG MODE and when the value is 0 it runs at 1% speed.**

② **VEL output is capable of generating robot's moving speed in JOG MODE and AUTO MODE.**

③ **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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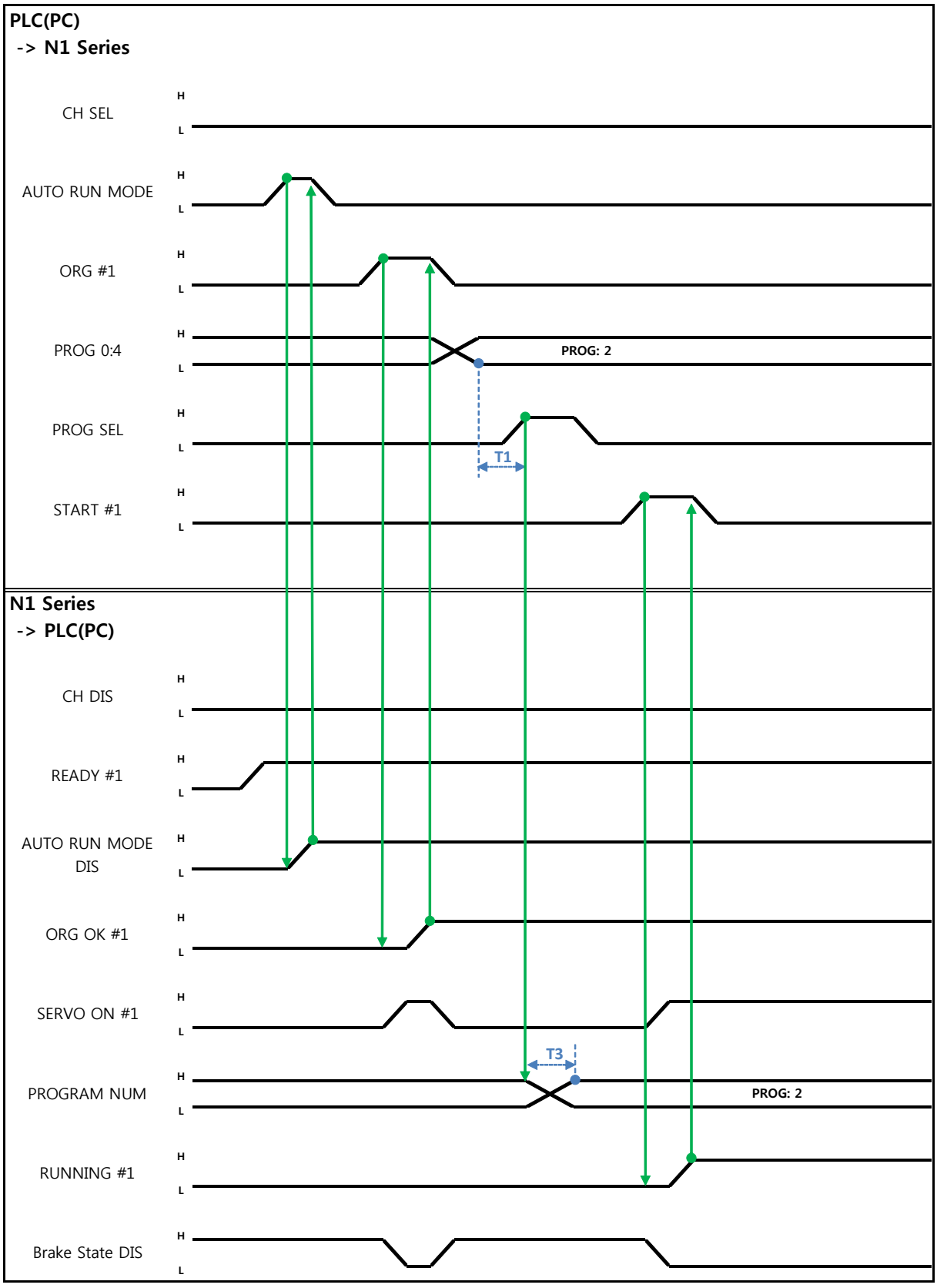
6.3.1 Operation in AUTO RUN MODE



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.
- Check PROGRAM NUM sent from N1 Controller and set START #1 Bit to High.

When not in Auto Servo ON

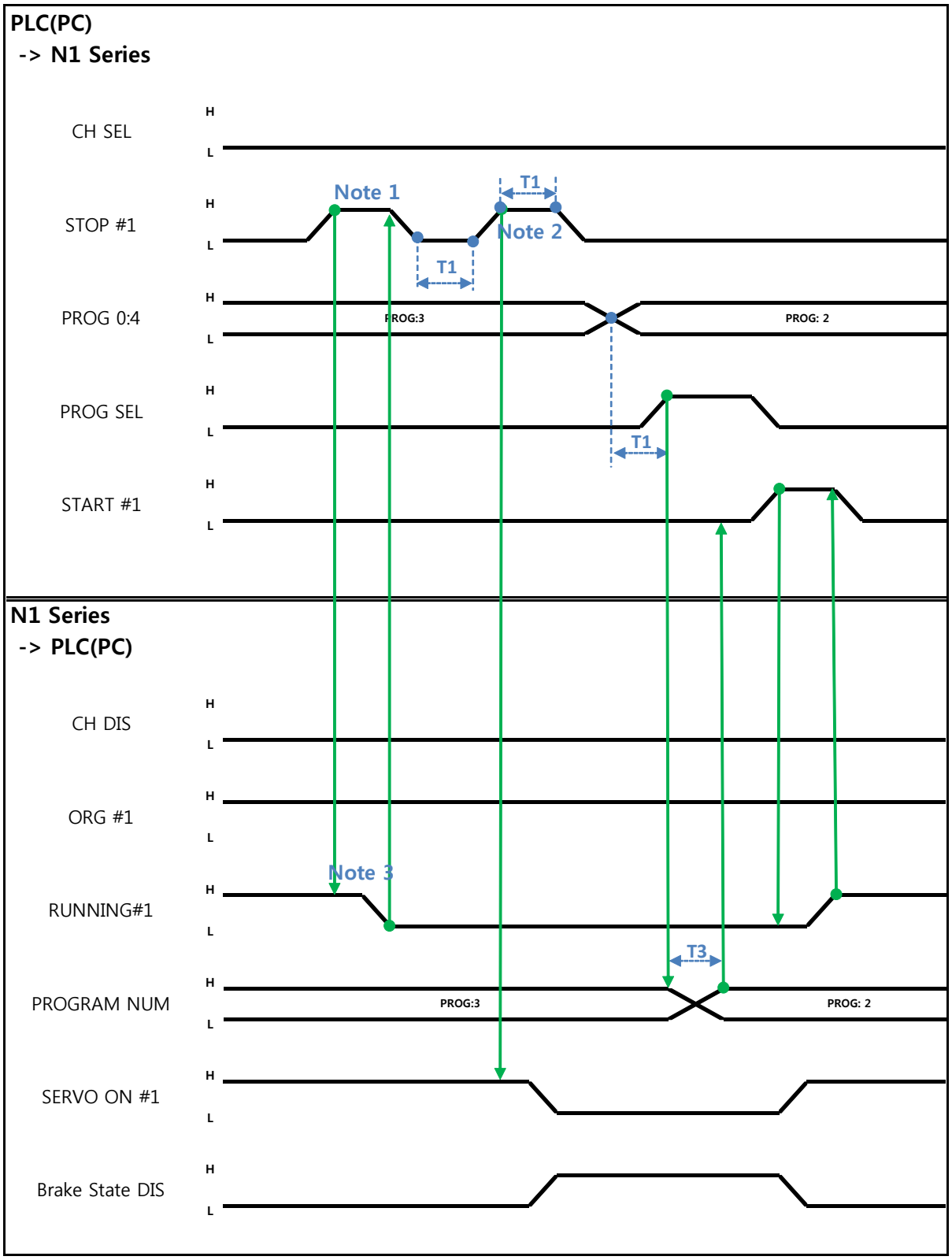
Description :

- 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.)
- Check PROGRAM NUM sent from N1 Controller and 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.
- Check PROGRAM NUM sent from N1 Controller and 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

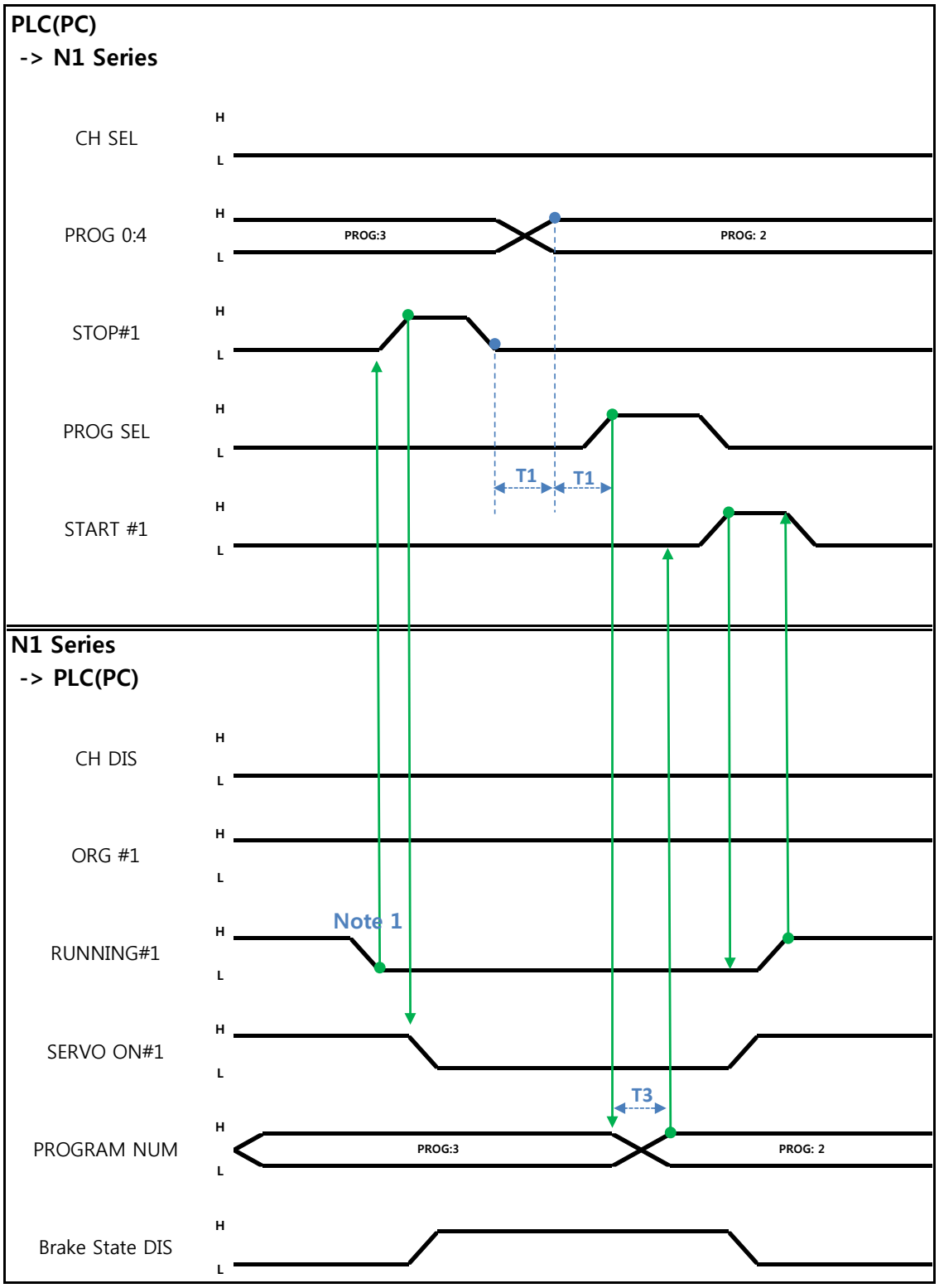
Description :

- 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.
- Check PROGRAM NUM sent from N1 Controller and enter SERVO ON #1 Signal in Pulse. (High status should be kept 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.
- Check PROGRAM NUM sent from N1 Controller and set START #1 to High.

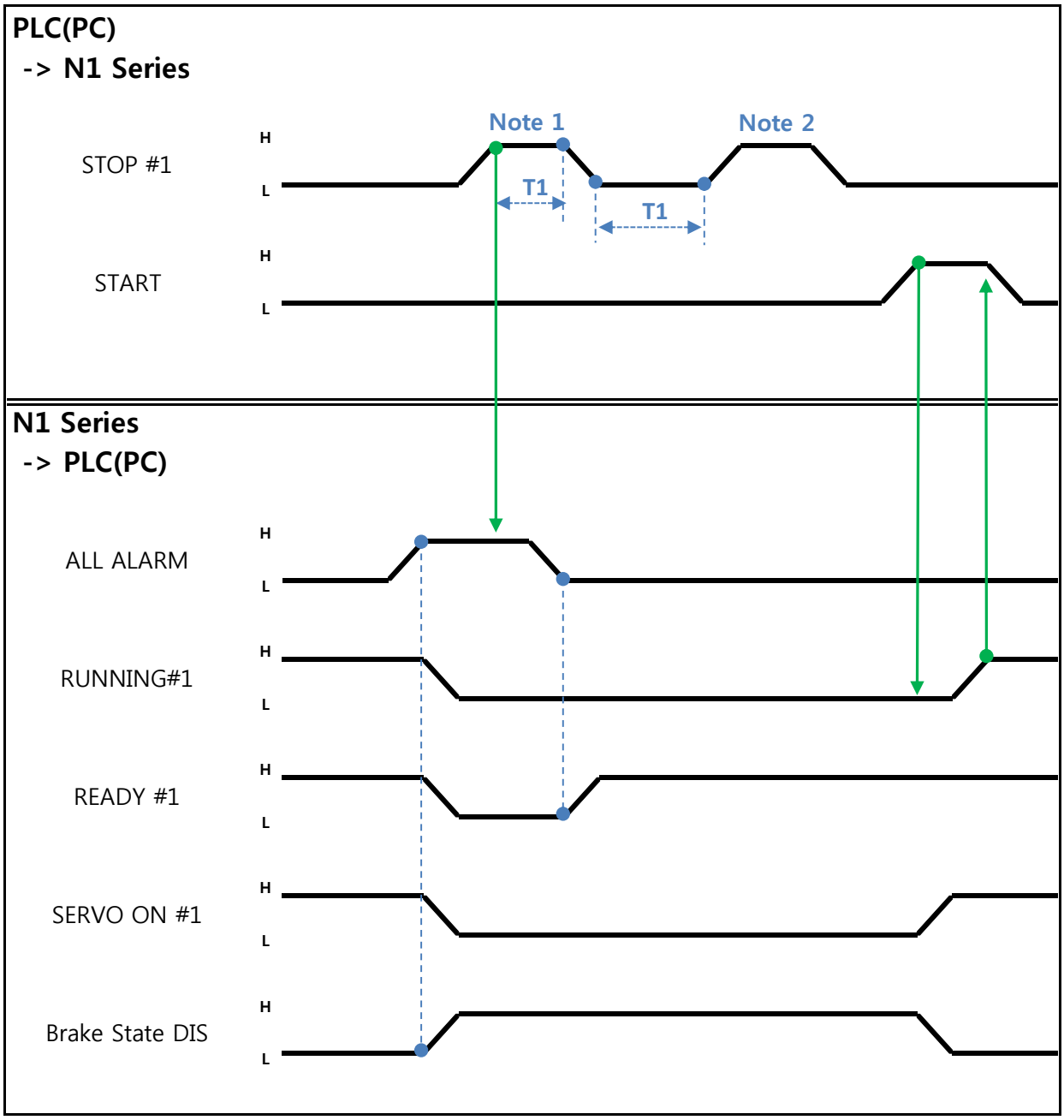
Note 1) When JOB ends in JOB Program by EOP, RUNNING#1 Bit is changed into Low.

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.
- Check PROGRAM NUM sent from N1 Controller and enter SERVO ON #1 Signal into pulse. (High status should be kept 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.

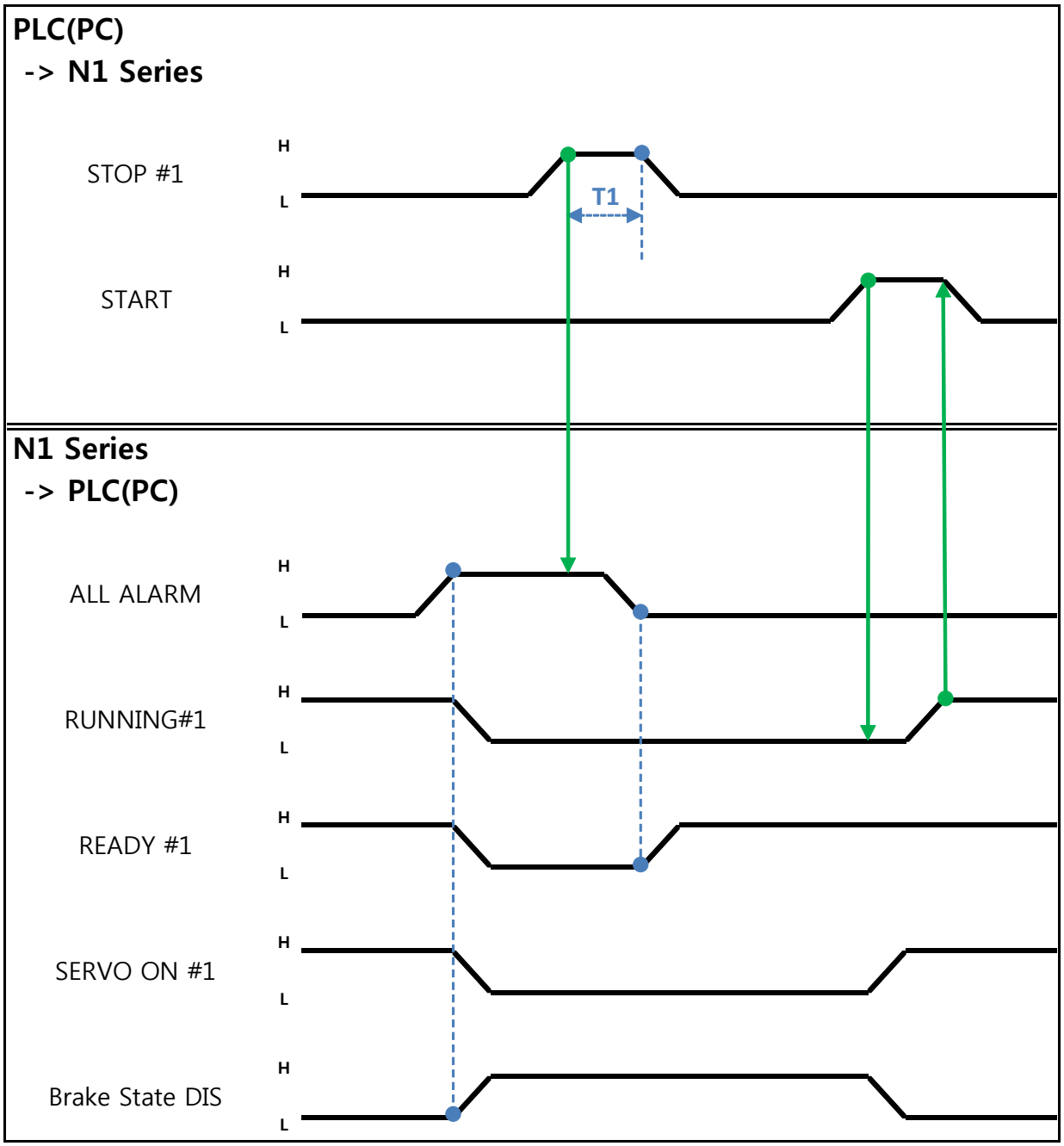
Note 2) Set JOB Program STEP Line for the first time.

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 :

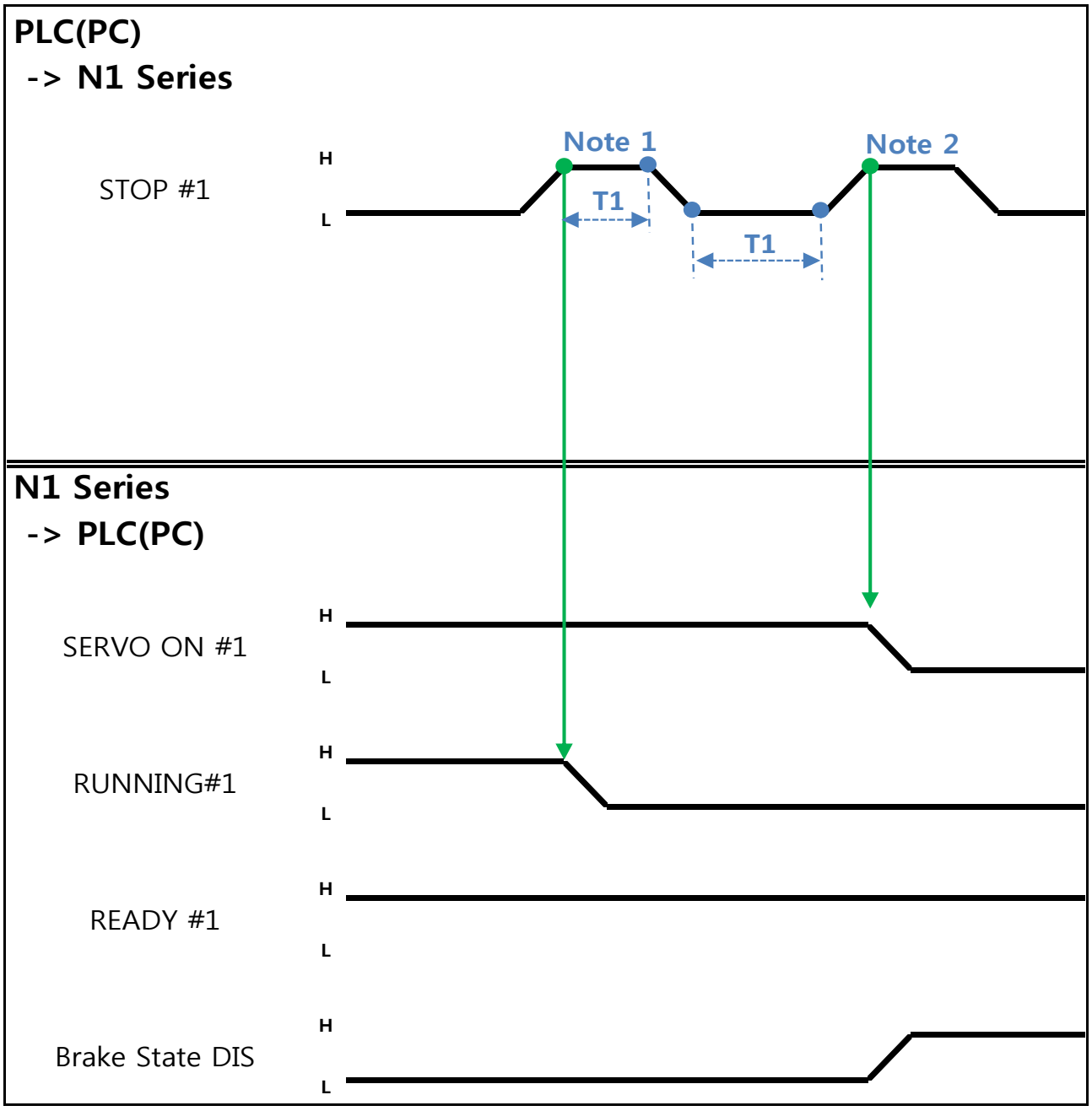
- Enter STOP #1 Signal into pulse. (High status should be kept over 20ms.)
- Set START #1 to High.

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

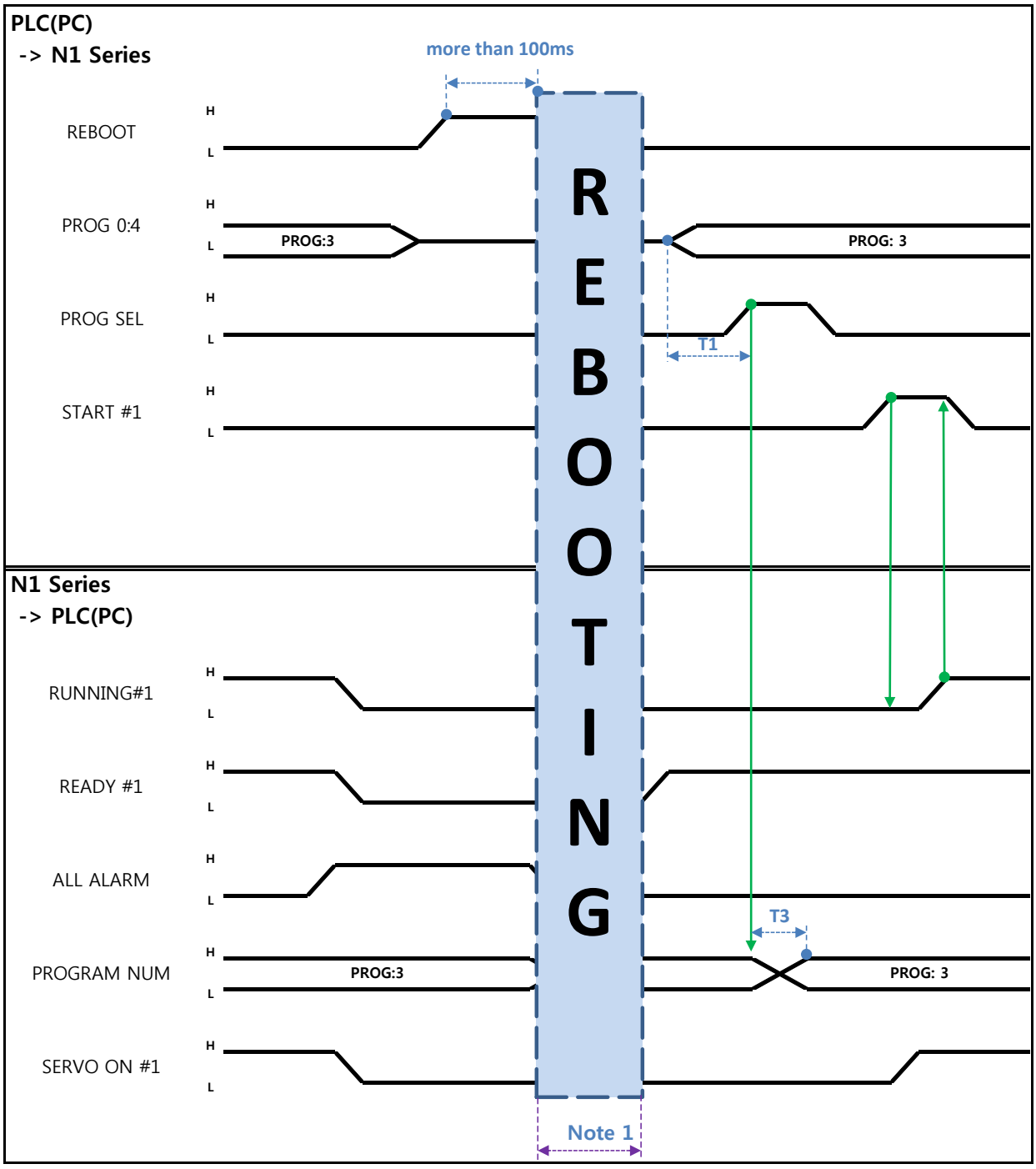
Description :

- 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 :

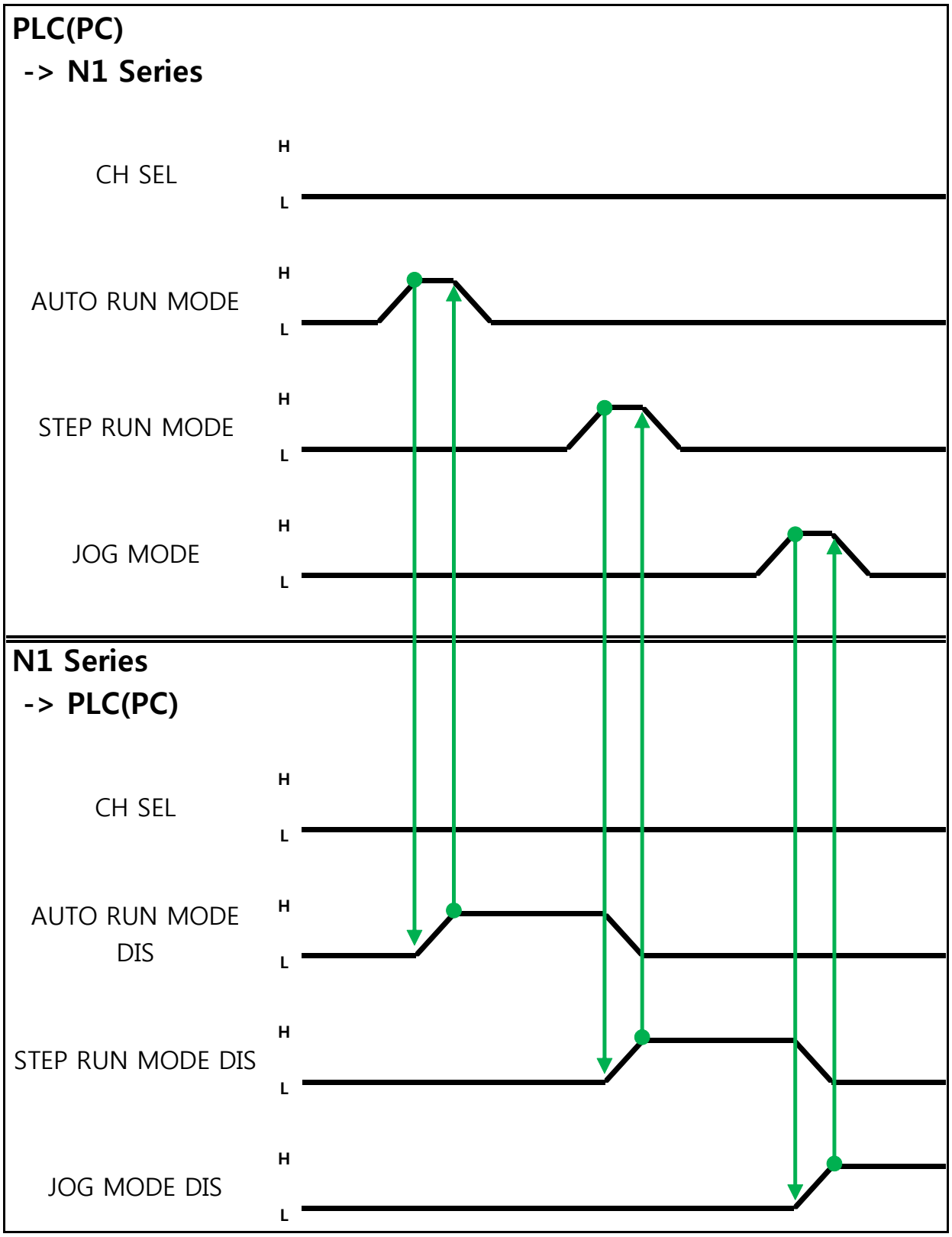
- Set REBOOT Bit to High. Rebooting becomes available only when High status is kept over 100ms. When kept below 100ms, Rebooting may not be performed.
- When Rebooting is complete yet alarm conditions are not disabled, ALARM Bit maintains High status. In this case, disable all alarm conditions and retry Rebooting.

- When Rebooting is complete, READY #1 Signal turns into High, when JOB Program num is set.
- Check PROGRAM NUM sent from N1 Controller and 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



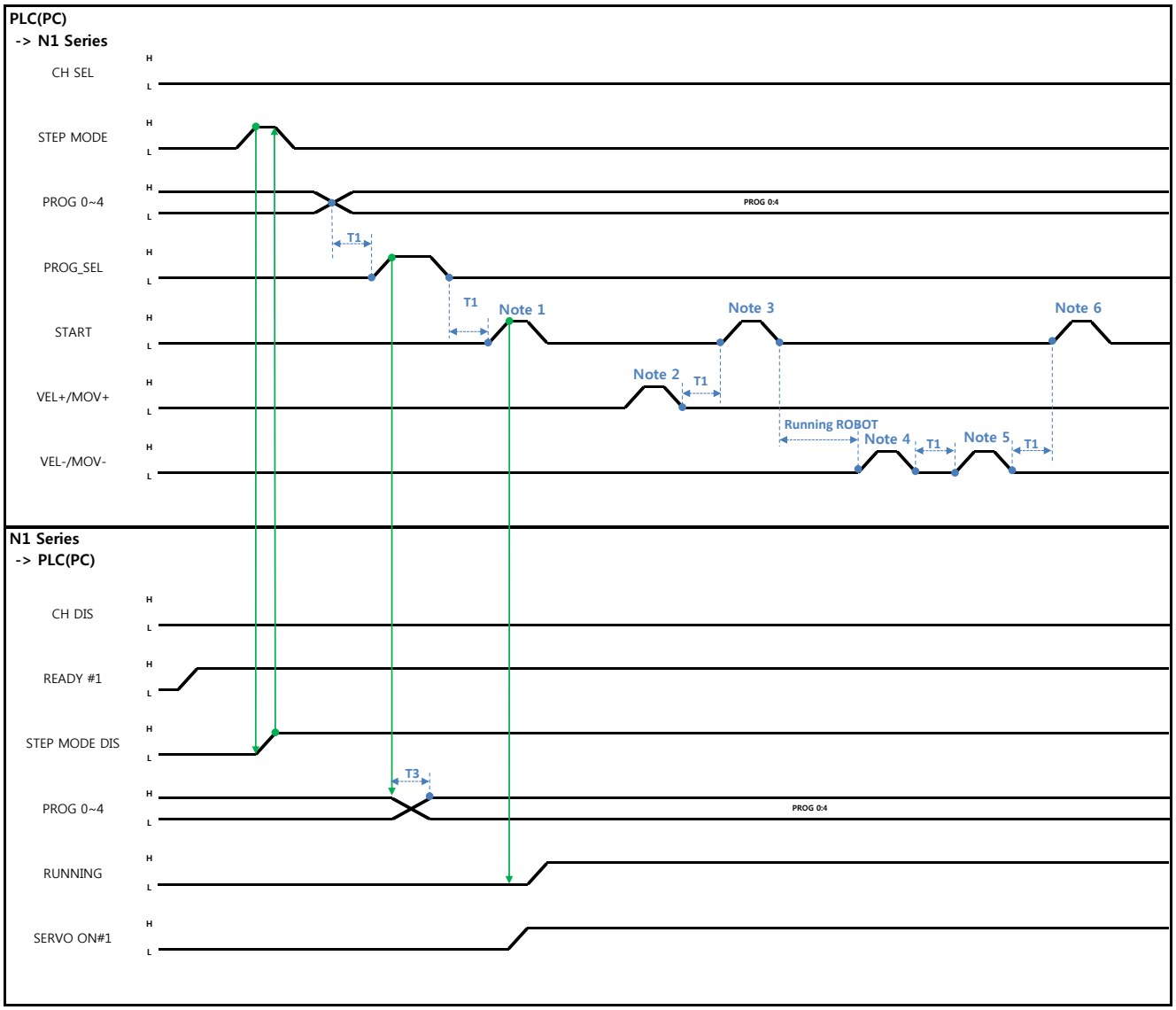
Description :

- 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.
- Check PROGRAM NUM sent from N1 Controller.
- 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)

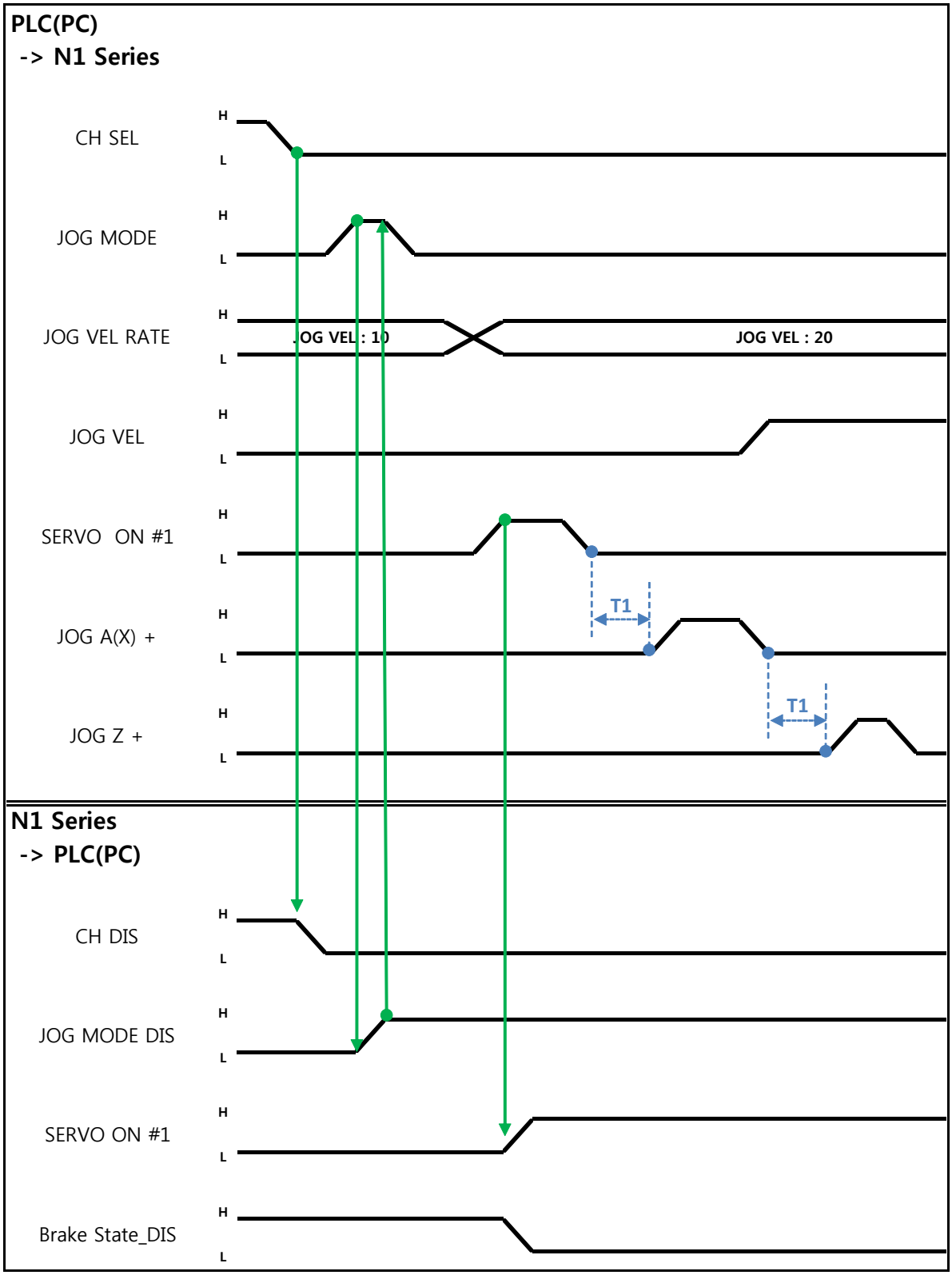
Note 6) Run the current Step Line. Add +1 to Step. (Step Line: 2)

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.
- Check PROGRAM NUM sent from N1 Controller.
- 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



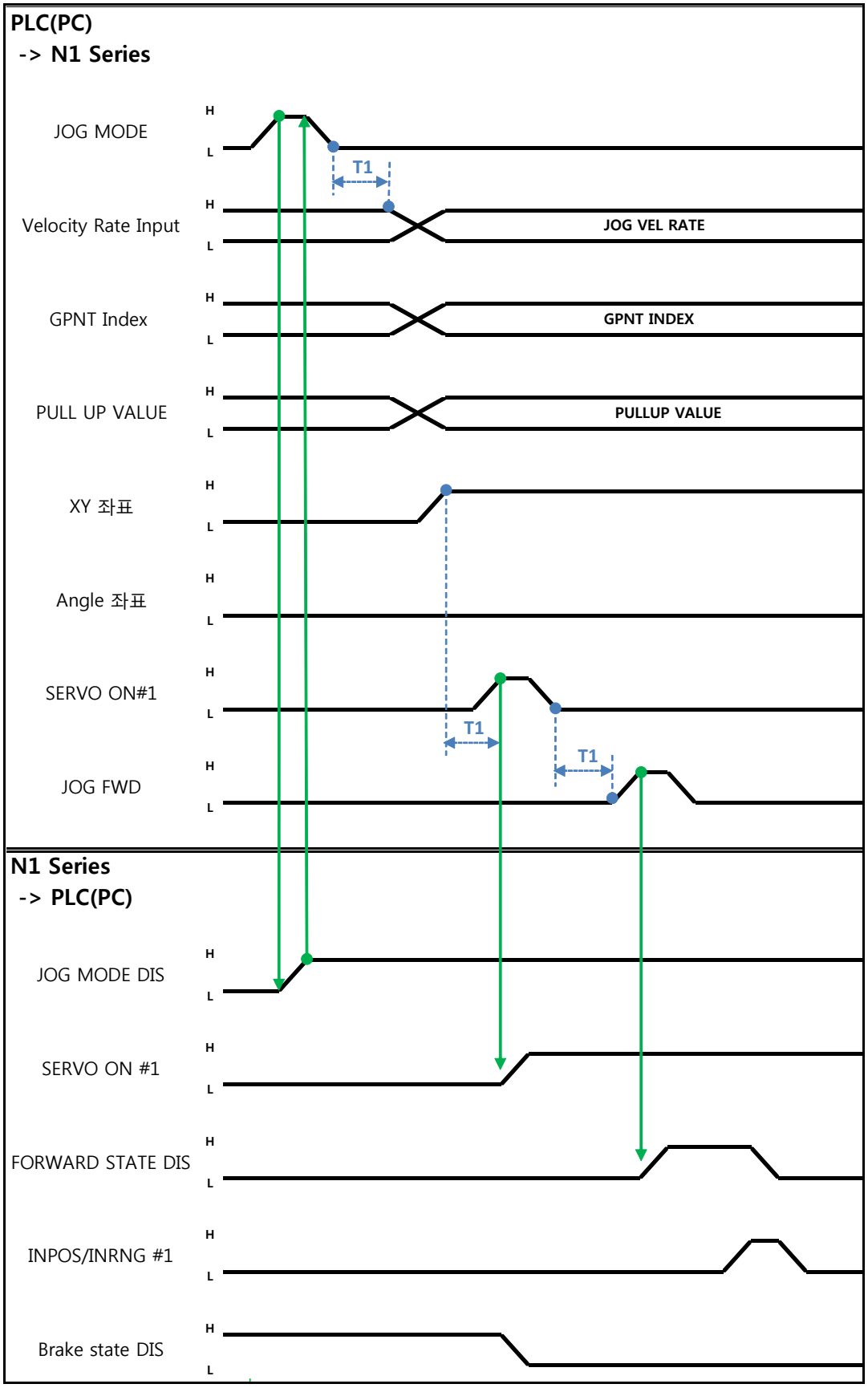
Description:

- 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.
- Set the moving speed during JOG operation, with an input range of 0 to 100%.
- 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

- **When Velocity Rate Input is 0, operation is performed at 1% speed.**
- **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



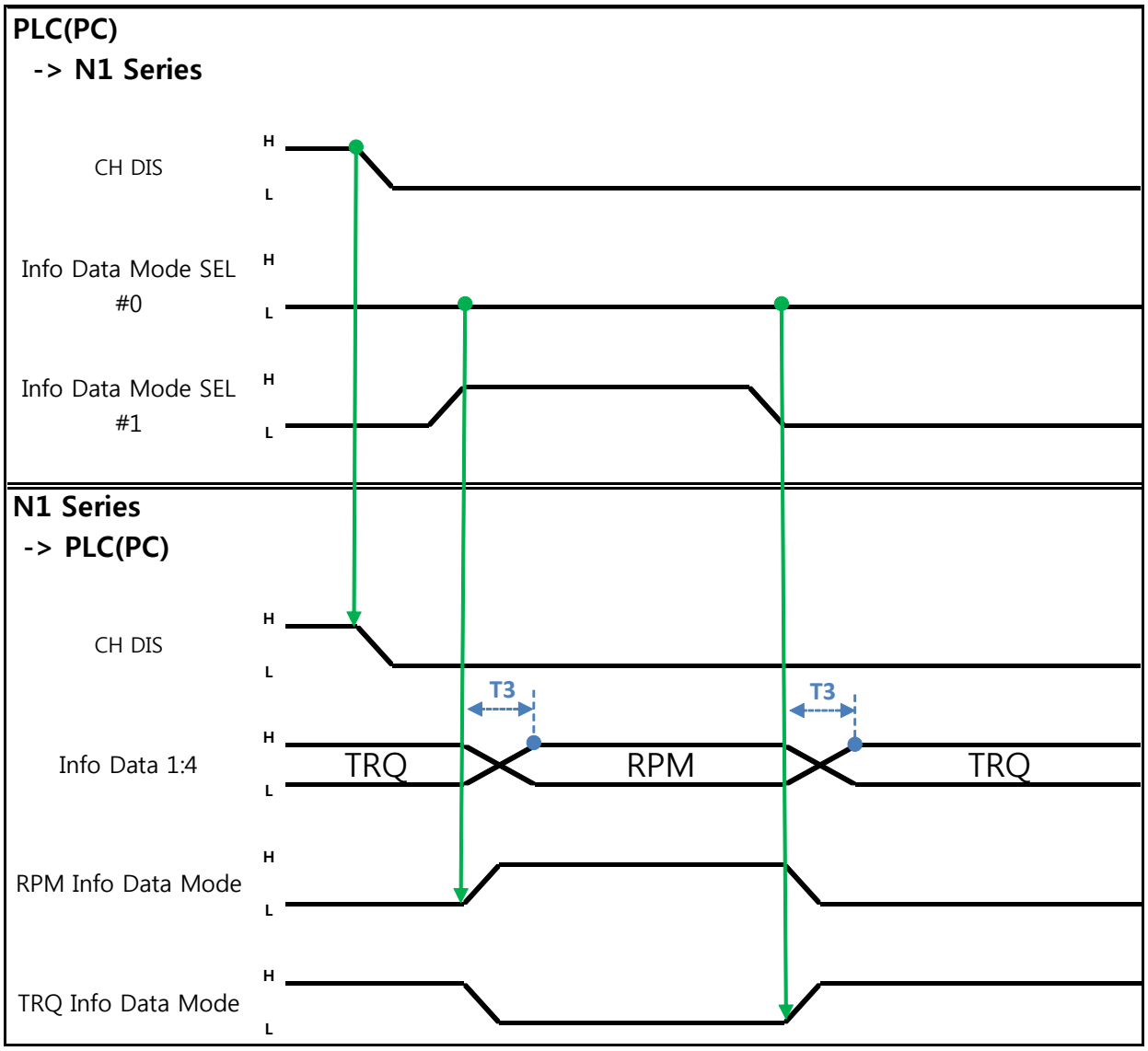
Description:

- 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 speed to apply when performing JOG FWD operation, with input range of 0 to 100% and initial value of 1%)
- Set the GP Point Index to move.
- Set the PULL UP value to apply during FWD operation.
- 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

- **When Velocity Rate Input is 0, operation is performed at 1% speed.**
- **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.**

6.3.12 Read RPM, TRQ

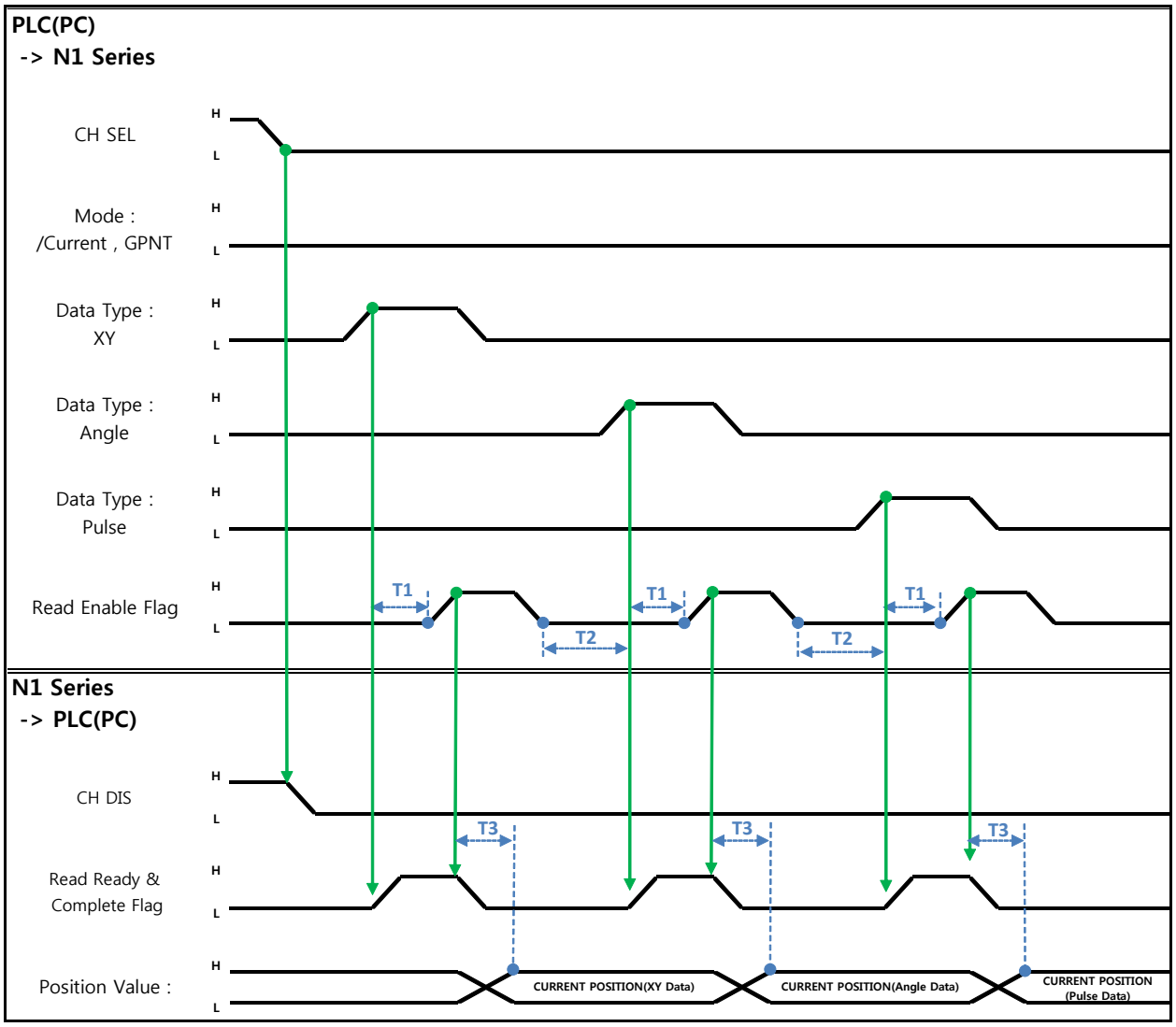


Description:

- 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



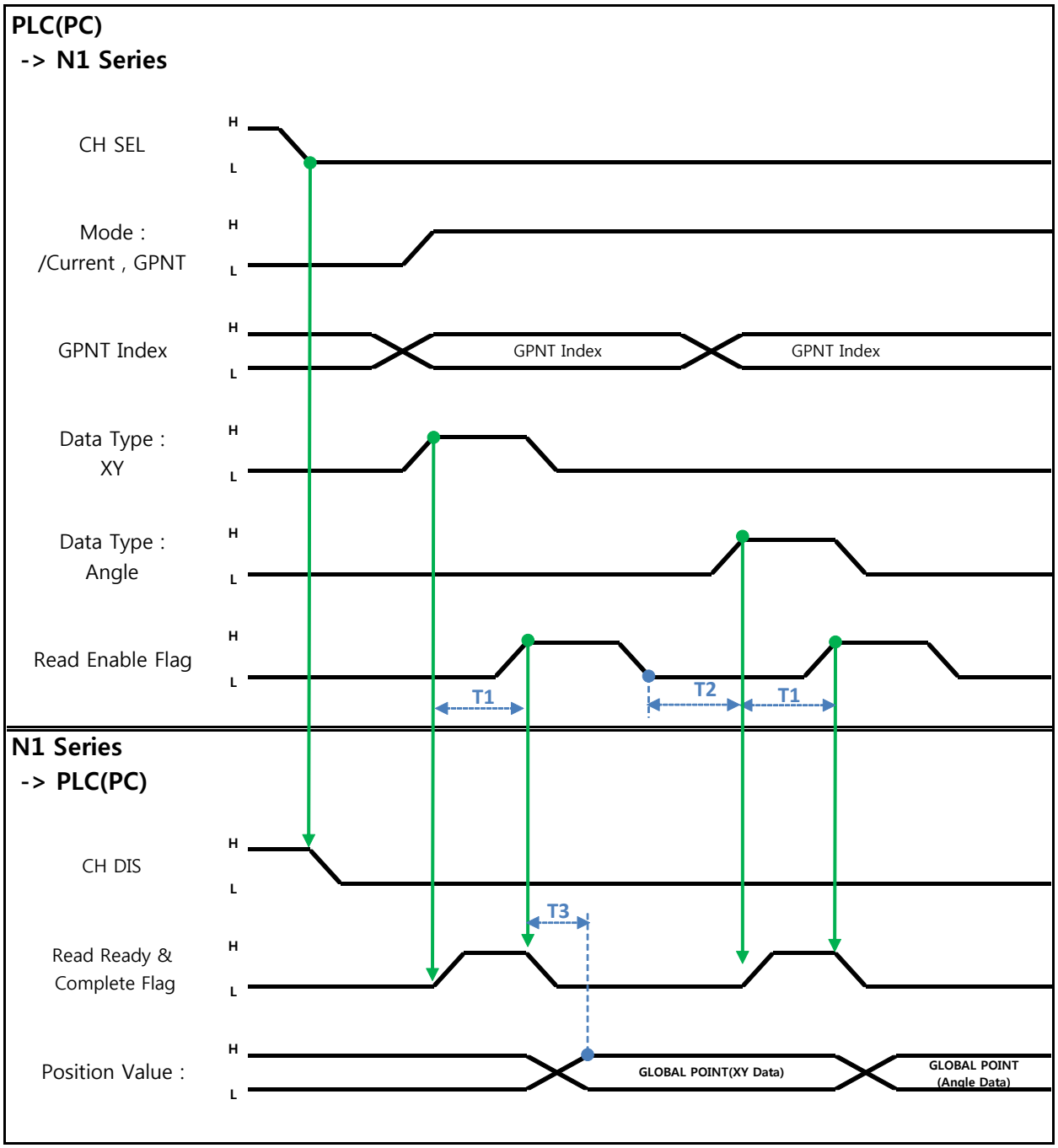
Description:

- 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



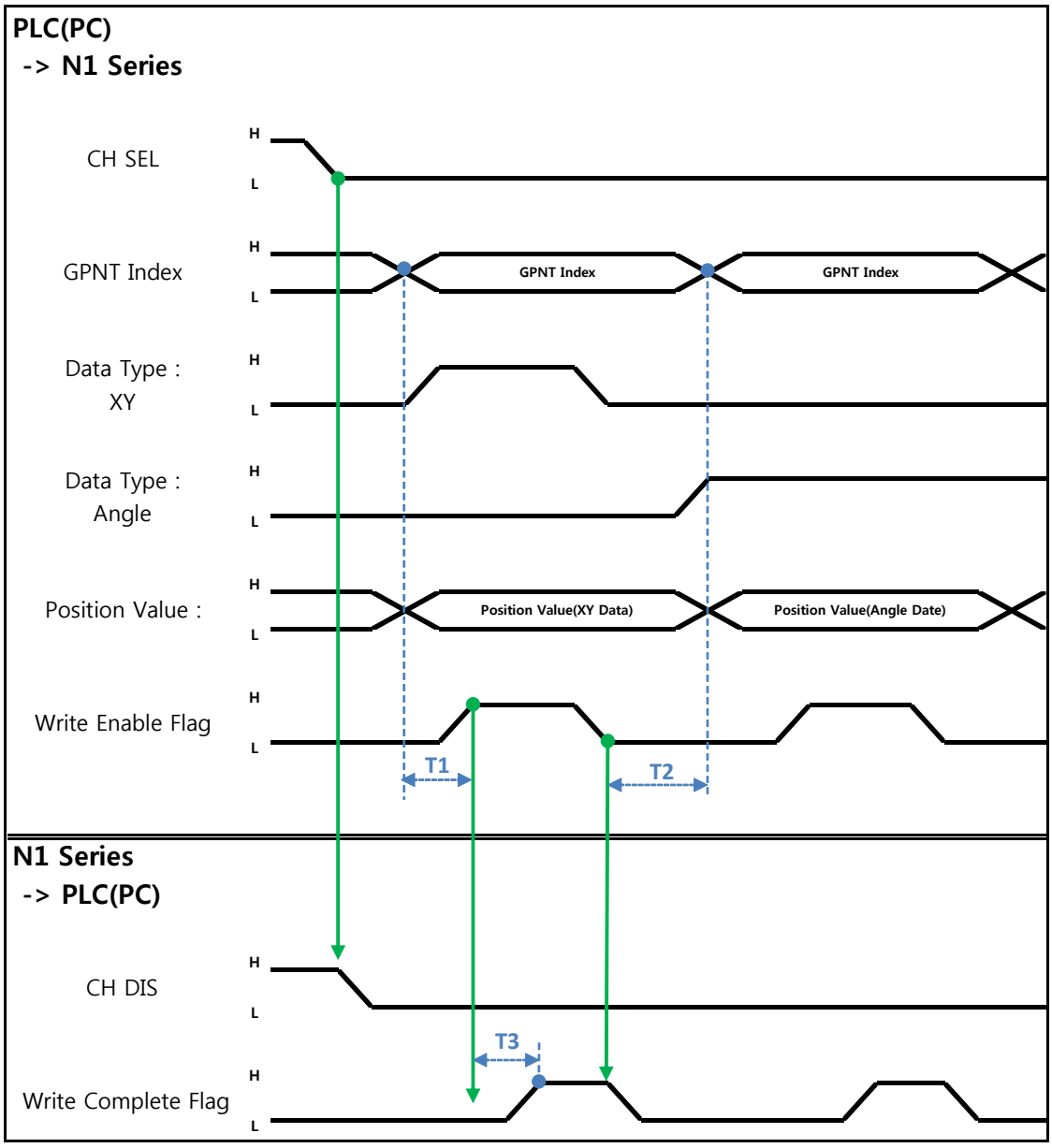
Description :

- 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



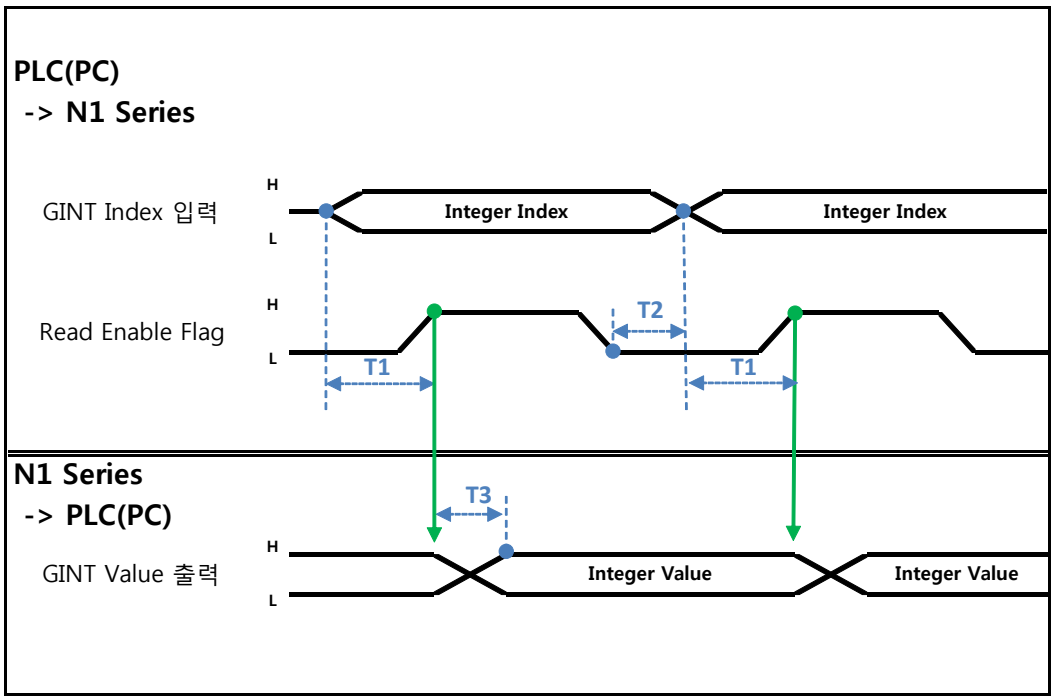
Description:

- 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



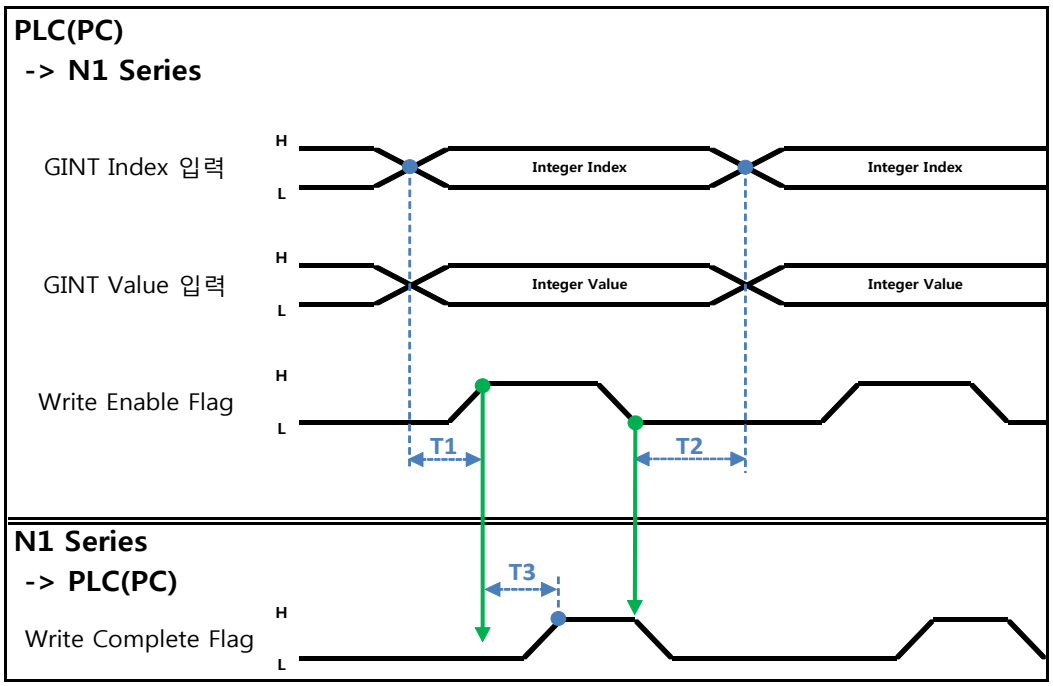
Description :

- 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



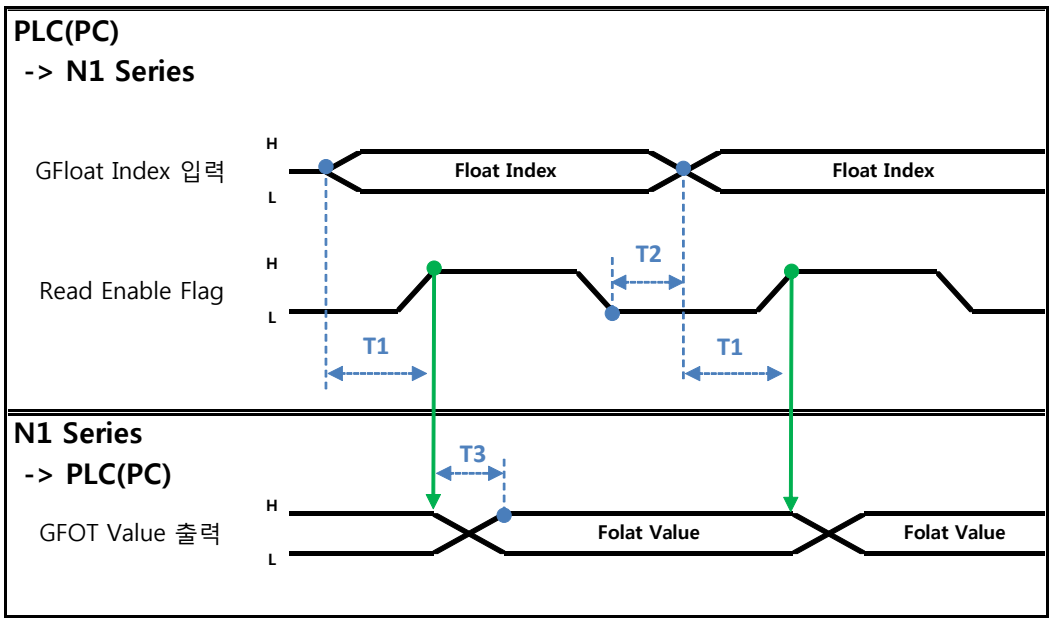
Description :

- 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



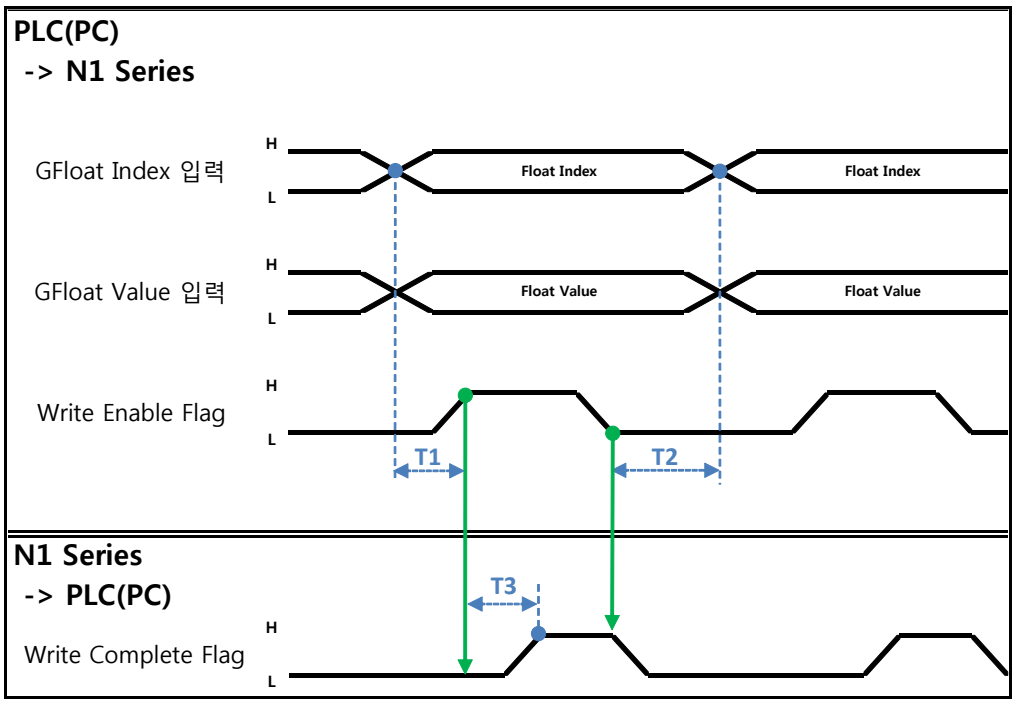
Description:

- 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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