Digital
Human Machine Interface

Pro-face®

Flex Network
Single-Axis Positioning
Unit User Manual

Digital
Digital Electronics Corporation

Preface

Thank you for purchasing the Pro-face Flex Network Single-Axis Positioning unit, hereafter referred to as the “FN-PC" unit.

The unit is designed to be used with Pro-face’s Graphical Logic Controller (GLC) Series, LT Series, and GP3000 Series FLEX NETWORK board type (hereafter referred to as “GLC”) as a remote I/O system.

This manual explains the overall features and specifications of the FN-PC unit, as well as its installation procedures.

Please be sure to read this manual thoroughly to understand the correct and safe usage of this product and its features.

<Note>

1) It is forbidden to copy the contents of this manual, in whole or in part, except for the user's personal use, without the express permission of the Digital Electronics Corporation.
2) The information provided in this manual is subject to change without notice.
3) This manual has been written with care and attention to detail; however, should you find any errors or omissions, please contact the Digital Electronics Corporation and inform us of your findings.
4) Please be aware that Digital Electronics Corporation shall not be held liable by the user for any damages, losses, or third party claims arising from the uses of this product.

Table of Contents

Essential Safety Precautions

This guide contains a variety of safety markings for safe and correct operation of this Unit. Please read this installation guide and any related manuals carefully to fully understand how to correctly use the FN-PC unit's features.

■ Safety Symbols

Please pay attention to these symbols and follow all instructions given.
The safety symbols and their meanings are as follows:

DANGER	Indicates situations where severe bodily injury, death or major machine damage will definitely occur.
WARNING	Indicates situations where severe bodily injury, death or major machine damage can possibly occur.
CAUTION	Indicates situations where slight bodily injury or machine damage can occur.

DANGERS

- **An emergency stop circuit and an interlock circuit should be constructed outside of the FN-PC unit. Constructing these circuits inside a system that uses this Unit may cause a runaway situation, system failure, or an accident due to unit failure.**
- **Systems using this Unit should be designed so that output signals which could cause a serious accident are monitored from outside the FN-PC unit.**
- **The FN-PC unit is not appropriate for use with aircraft control devices, medical life-support equipment, central trunk data transmission (communication) devices, or unclear power control devices, due to their inherent requirements of extremely high levels of safety and reliability.**
- **When using the FN-PC unit with transportation vehicles (trains, cars, and ships), disaster and crime-prevention devices, various types of safety equipment, and medical devices that are not life-support related, use redundant and/or fail-safe system designs to ensure proper reliability and safety.**

⚠ WARNINGS

- **Prior to installing, removing, wiring, and conducting maintenance or inspections, be sure to disconnect power to the FN-PC unit to prevent an electric shock or fire.**
- **Do not disassemble or remodel the FN-PC unit, since it may lead to an electric shock or fire.**
- **Do not use the FN-PC unit in an environment that contains flammable gases since an explosion may occur.**
- **Do not use the FN-PC unit in an environment that is not specified in either the Installation Guide or User Manual. Otherwise, an electric shock, fire, malfunction or other failure may occur.**
- **Due to the possibility of an electric shock or malfunction, do not touch the FN-PC unit's power terminals while it is operating.**

⚠ CAUTIONS

- **Communication cables or I/O signal lines must be wired separately from the main circuit (high-voltage, large-current) line, high-frequency lines such as inverter and power lines. Otherwise, a malfunction may occur due to noise.**
- **The FN-PC unit must be installed according to directions given in its Installation Guide and User manual. Improper installation may cause the Unit to malfunction or fail.**
- **The FN-PC unit must be wired according to directions in the Installation Guide and User Manual. Improper wiring may cause a malfunction, failure or electric shock.**
- **Do not allow foreign substances, including chips, wire pieces, water, or liquids to enter inside the FN-PC unit's case. Otherwise, a malfunction, failure, electric shock, or fire may occur.**
- **When disposing of the FN-PC unit, it should be processed according to your country's industrial waste disposal laws.**

General Precautions

■ To Prevent Unit Damage

- Avoid storing or operating the FN-PC unit in either direct sunlight or excessively dusty or dirty environments.
- Because the FN-PC unit is a precision instrument, do not store or use it in locations where excessive shocks or vibration may occur.
- Avoid covering the FN-PC unit's ventilation holes, or operating it in an environment that may cause it to overheat.
- Avoid operating the FN-PC unit in locations where sudden temperature changes can cause condensation to form inside the unit.
- Do not use paint thinner or organic solvents to clean the FN-PC unit.

Flex Network Unit Models

Flex Network Units allow the GLC to communicate via a Flex Network system. The Flex Network Unit model numbers are listed below.

Product Family	Unit Name	Model No.	Nodes Required	Manual
Flex Network	I/O Unit	FN-X16TS41	1	DIO Unit User Manual
		FN-X32TS41	2	
		FN-Y16SK41	1	
		FN-Y16SC41	1	
		FN-XY08TS41	1	
		FN-XY16SK41	1	
		FN-XY16SC41	1	
		FN-XY32SKS41	4	
		FN-Y08RL41	1	
	Analog Unit	FN-AD02AH41	1	2-Cannel Analog Unit User Manual
		FN-DA02AH41	1	
		FN-AD04AH11	4	Analog Unit User Manual
		FN-DA04AH11	4	
	Single-Axis Positioning Unit	FN-PC10SK41	4	This Manual
		FN-PC10LD41	-	
	High-Speed Counter Unit	FN-HC10SK41	8	High-Speed Counter Unit User Manual

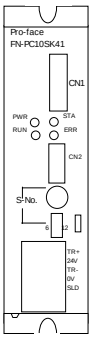
Compatible GLC Units

The following GLC units can be used with the Flex Network units. (GLC, LT , and GP are referred to collectively as the "GLC" in this manual.)

Product Family	Series Name		Unit Name	Model No.
GLC	GLC2000 Series	GLC2300 Series	GLC2300T	GLC2300-TC41-24V
			GLC2300L	GLC2300-LG41-24V
		GLC2400 Series	GLC2400T	GLC2400-TC41-24V
		GLC2500 Series	GLC2500T	GLC2500-TC41-24V
				GLC2500-TC41-200V
		GLC2600 Series	GLC2600T	GLC2600-TC41-24V
				GLC2600-TC41-200V
LT	LT Series		LT TypeB	GLC150-BG41-FLEX-24V
			LT Type B+	GLC150-BG41-XY32KF-24V
			LTC Type B+	GLC150-SC41-XY32KF-24V
			LT Type C	GLC150-BG41-RSFL-24V
GP	GP3000 Series	GP-3300 Series	AGP-3300L	AGP3300-L1-D24-FN1M
			AGP-3300T	AGP3300-T1-D24-FN1M
		GP-3400 Series	AGP-3400T	AGP3400-T1-D24-FN1M
		GP-3500 Series	AGP-3500T	AGP3500-T1-D24-FN1M
				AGP3500-T1-AF-FN1M
		GP-3600 Series	AGP-3600T	AGP3600-T1-D24-FN1M
				AGP3600-T1-AF-FN1M

Package Contents

■ **Flex Network Single-Axis Positioning Unit (1) (FN-PC10SK41)**



■ **Flex Network Single-Axis Positioning Unit Installation Guide – English/Japanese (1)**

Note: The Flex Network Single-Axis Positioning Unit User Manual is sold separately.

Special care and attention have been given to the packaging of this unit. However, if any of the items are damaged or missing, please contact your local distributor immediately for prompt service.

Driver

The driver for the Flex Network Unit is required in order to use the unit.

For GLC2000 series and LT series,

You can select the Flex Network Driver via GP-PRO/PBIII C-Package (Pro-Control Editor) or LT Editor.

If the selection of the appropriate unit's name does not appear in the [I/O Configuration] - [I/O Unit Settings] area, you will need to update the driver file.

You can download the latest driver from Pro-face's web site.

URL :http://www.pro-face.com/

For GP3000 Series,

You can select the Flex Network Driver via GP-Pro EX as an I/O driver.

UL/c-UL (CSA) Application Notes

The FN-PC10SK41 and FN-PC10LD41 is a UL/c-UL (CSA) listed product. (UL File No. E220851)

This units conforms to the following standards.

■ UL508 Electrical Control System for Industry

■ CAN/CSA-C22.2 No.1010-1

(Safety requirements for electrical equipment for measurement and laboratory use)

FN-PC10SK41 (UL Registration Model: 2980051-02)

FN-PC10LD41 (UL Registration Model: 2980051-03)

<Notes>

- This unit is designed to be installed in other equipment.
- The power supply unit connected to the Flex Netwrok unit must be a UL/c-UL(CSA) approved Class 2 power supply unit or Class 2 transformer*1 . When the GLC or multiple Flex Netwrok units under load are operated with a single power supply, the amount of current consumption and full-load current of the Flex Netwrok units must be within the rated load of the Class 2 power supply unit or Class 2 power supply transformer.

CE Marking Notes

The FN-PC10SK41 and FN-PC10LD41 is a CE Marked unit that conforms to EMC directives EN55011Class A and EN61000-6-2.

For detailed CE Marking information, please contact your local Pro-face distributor.

*1 *A Class 2 power supply unit or Class 2 power supply transformer is defined by NEC as being 30V and, at 8A or less output, at less than 100VA.*

Documentation Conventions

The list below describes the documentation conventions used in this manual.

Symbol	Meaning
	Indicates important information or procedures that must be followed for correct and risk-free software/device operation.
	Provides useful or important supplemental information.
***1**	Provides useful or important supplemental information.
Reference	Cross-references useful or important supplemental information.
GLC	Generic name for the "GLC Series" of Graphic Logic Controllers made by Pro-face. In this manual, it also indicates "LT Series" and "GP3000 Series FLEX NETWORK board type".

Chapter 1 Introduction

This Single-Axis Positioning unit, when connected to a servo or stepping motor's Pulse Train Input-type Driver, allows the GLC to perform as a single-axis positioning controller.

1.1 System Design

1.1.1 Flex Network Design

The following information explains how to connect various types of Flex Netwrok units to a Flex Network.

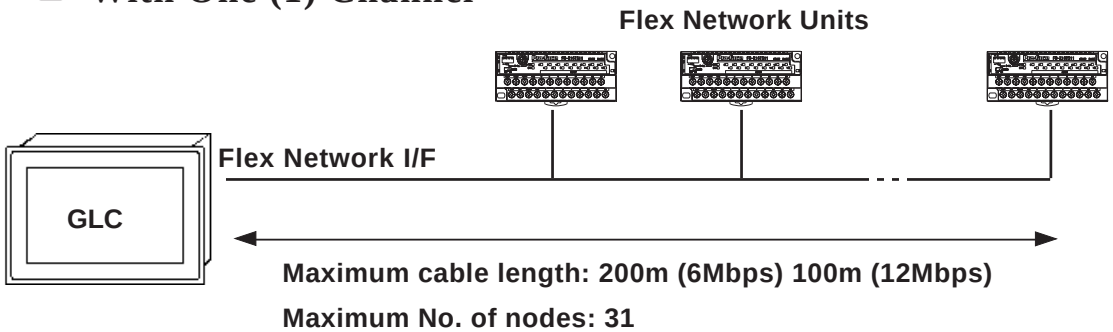
When connecting to the Flex Network, two channels are available – CH1 and CH2. Each channel outputs the same data and either can be used for data transmission.

No software set up is required.

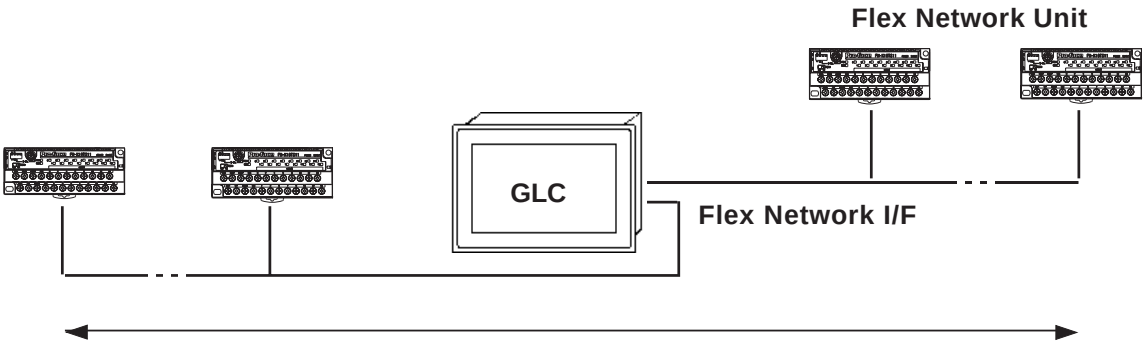
The maximum number of connectable nodes when using a single channel is 31, and when using a second channel, the number increases by 32 to a total of 63.

- **When using the FN-PC unit, each Single-Axis Positioning unit connected will use 128 bits of memory, which is equivalent to 4 I/O nodes. Thus, the maximum number of connectable nodes (see above) differs from the maximum number of connectable units.**
- **When using the LT Type B+ unit, the internal 32-point I/O requires 1 station on the Flex Network.**
- **The Flex Network uses High-Speed data-transfer technology, and if a cable used for data transfer is not the same as that specified in this document, network data-transfer performance cannot be guaranteed. Thus, be sure to use only the cable(s) recommended.**

■ With One (1) Channel



■ With Two (2) Channels

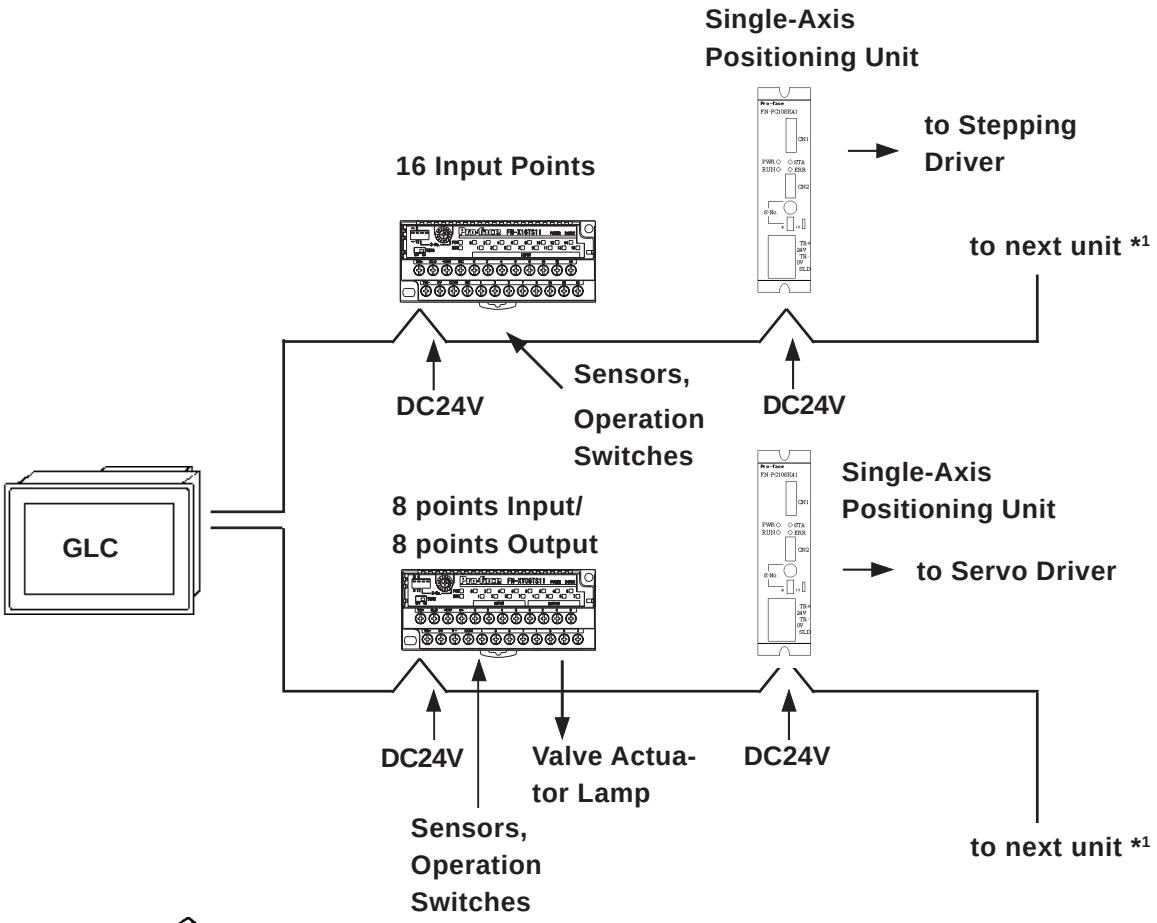


Maximum cable length: 400m (6Mbps), 200m (12Mbps)

Maximum No. of nodes: 63 (31 + 32)

Note: When using two channels, up to 32 nodes can be connected to either channel.

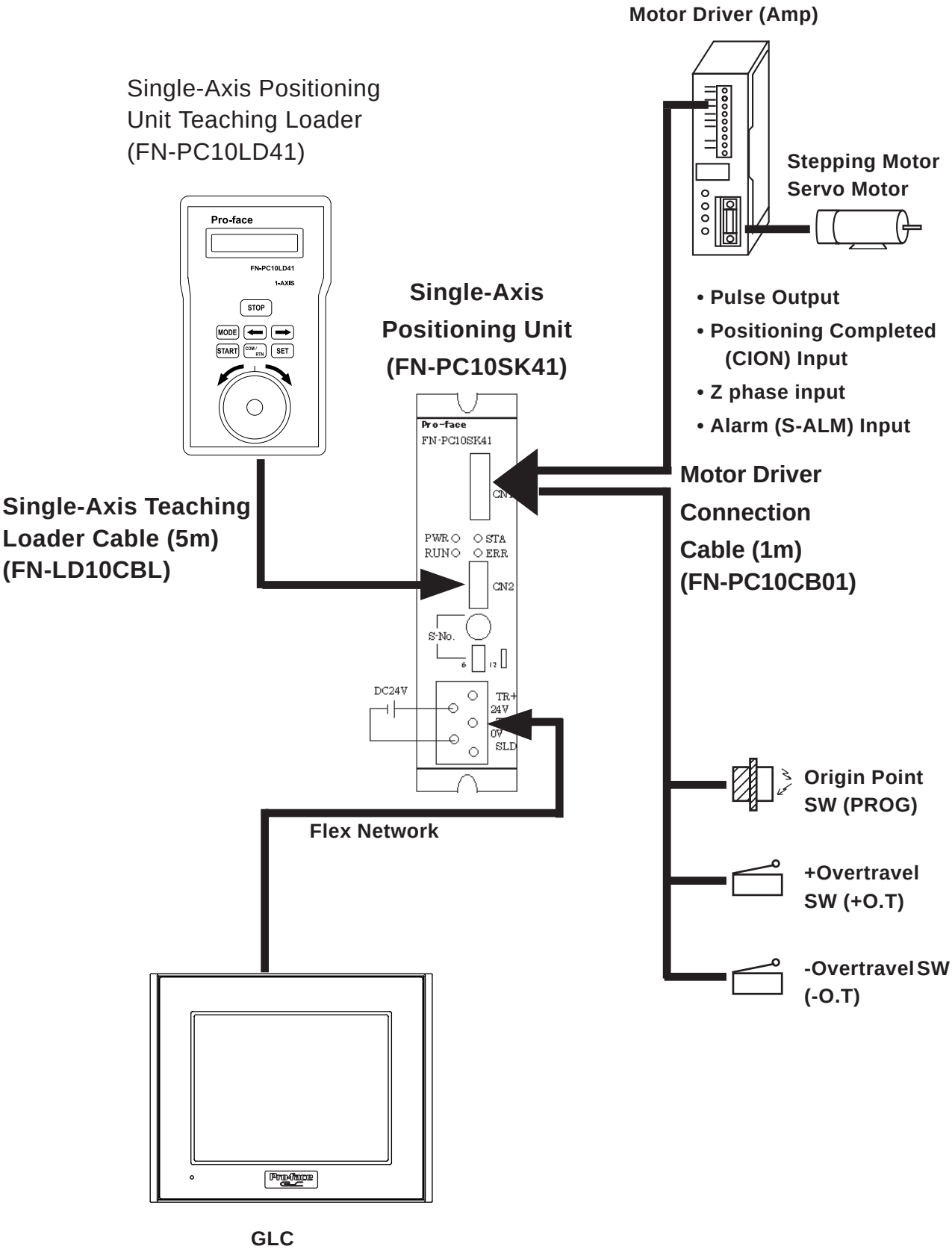
■ Standard System Design



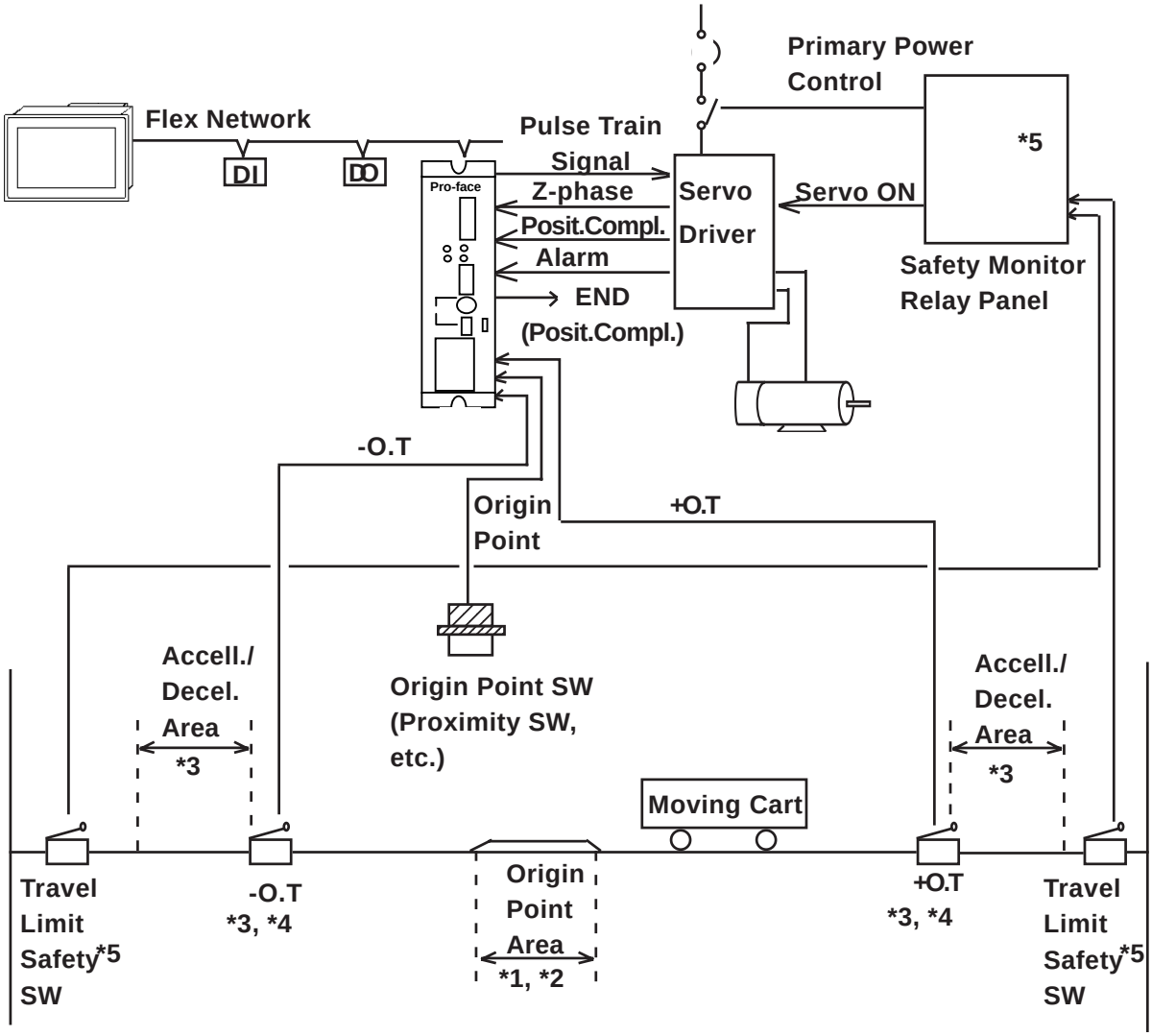
Note: 6Mbps is the recommended speed.

**1.Be sure the Terminal Switch (TERM) of the network's last unit (at each end) is turned ON.*

1.1.2 Single-Axis Positioning Unit System Design



■ Single-Axis Positioning Unit System Wiring Example



Note: This is an image drawing. It does not represent actual signal logic processing.

**1 Width (span) that Origin Point SW(PORG) is ON.*

**2 Be sure to set detection so that it is within the width (span) that the Z-phase Origin Point SW(PORG) is ON.*

**3 Be sure to position O.T. so that it does not overlap the standard positioning movement range. When performing Origin point return and an O.T. signal is detected, slow (reduce) and then stop the unit.*

**4 Origin Point Return and Positioning are not performed when O.T. is ON.*

**5 If unit overrun will potentially cause a major accident, be sure to monitor the unit travel limit position and design the system to perform an emergency stop.*

1.2 Accessories

All optional equipment listed here is sold separately.

■ Optional Items

Item	Model No.	Description
Single-Axis Teaching Loader	FN-PC10LD41	Programmer for Single-Axis Positioning Unit. Allows entry, editing and operation checking of high-precision positioning data(5m cable included)
Single-Axis Motor Driver Connection Cable	FN-PC10CB01 (1m)	Connects the Flex Network single-axis positioning unit and the servo and stepping drivers.
Flex Network Communication Cable	FN-CABLE 2010-31-MS (10m)	Connect GLC/LT units with Flex Network units.
	FN-CABLE 2050-31-MS (50m)	
	FN-CABLE 2200-31-MS (200m)	

■ Maintenance Items

Item	Model No.	Description
Single-Axis Teaching Loader Cable	FN-LD10CBL (5m)	Connects the Flex Network single-axis positioning unit and the single-axis teaching loader.

Memo

Chapter 2 Specifications

1. General Specifications
2. Functional Specifications
3. I/O Circuit Connection Drawings
4. Part Names and Features
5. Dimensions

2.1 General Specifications

2.1.1 Electrical

Rated Voltage	DC24V
Rated Voltage Range	DC20.4V to DC28.8V
Allowable Voltage Drop	10 ms or less (Power Voltage DC24V)
Power Consumption	4.5W or less
In-rush Current	30A or less
Voltage Endurance	AC500V 20mA for 1 min. (combined I/O power and FG terminals)
Insulation Resistance	DC500V at 10MΩ or higher (combined I/O power and FG terminals)

2.1.2 Environmental

Ambient Operating Temperature	0^{o}C to 55^{o}C
Storage Temp.	-25^{o}C to $+70^{o}$C
Ambient Humidity	30%RH to 95%RH (no condensation)
Air Purity (Dust)	0.1mg/m^3 or less (non-conductive levels)
Corrosive Gasses	Free of corrosive gasses
Atmospheric Pressure	800 hPa to 1114 hPa (2,000 meters or lower)
Shock Resistance	IEC61131-2 (JIS B 3501) compliant 147m/s^2 (in X,Y, Z directions - 2 times each)
Vibration Resistance	IEC61131-2 (JIS B 3501) compliant When vibration IS NOT continuous: 10Hz to 57Hz 0.075mm, 57Hz to 150 Hz 9.8m/s^2 When vibration IS continuous: 10Hz to 57Hz 0.035mm, 57Hz to 150 Hz 4.9m/s^2 X,Y, Z directions for 10 times (80 min.)
Noise Immunity (via noise simulator)	Noise Voltage: 1000Vp-p Pulse Width: 1μs Arise Time: 1ns
Electrostatic Discharge Immunity	Contact discharge of 6kV (IEC61000-4-2, Level 3)

2.1.3 Structural

Protection	Protection: Equivalent to IP30 Installation method: Attachment screws
Cooling Method	Natural air circulation
Weight	Approx. 700g (Main unit only)
External Dimensions	W 122 x H 196 x D 35mm [4.80 x 7.72 x 1.38in.]

2.2 Performance Specifications

2.2.1 Performance Specifications

No. of Control Axis	1
Input Control	Photocoupler Isolation
Program Method	Sequence program, Teaching loader
Max. Positioning Memory	90 points (ABS/INC)
Pulse Output Method	CW/CCW Line Driver Output/Open Collector Output
Output Frequencies*1	1.5625pps to 62.5kpps/6.25pps to 250kpps/12.5pps to 500kpps/ 50pps to 2Mpps (set via parameters)
Max. Pulse Output	+/-2,147,483,647 pulses
Accelerate/Decellerate Method	Trapezoidal and Sinusoidal curves
Position Settings	Absolute/Incremental
Backlash Correction	0 to 65,535 pulses
Control Mode	Manual, Automatic, Direct
Origin Point Return	4 Types (option, low-speed, 2 types of high speed)
Origin Point Correction	-32,767 to 32,767 pulses

**1 Max. speed for open collector output is 100kpps.*

2.2.2 Data Transfer Settings

	GLC2000/LT Series	GP3000 Series
Communication Configuration	1:N	
Connection Method	Multi-Drop Connection	
Maximum Distance	200m/channel at 6 Mbps 100m/channel at 12 Mbps	
Communication Method	Cyclic Time Division, half-duplex	
Communication Speed	6Mbps, 12Mbps	
Communication Interface	Differential, pulse-transformer isolation	
Error Check	Format detection, bit detection, CRC-12 detection	
Number of Connectable Nodes	63 (max.), 1008 I/O points (depending on type of units used.)	63 stations max., Bit variable input: 256 points, Bit variable output: 256 points, Integer variable input: 64 points, Integer variable output: 64 points (depending on type of units used.)
Number of Occupied Nodes	4	

2.2.3 Input/Output Specifications

Control Input	Rated Input Voltage		DC24V
	Maximum Allowable Input Voltage		DC26.4V
	No. of Input Points		5 points (1 common)
	Input ON Voltage		DC19V or higher
	Input OFF Voltage		DC5V or less
	Input Impedance		3.9kΩ
	Input Delay	OFF-ON	1.5ms or less
		ON-OFF	1.5ms or less
Z Phase Input	Rated Input Voltage		DC5V
	Maximum Allowable Input Voltage		DC5.5V
	No. of Input Points		1
	Input ON Voltage		330Ω
	Input OFF Voltage		DC4V or higher
	Input Impedance		DC1V or lower
	Input Delay	OFF-ON	1.5ms or less
		ON-OFF	1.5ms or less
Control Output	Rated Output Voltage		DC24V
	Maximum Allowable Output Voltage		DC24V(+/-10%)
	No. of Output Points		1
	Maximum Load Current		50mA or less
	Output Hold Feature		None
	Voltage Drop (ON Voltage)		DC1.5V or less
	Clamp Voltage		DC39V +/-1V
	Current Leakage		0.1mA or less
	Output Delay Time	OFF-ON	1ms or less
		ON-OFF	1ms or less
Pulse Output **Open Collector**	Rated Output Voltage		DC5V
	Maximum Allowable Output Voltage		DC4.5V to DC5.5V
	No. of Output Points		2 points (CW/CCW)
	Maximum Load Current		50mA or less
	Output Hold Feature		None
	Voltage Drop (ON Voltage)		DC0.8V or less
Line Driver (non-isolated)	Differential Output		Equivalent to TI Corp. SN75158
	Output Hold Feature		None

2.3 Interface Specifications

2.3.1 Control I/O Connector

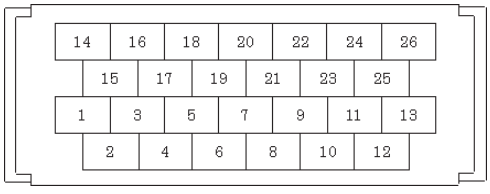
This is the Control I/O interface and is connected to the Motor Driver (Amp). When connecting to the Motor Driver, use Digital's Motor Driver Connection Cable (FN-PC10CB01).

Pin No.	Signal No.	Type	Description
1	24V	Input Voltage	Controller Input Voltage DC24V
2			
3			
4	NC		
5	COIN	Control Input	Positioning completed input signal from Motor Driver
6	-O.T		CCW direction overtravel signal (a contact/b contact)
7	PORG*1		Origin point switch (a contact)
8	END	Control Output	Positioning completed output
9	+CW	Pulse Output	CW direction pulse output (Line Driver)
10	-CW		
11	+5V	Output Voltage	Pulse output voltage (for Open collector)
12			
13	CW	Pulse Output	CW direction pulse output (non-logical Open Collector)
14	NC		
15	24G	Input Voltage	Controller Input Voltage DC0V
16			
17			
18	+O.T	Control Input	CW direction overtravel signal (a contact, b contact)
19	S-ALM		Motor Driver Alarm Input
20	-Z (ORG)	Z Phase Input	Encoder origin point signal
21	+Z (ORG)		
22	+CCW	Pulse Output	CCW direction pulse output (Line Driver)
23	-CCW		
24	5G	Output Voltage	Pulse output voltage (for Open collector)
25			
26	CCW	Pulse Output	CCW direction pulse output (non-logical Open Collector)

**1 PORG should be used for a transistor output's sensor (proximity switch, etc.)*

Connector :10226-5202JL (FN-PC side)<Sumitomo/3M Corp.>
:10126-3000VE (Cable side)<Sumitomo/3M Corp.>

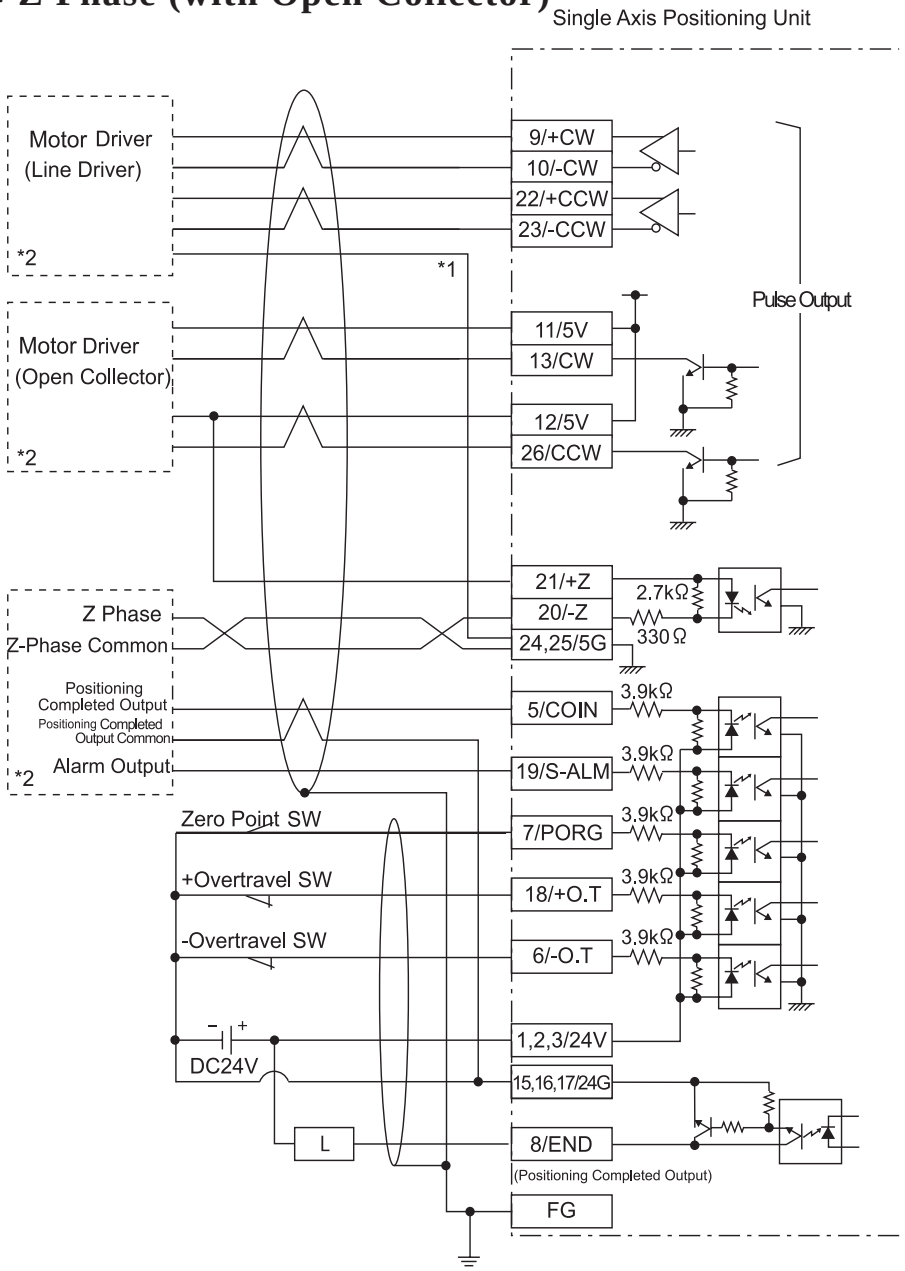
Cover :10326-52A0-008 <Sumitomo/3M Corp.>



Side face of half-pitch I/O Connector Cable

2.3.2 Flex Network Single-Axis Positioning Unit Connection Drawing

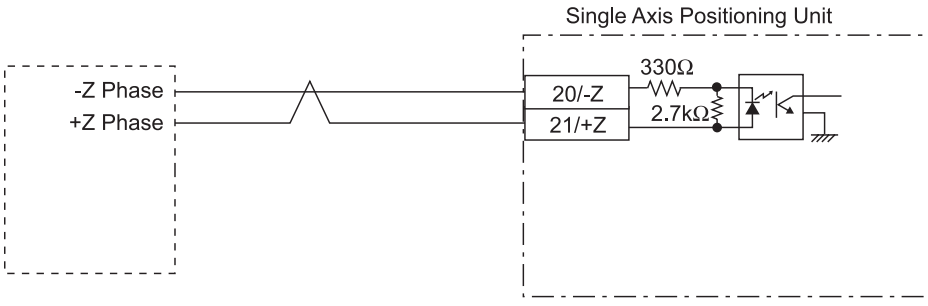
■ Z Phase (with Open Collector)



**1 The FN-PC unit's live line is not isolated. If it is connected to a non-isolated servo driver, be sure to connect the signal ground (5G) to prevent overvoltage damage.*

**2 For motor driver connection details, refer to appendix 1.*

■ Z Phase (with Line Driver)



2.4 Part Names and Features

2.4.1 Flex Network Single-Axis Positioning Unit

A: Control I/O Connector

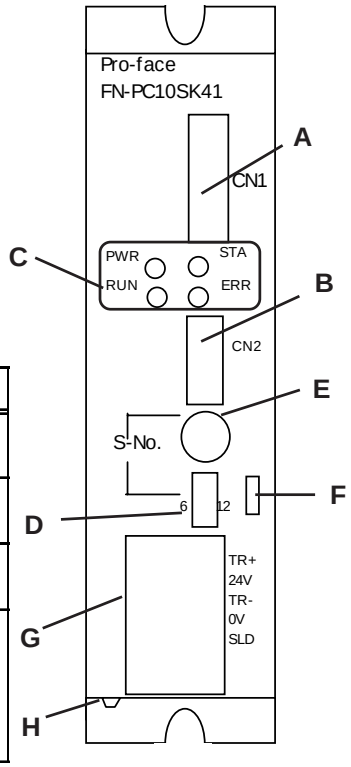
Used to connect the Motor Driver Connection Cable.

B: Teaching Loader Connector

Used to connect the Single-Axis Teaching Loader Cable.

C: Status LED

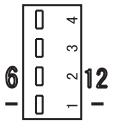
Indicates the following conditions.



LED	Color	Indicates
PWR (POWER)	Green	Power is turned ON.
STA (STANDBY)	Green	Preparation for RUN mode.
RUN	Green	Unit is in operation.
ERR (ERROR)	Red	Blinks during positioning error. Lights during communication error.

D: Dip Switches

Designates the Communication Speed setting, and first (hex) digit of the FN-PC unit's S-No.

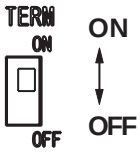


E: Station No. Switch

Designates the second (hex) digit of the FN-PC unit's S-No.

F: Terminator

Turns the termination resistance feature ON or OFF.



G: Flex Network Communication Power Terminal Block

The Flex Network Communication and Power lines are connected here.

H: FG Terminal

This line earths the FN-PC unit's Frame Ground.

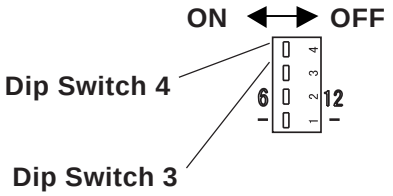
■ S-No. (Station Number) Setting

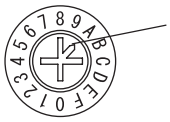
Station numbers from 1 to 60 are set in hexadecimal (01h to 3Ch). The factory setting is 0.

Note:

The number of occupied nodes for a Single-Axis Positioning unit is 4. A standard FN unit connected after this unit will use an S-No. (Station number) that is 4 more (+4) than the High Speed Counter unit's. If this number is not set correctly, incorrect unit operation can result.

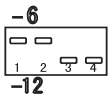
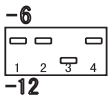
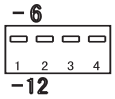
The hex upper digit is controlled by the Dip switch 3 and 4's ON/OFF settings, and the lower digit is set via the S-No. 0 to F setting.





The arrow's tip indicates the position

S-No. Setting Example

S-No. (Station No.)		Dip Switch		S-No. (Station No.) Switch	
Base 10	Base 16	3	4		
1	01h	OFF	OFF	1	
					**This station number is set to 1.**
16	10h	OFF	ON	0	
					**This station number is set to 16.**
60	3Ch	ON	ON	C	
					**This station number is set to 63.**

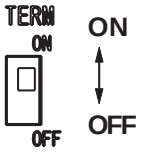
Important

The S-No. (Station number) is read in after the Single-Axis Positioning unit's power is turned ON. To change this unit's settings, be sure to first turn the unit's power OFF, make the changes, and then turn the power ON again.

■ Termination Settings

This setting helps prevent reflections (echoes) from the terminating unit (adjusts the termination impedance).

Be sure that this termination setting for each channel in your system's final unit is set to ON.

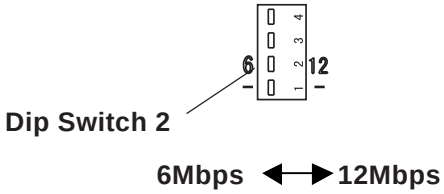


Important

The termination resistance setting is read in after the Single-Axis Positioning unit's power is turned ON. To change this unit's settings, be sure to first turn the unit's power OFF, make the changes, and then turn the power ON again.

■ Communication Speed Settings

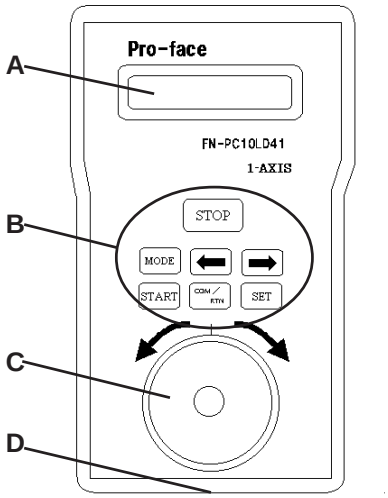
Dip Switch No. 2 controls the communication speed (6Mbps or 12Mbps). The factory setting is 6Mbps and is recommended.



Important

The Communication Speed setting is read in after the Single-Axis Positioning unit's power is turned ON. To change this unit's settings, be sure to first turn the unit's power OFF, make the changes, and then turn the power ON again.

2.4.2 Single Axis Teaching Loader Part Names and Features



A) Display

LCD: displays errors (2 rows, 16 char.)

B) Keypad

STOP	Input Cancel/Decelleration & Stop
MODE	Mode selection screen change/Error release
→	Selection Key
←	Selection Key
START	Program Start
COM/RTN	Origin Point Return
SET	Select/Screen change

C) JOG Dial

Used for manual movement during Menu selection, Data Input and Manual mode, and Teaching.

D) Teaching Cable Connector

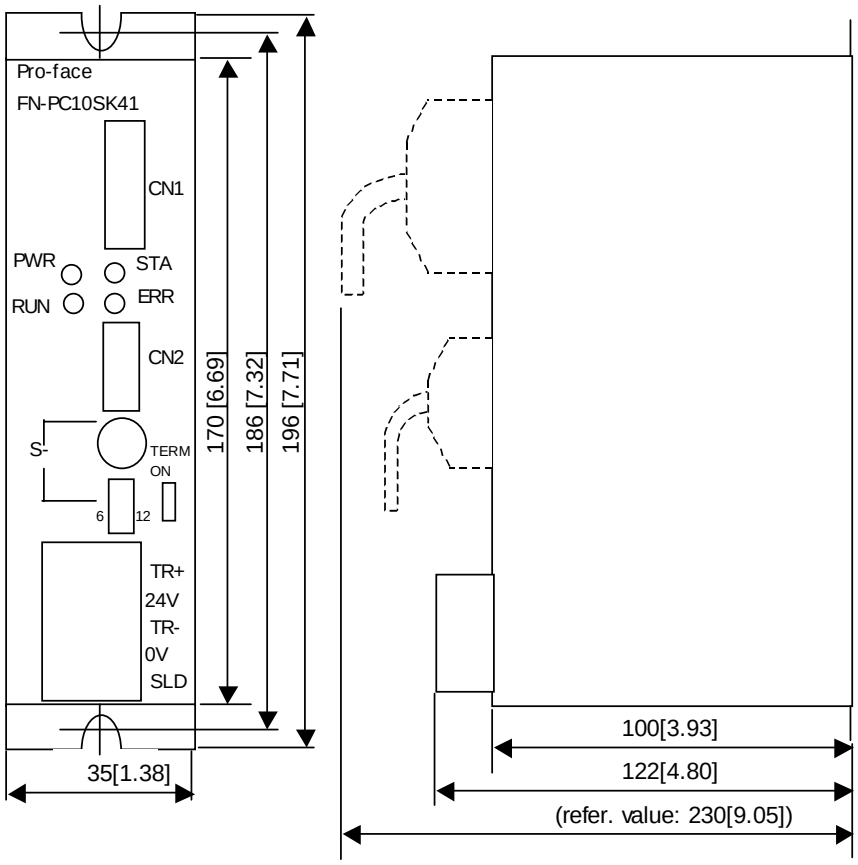
Connect the Single Axis Teaching Loader Cable (FN-LD10CBL) here.

Reference *For Teaching Loader operation details, refer to* ***Chapter 7 - Using the Teaching Loader***

2.5 Dimensions

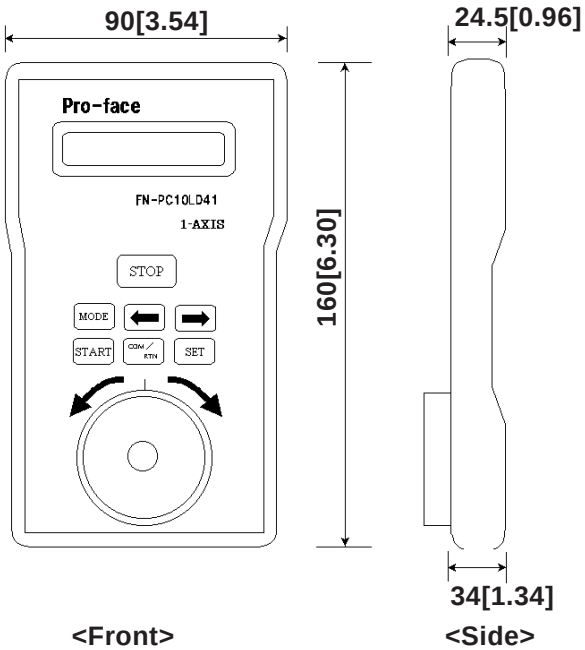
2.5.1 Flex Network Single-Axis Positioning Unit

Units: mm [in.]



2.5.2 Flex Network Single-Axis Teaching Loader Unit

Units: mm [in.]



Memo

1. Installation
2. Wiring
3. Wiring Design

Chapter 3 Installation and Wiring

3.1 Installation

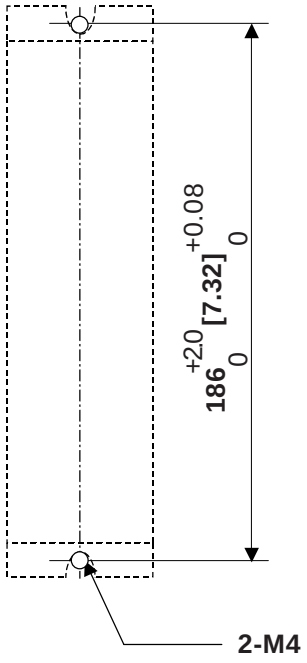
WARNING

Prior to installing the Flex Network Single-Axis Positioning Unit, be sure that the main power supply is turned completely OFF.

3.1.1 Flex Network Single-Axis Positioning Unit Installation

Create screw holes with M4 size screws. Screw torque should be from 1.0N•m to 1.3N•m.

(Units:mm[in.])



3.2 Wiring

WARNING

To prevent an electric shock, prior to wiring the Flex Network Unit, be sure that the main power supply is turned OFF.

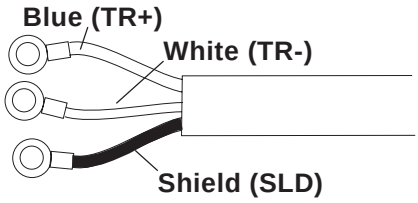
3.2.1 Connecting the Flex Network Communication Cable

Use jumper wiring between the distributed Flex Network units (T-type connections are not possible).

Pro-face recommends that the following cables be used:

Manufacturer	Model No.	Length
Digital Electronics Corporation	FN-CABLE2010-31-MS	10m
	FN-CABLE2050-31-MS	50m
	FN-CABLE2200-31-MS	200m

The cable should be made as shown below:

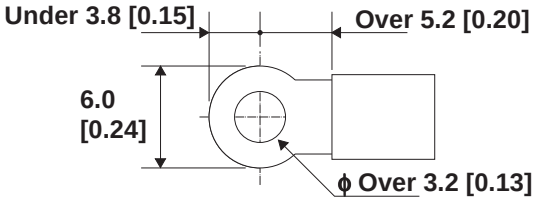


Important

The shield line should either be taped or covered with a plastic tube. Also, since the FN-HC unit has no shield (SLD) line, be sure to connect this line to an insulated or closed terminal connector.

Use the following type of crimp terminals.

Unit: mm [in.]



Important

- **Crimp terminals should be either taped or covered with a plastic tube.**
- **Be sure to tighten all unused terminal screws.**

Note:

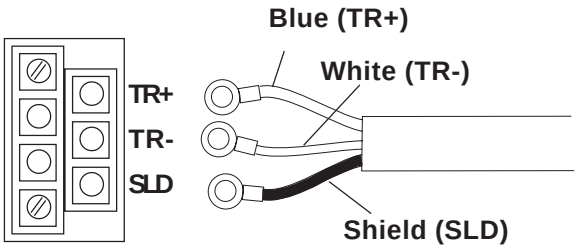
- The required torque for securing ring terminals is 0.3 to 0.5 N•m.
- Up to 2 terminals can be connected.

The cable should be made as shown below:

1) Confirm that the power supply is turned OFF.

2) Remove the terminal block's clear plastic cover.

3) Remove the terminal block screws, position the terminals in the correct locations and reattach the terminal block screws.



Flex Network Terminal/ Communication Block

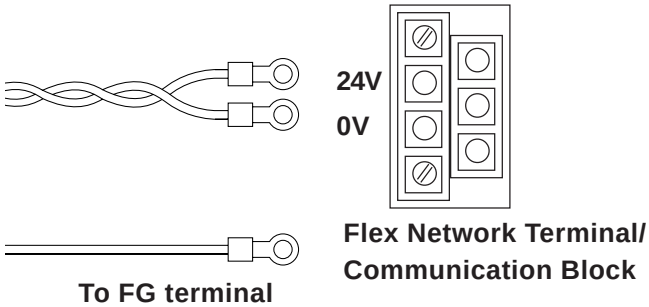
4) Replace the terminal block's clear plastic cover.

3.2.2 Connecting the FN-PC Unit Power Cable

⚠ WARNINGS

- ***To prevent an electric shock, prior to wiring the Flex Network Unit, be sure that the main power supply is turned OFF.***
- ***The Single-Axis Positioning unit uses only DC24V. Using either the wrong level of power, or connecting the power terminals incorrectly can damage both the unit and the power supply.***
- ***The Single-Axis Positioning unit has no power switch. As a result, please create a breaker-type power control switch.***

- Whenever possible, use thick wires (max. 1.25 mm^2<AWG18>) for power lines, and twist the exposed wire ends when connecting the Ring Terminals. All wiring should be UL1015 or UL1007 compliant.
- Use the same crimp terminals as the Flex Network Communication cable.
- Make all connections the same as with a standard Flex Network unit.

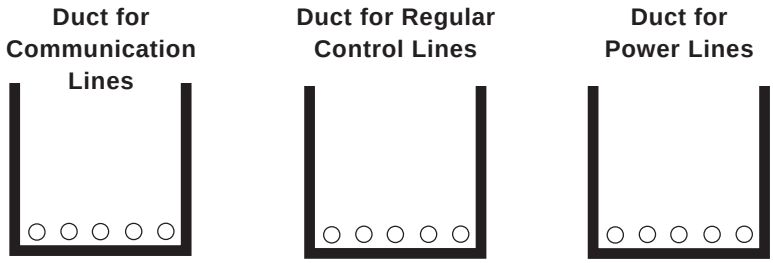


Note: The FG terminal is located at the bottom of the Single-Axis Positioning unit.

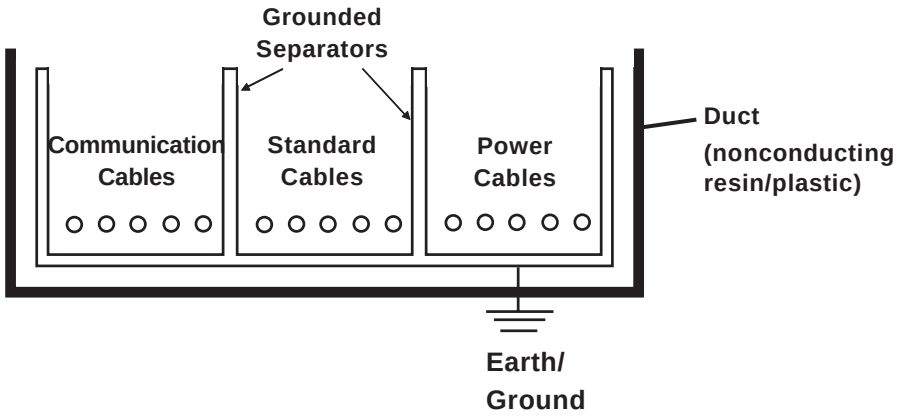
Be sure to tighten all unused terminal screws.

3.2.3 General Cautions

To help prevent noise and interference problems, separate all communication lines from power lines by placing them in a separate duct.



If the wires must be placed in the same duct, separate them via an earthed/ grounded divider.



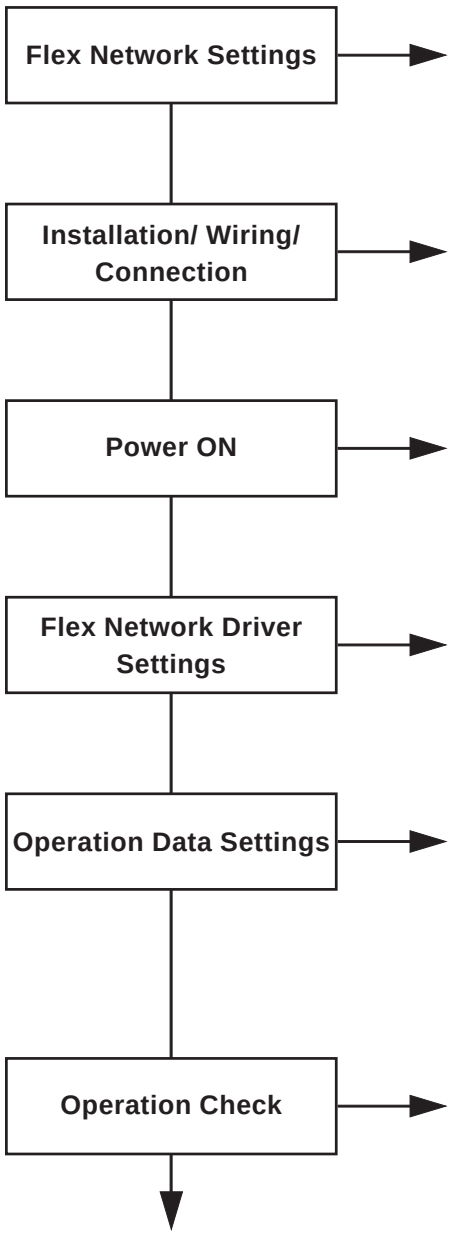
Note: If the cables cannot be separated, use shielded cables and create a ground from the shield line.

- **To create a reliable system, use external wiring to reduce noise.**
- **To prevent power surges or noise interference, use ducts to separate all DC I/O or current circuit wires from communication cables.**
- **To prevent malfunctions due to noise, communication cables must be wired separately from high-frequency lines and power lines such as high-voltage lines, high-current lines, and inverters.**

3.3 Connection Design

3.3.1 Performance Specifications

Use the following flowchart to guide you in the connection of your unit.



Set up the Single-Axis unit's S-No. (node), Communication speed, etc.

Reference ***2.4.1 Single-Axis Unit Parts and Features***

Install and wire the Single-Axis unit

Reference ***2.3 Interface Specifications, Chapter 3 Installation***

If the unit's Status LED PWR (Power) does not light, or the ERR (Error) does not light, turn OFF the power and check all wiring and connections.

Designate the Flex Network Driver's settings and download the data to the GLC.

Reference ***Chapter 6 Operation Data Settings***

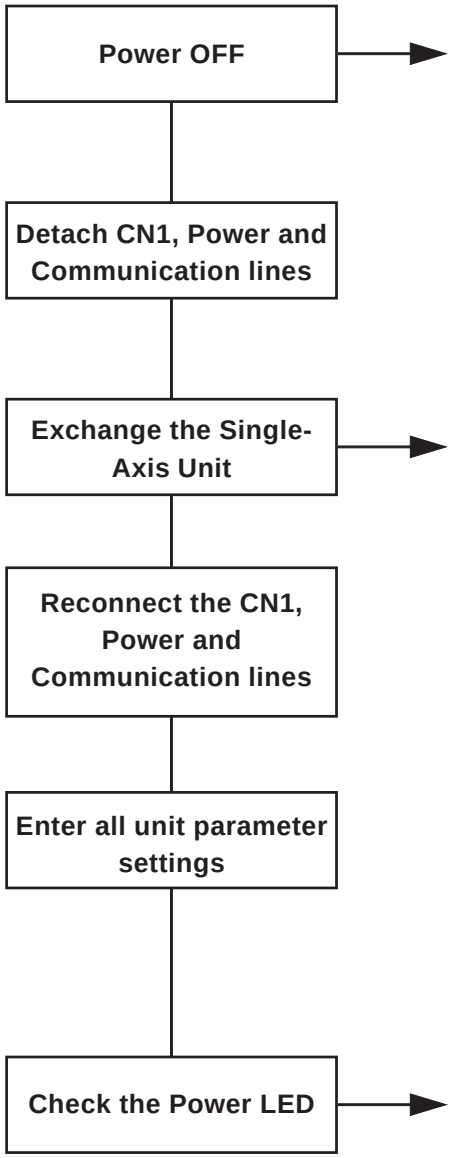
Enter the Single-Axis unit's Parameter and Automatic Operation data.

Reference ***Chapter 7 Single Axis Teaching Loader Operation, Chapter 5 Operation Data***

Check that all unit operation is as expected. If the result does not agree with the setting values entered, recheck all settings and wiring.

3.3.2 Replacing the FN-PC Unit

Use the following flowchart to guide you in the replacement of your unit.



Be sure to check that all power is OFF.

Be sure to set up the new unit's S-No. (node), communication and speed settings.

Reference *Chapter 2.4.1 Single Axis Unit Parts and Features*

Check that unit's power lamp lights. If an error occurs, turn the unit's power supply OFF and check all settings and wiring.

Chapter 4 Functional Specifications

To prepare the Single Axis Positioning Unit for operation, both parameter and each step's auto RUN data must be entered.

4.1 Operation Mode

Two operation modes are available — Setting Mode and RUN Mode — which can be switched using bit 15 of the Control (CTL) register.

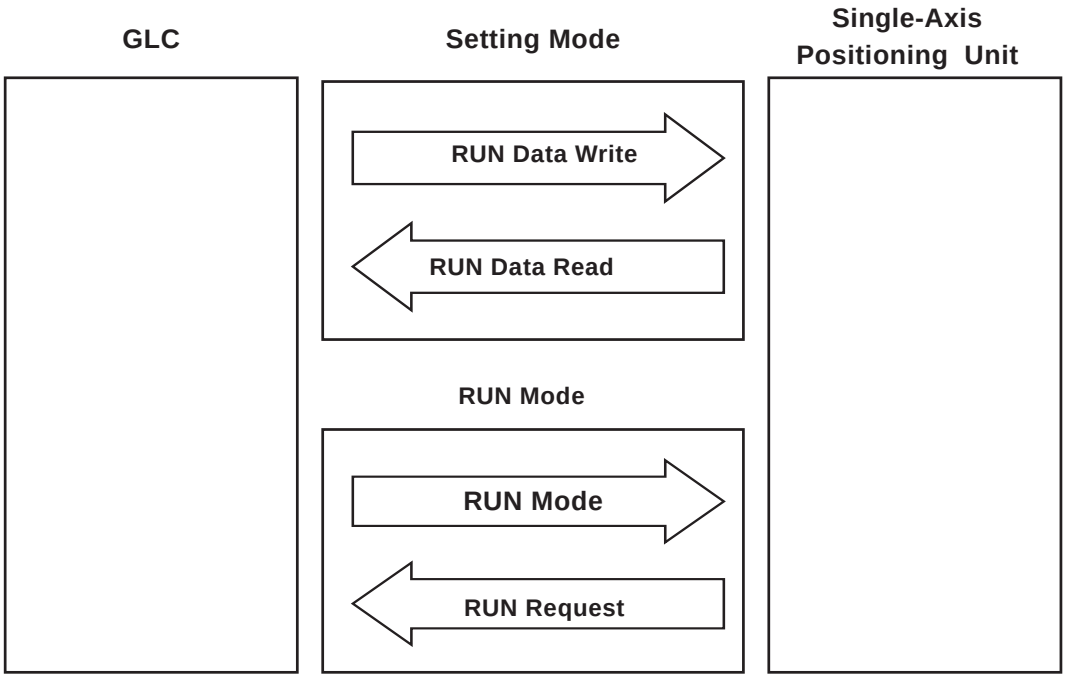
Reference *6.1 Flex Network Settings ■ Control (CTL)*

■ Setting Mode

Using commands, data can be written to the positioning unit. While in the Setting Mode, however, the Single-Axis Positioning unit cannot count or perform output controls.

■ RUN Mode

The positioning unit can be operated. However, the Single-Axis Positioning unit cannot use commands to read or write data.



Important

Prior starting the FN-PC unit or performing Origin point return, be sure to change to RUN mode if your are in Setting mode. Then, after using the status (STA) bit 15 to confirm that the mode has actually changed, start the FN-PC unit or perform Origin point return

4.2 Functions

No.	Function Name
1	RUN Data Write
2	Origin Point return
3	Manual RUN
4	Automatic RUN
5	Direct RUN Command
6	Current Position Read

■ RUN Data Write

The FN-PC unit can read in operation data prior to starting up.

This operation data can be recorded once on the FN-PC unit's internal EEPROM and does not need to be reentered until a data modification is required.

Reference *For operation data setting details, refer to **Chapter 5 RUN Data** and **Chapter 6 RUN Data Settings**.*

■ Origin Point Return

The unit returns to the Origin position using the return method entered in the parameter settings.

Reference *For Origin Return Point setting details, refer to **8.1 Origin Point Return**.*

■ Manual RUN

When either the CW or CCW bit turns ON, movement begins according to the input entered in the Manual Speed Parameter.

Reference *For Manual RUN setting details, refer to **8.2 Manual RUN***

■ Automatic RUN

In Automatic RUN, three modes are available.

• 1 Step

• Continuous Step

• 1 Cycle

Automatic RUN mode's operation setting is performed via Control (CTL).

Reference *For Automatic RUN setting details, refer to **8.3 Automatic RUN.***

■ Direct RUN Command

The Direct RUN Command's operation setting is performed via Control (CTL).

Reference *For Direct RUN Command setting details, refer to **8.5 Direct RUN Command.***

■ Current Position Read

This feature reads out the FN-PC unit's current position (POS). The unit position immediately prior to switching to Setting Mode is saved and not changed.

Memo

Chapter 5 RUN Data

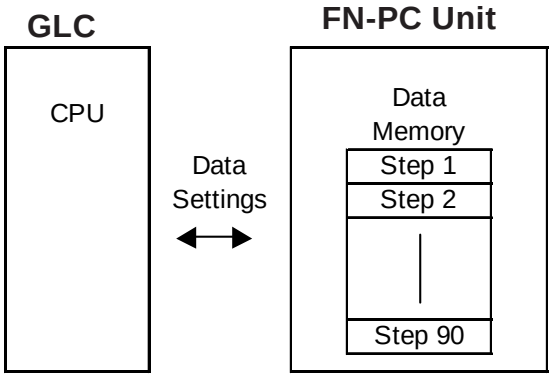
5.1 RUN Data

In order to operate the FN-PC unit, a variety of types of data must be entered, such as parameter and step by step Automatic RUN position data.

There are four types of RUN data; Parameters, Automatic RUN Position data, Direct RUN Command data and Internal Information data.

There are three ways to enter this data - via the optional Teaching Loader, the Logic Program or the Screen. Regardless of which is used, the Positioning Unit and the Interface (Timing) is the same.

The FN-PC unit's RUN data is backed up in its internal EEPROM. This allows the preservation of data, even when the FN-PC is turned OFF.



5.1.1 Parameters

FN-PC unit parameters are related to Origin Point Return, Manual Mode, AUTO RUN, and Direct RUN, and need to be set prior to actual unit operation.

A minimum of two (2) parameters are required for operation; the Origin Point Return and Manual RUN (only when the Single-Axis Teaching Loader is used).

To test FN-PC unit operation, the initial (factory set) settings can also be used.

■ Parameter Summary (Command Summary)

	CMD							WD/RD	
Par. No.	Write CMD	Read CMD	MSB 15 - 12	11 - 8	7 - 4	LSB 3 - 0	Teaching Loader Display	Setting Range	Initial Value
1	1 (01h)	129 (81h)	Zero Return Method	· O.T Rev. ROT. · O.T Logic · S-ALM Logic · COIN RNU	· Accel. / Decel. Mode · Speed Mode	High Speed Zero Point Count			513 (0201h)
2	2 (02h)	130 (82h)	PORG OFF Time (Unit:10ms)				PORG OFF TIME	0 - 4095 (0 - FFFh)	10 (Ah)
3	3 (03h)	131 (83h)	PORG ON Time (Unit:10ms)				PORG ON TIME	0-4095 (0-FFFh)	10 (Ah)
4	4 (04h)	132 (84h)	Max. Speed *1				MAX SPEED	1-40000 (1-9C40h)	10 (Ah)
5	5 (05h)	133 (85h)	Manual Jog Speed *1				MANUAL JOG SPEED	1-40000 (1-9C40h)	10 (Ah)
6	6 (06h)	134 (86h)	Manual Speed *1				MANUAL SPEED	1-40000 (1-9C40h)	10 (Ah)
7	7 (07h)	135 (87h)	Auto Jog Speed *1				AUTO JOG SPEED	1-40000 (1-9C40h)	10 (Ah)
8	8 (08h)	136 (88h)	Zero Point Return Speed *1				RETURN SPEED	1-40000 (1-9C40h)	10 (Ah)
9	9 (09h)	137 (89h)	High Speed Zero Point Return Speed *1				RETURN HI SPEED	1 - 40000 (1-9C40h)	10 (Ah)
10	10 (0Ah)	138 (8Ah)	Accel. / Decel. Time (Unit:10ms)				SLOPE	1-65535 (1-FFFFh)	10 (Ah)
11	11 (0Bh)	139 (8Bh)	Backlash Correction (Unit:Pulse)				BACKLASH OFFSET	0-65535 (0-FFFFh)	0 (0h)
12	12 (0Ch)	140 (8Ch)	Zero Point Correction (Unit:Pulse)				RETURN OFFSET	-32767 to 32767 (8001 to 7FFFh)	0 (0h)
13	13 (0Dh)	141 (8Dh)	Maximum Position Data (Unit:Pulse)				MAX STROKE LIMIT	0-2147483647 (0-7FFFFFFFh)	2147483647 (7FFFFFFFh)
14	14 (0Eh)	142 (8Eh)	Minimum Position Data (Unit:Pulse)				MIN STROKE LIMIT	-2147483647 - 0 (80000001-0h)	-2147483647 (80000001h)

**1 For Speed Data settings, see 5.1.1Parameters ■ Parameters No.4,5,6,7,8,9 and ◆ Speed Data Calculation. For each setting's speed, refer to 8 Run Mode.*

	CMD							WD/RD	
Par. No.	Write CMD	Read CMD	MSB 15 - 12	11 - 8	7 - 4	LSB 3 - 0	Teaching Loader Display	Setting Range	Initial Value
15	15 (0Fh)	143 (8Fh)	- RUN Enable/Disable - Cycle Continuous/Stop - Control Mode - Position Settings		0		Refer to Bit Allocation		32768 (8000h)
16	16 (10h)	144 (90h)	Speed Data*1 (AUTO RUN Data)				SPEED	1 - 40000 (1 - 9C40h)	10 (Ah)
17	17 (11h)	145 (91h)	Accel./Decel. Time (AUTO RUN Data, Unit:10ms)				SLOPE	1 - 65535 (1 - FFFFh)	10 (Ah)
18	18 (12h)	146 (92h)	Goal Position Data*2 (Unit: Pulse)				POS	-2147483647 to H102147483647 (80000001 - 7FFFFFFFh)	0 (0h)

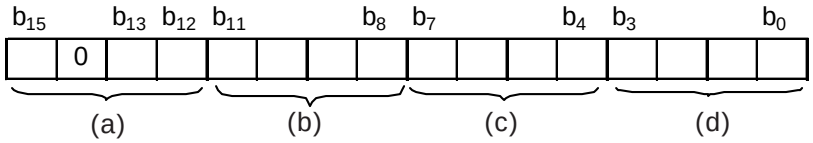
**1 For Speed Data settings, see 5.1.1Parameters n Parameters No.4,5,6,7,8,9 and u Speed Data Calculation*

**2 The Goal Position Value's initial setting is "0". This factory set value is entered for all steps prior to shipping.*

	CMD				WD/RD	
Par. No.	Write CMD	Read CMD	Name	Description	Setting Range	Init. Val.
19	19 (13h)	147 (93h)	Direct RUN Speed Data	Direct RUN Mode Speed Data Settings*1 (Not saved to EEPROM)	1 - 40000 (1 - 9C40h)	10 (Ah)
20	20 (14h)	148 (94h)	Direct RUN Accel./Decel. Time	Direct RUN Mode Accel./Decel Time Settings (Unit:10ms) (Not saved to EEPROM)	1 - 65535 (1 - FFFFh)	10 (Ah)
21		254 (FEh)	Error Code	Read out error code from Positioning Unit		
22		255 (FFh)	Version	Read out version data from Positioning Unit		

**1 For Speed Data settings, see 5.1.1Parameters n Parameters No.4,5,6,7,8,9 and u Speed Data Calculation*

■ Parameter No. 1



(a) Origin Point Return Direction

Sets the Origin point return direction.

b_{15}	Origin Point Return Method	Single-Axis Teaching Loader Display	
0	CCW DIR	RTN DIR	CCW
1	CW DIR		CW

Origin Point Return Method

Sets the Origin point return method.

b_{13}	b_{12}	Zero Origin Return Method	Single-Axis Teaching Loader Display	
0	0	Optional Origin Point Return	RTN WAY	OPTIONAL
0	1	Low Speed Return		LOW SPEED
1	0	High Speed Return 1		HI SPEED 1
1	1	High Speed Return 2		HI SPEED 2

(b) O.T. Reverse Movement

Sets the O.T Reverse Movement feature to ON or OFF.

b_{11}	Over Travel Reverse	Single-Axis Teaching Loader Display	
0	Reverse Disable	O.T REVERSE	OFF
1	Reverse Enable		ON

O.T. Logic

Sets the O.T input logic to either an A contact or a B contact.

b_{10}	O.T. Logic	Single-Axis Teaching Loader Display	
0	a Contact	O.T LOGIC	A CONTACT
1	b Contact		B CONTACT

Servo Alarm Logic

Sets the Servo alarm input logic to either an A contact or a B contact.

b_9	Servo Alarm Logic	Single-Axis Teaching Loader Display	
0	a Contact	SRV ALM LOGIC	A CONTACT
1	b Contact		B CONTACT

COIN Logic

Sets the COIN input logic to either A contact or B contact.

b_8	COIN Operation	Single-Axis Teaching Loader Display	
0	a Contact	COIN LOGIC	A CONTACT
1	b Contact		B CONTACT

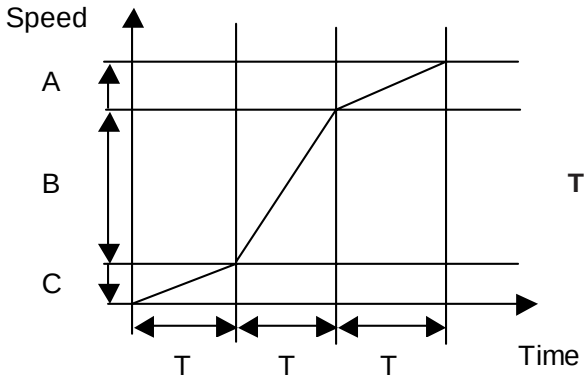
(c) Acceleration/Deceleration Mode

Sets the Acelleration/Decelleration mode.

b_7	b_6	Accel/Decel Method	Single-Axis Teaching Loader Display		
0	0	Trapezoidal Accel/Decel	SLOPE MODE	TRAPEZOID	
0	1	S-Curve Accel/Decel 1		S1	(1)
1	0	S-Curve Accel/Decel 2		S2	(2)
1	1	S-Curve Accel/Decel 3		S3	(3)

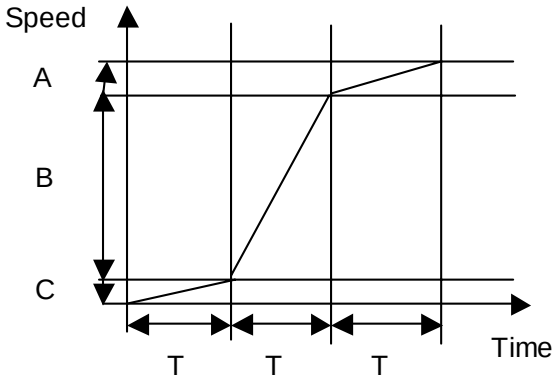
Sinusoidal Curves - Acceleration/Deceleration Comparison

(1) A : B : C = 1 : 4 : 1 (Standard) ——————— S1(Sinusoidal 1)



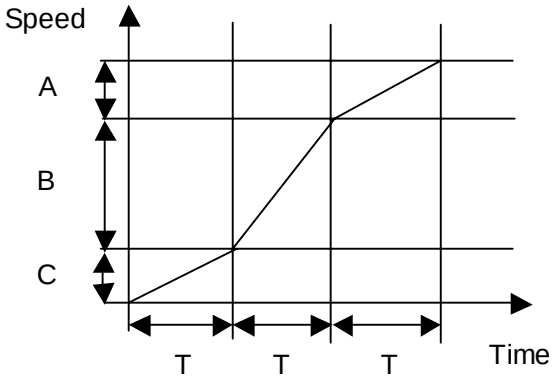
T = SLOPE/3

(2) A : B : C = 1 : 10 : 1 (High S Curve) — — — S2(Sinusoidal 2)



T = SLOPE/3

(3) A : B : C = 1 : 2 : 1 (Low S Curve) ——————— S3(Sinusoidal 3)



T = SLOPE/3

Speed Mode

Sets the speed mode. Parameters 4 to 9 are used for speed data calculations.

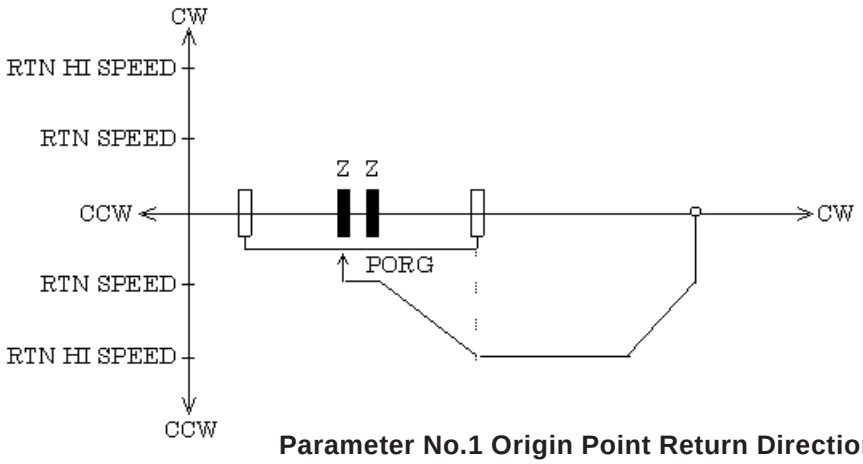
b_5	b_4	Speed Range	Speed Modulus	Teaching Loader Display	
0	0	1.5625pps - 62.5Kpps	1.5625pps	SPEED MODE	1.56 -> 62.5k
0	1	6.25pps - 250Kpps	6.25pps		6.25 ->250k
1	0	12.5pps - 500Kpps	12.5pps		12.5 -> 500k
1	1	50pps - 2Mpps	50pps		50 -> 2M

(d) High Speed Origin Point Count

Sets the number of high-speed Origin points. When Origin-point return is performed, this sets the Z-axis count value used for stopping. When this value is set to "0", the Z-axis value is ignored and PORG input is used.

Setting Data b_3 -> b_0 (Base 16)	Count	Single-Axis Teaching Loader Display	
0	0	ORIGIN COUNT	0
:	:		:
F	15		15

Ex. When High Speed Origin Point Count is set to "2".



Parameter No.1 Origin Point Return Direction Setting: CCW

■ Parameters No. 2 and 3

Enter the PORG OFF, PORG ON time (Unit:10ms).

Setting range: 0.00 to 40.95s

(Hex:0000h to 0FFFh)

When data outside this range is entered, the max. or min. value is written.

■ Parameters No. 4, 5, 6, 7, 8, 9

After performing the following calculations for each desired speed, enter the speed value. (Setting Range: 1 to 40000(9C40h))

◆ Speed Data Calculation

Depending on the speed mode set in Parameter No. 1, the speed data (VD) is calculated for parameters 4 to 9.

$$VD = \frac{V}{KV}$$

V : speed (pps)

KV: speed modulus (pps) (Speed mode set in parameter No. 1)

◆ Ex. Speed mode settings if speed is set to 10kpps.

1) KV=1.5625pps

$$VD = \frac{10\times10^3}{1.5625} = 6{,}400 = 1900h$$

2) KV=6.25pps

$$VD = \frac{10\times10^3}{6.25} = 1{,}600 = 0640h$$

3) KV=12.5pps

$$VD = \frac{10\times10^3}{12.5} = 800 = 0320h$$

4) KV=50pps

$$VD = \frac{10\times10^3}{50} = 200 = 00C8h$$

Do not set the speed to "0".

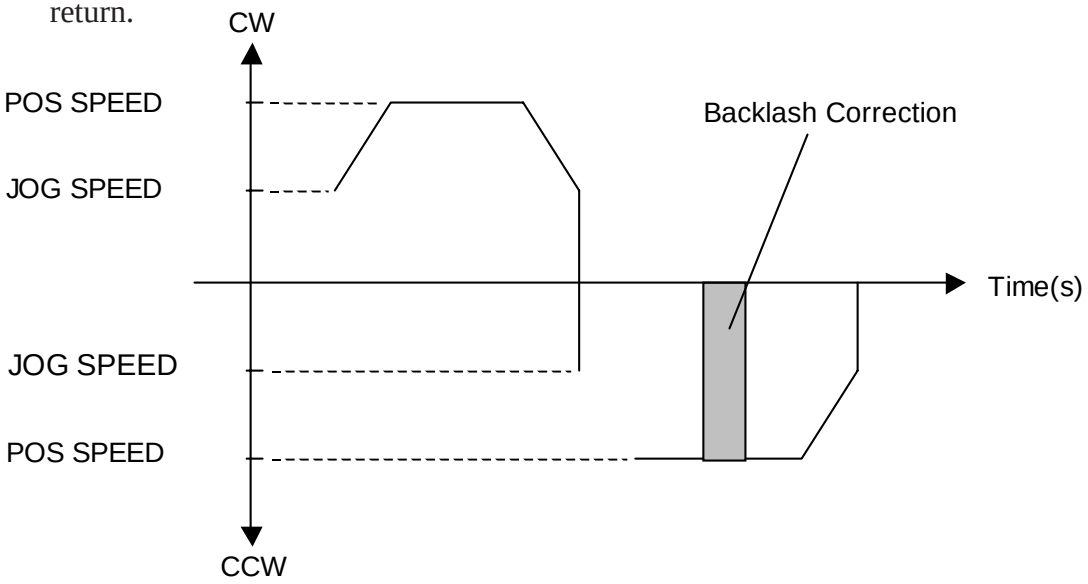
■ Parameter No. 10

Sets the Origin Point Return, and Acceleration/Deceleration time(Unit:10ms) in Manual RUN mode.

■ Parameter No. 11

Sets the amount of backlash correction.

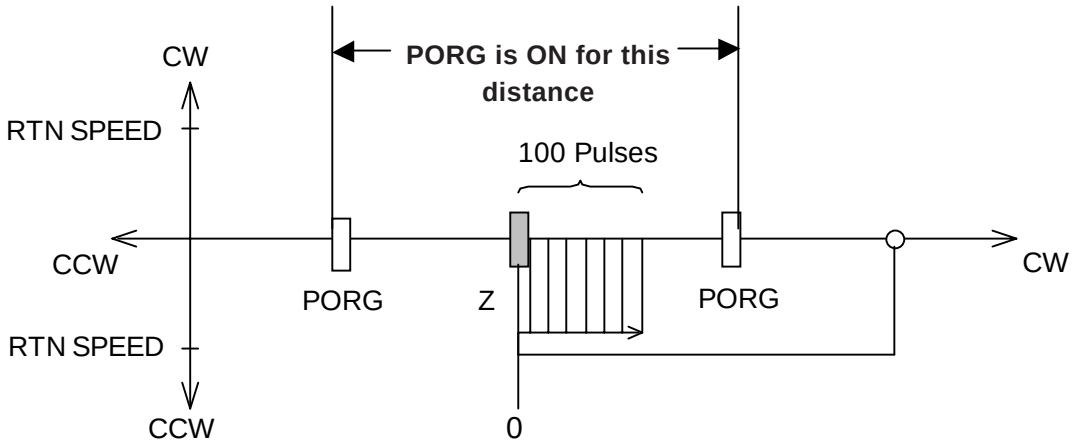
When the backlash correction movement direction is changed, the amount in excess of the correction amount is output. This occurs also during Origin point return.



■ Parameter No. 12

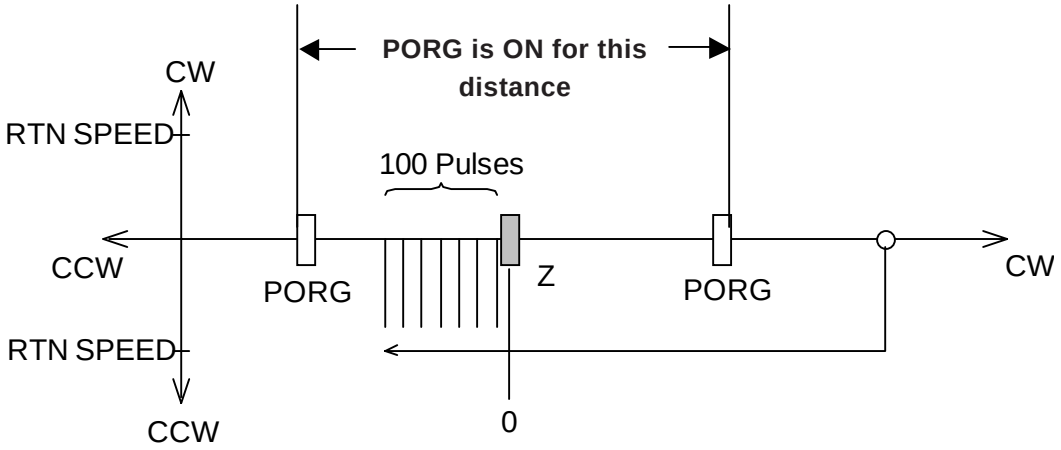
Sets the Origin Point Correction amount. Origin Point Correction is available in all Origin Point Return modes. When the Origin Point Return is completed, the designated pulse is output as the Origin Point Return Speed.

• Origin Point Correction Amount: +100(64h)



Origin Point Return Direction Setting: CCW

• Origin Point Correction Amount: -100(FFFFFF9Bh)



Origin Point Return Direction Setting: CCW

■ Parameter No. 13

Designates the upper position limit data.

Setting range is from 0 to 2,147,483,647 (00000000h to 7FFFFFFFh).

During automatic RUN, if the value entered here is larger than the position data value, a MAX position error will occur and movement will stop.

To recover from this error and begin normal operation, enter a value that is within the allowed range, and restart the FN-PC unit.

During manual RUN, if the allowed value is exceeded and movement is in the CW direction, the unit will decellerate and stop, and a MAX position error will occur. If movement is in the CCW direction, movement will proceed normally.

■ Parameter No. 14

Designates the lower position limit data.

Setting range is from 0 to -2,147,483,647 to 0 (80000001h to 00000000h).

During automatic RUN, if the value entered here is larger than the position data value, a MAX position error will occur and movement will stop.

To recover from this error and begin normal operation, enter a value that is within the allowed range, and restart the FN-PC unit.

During manual RUN, if the allowed value is exceeded and movement is in the CCW direction, the unit will decellerate and stop, and a MAX position error will occur. If movement is in the CW direction, movement will proceed normally.

5.1.2 Automatic RUN Data

This data is required for Automatic operation. Up to 90 points of Automatic RUN data can be entered. Each point of data is considered a "step" and is stored in the FN-PC unit's EEPROM.

Each Automatic RUN Position Data "Step" consists of RUN Mode, Speed Data, Acceleration/Deceleration Time data and Target Position Data.

■ Automatic RUN Data Summary (Command Summary)

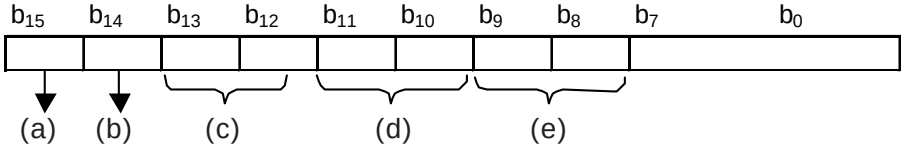
Each step's RUN data must be set. Beforehand, each step number is set as the write step number. See ***Flex Network Driver Settings.***

	CMD							WD/RD	
Par. No.	Write CMD	Read CMD	MSB 15 - 12	11 - 8	7 - 4	LSB 3 - 0	Teaching Loader Display	Setting Range	Initial Value
15	15 (0Fh)	143 (8Fh)	- RUN Enable/Disable - Cycle Continuous/Stop - Control Mode - Position Settings		0		Refer to Bit Allocation		32768 (8000h)
16	16 (10h)	144 (90h)	Speed Data*1 (AUTO RUN Data)				SPEED	1 - 40000 (1 - 9C40h)	10 (Ah)
17	17 (11h)	145 (91h)	Accel./Decel. Time (AUTO RUN Data, Unit:10ms)				SLOPE	1 - 65535 (1 - FFFFh)	10 (Ah)
18	18 (12h)	146 (92h)	Target Position Data*2 (Unit: Pulse)				POS	-2147483647 to H102147483647 (80000001 - 7FFFFFFFh)	0 (0h)

**1 For Speed Data settings, see 5.1.1Parameters ■ Parameters No.4,5,6,7,8,9 and ◆ Speed Data Calculation.*

**2 The Goal Position Value's initial setting is "0". This factory set value is entered for all steps prior to shipping.*

■ Data No. 1



(a) RUN Enable/Disable

b_{15}	RUN Enable/Disable	Single-Axis Teaching Loader Display	
0	RUN Disable (To not operate the unit)	RUN	OFF
1	RUN Enable (To operate the unit)		ON

Each step's RUN setting (Enable/Disable) is used.

When this bit changes to "1", the step is/can be performed. If this is set to "0", the step cannot be performed.

If during the performance of a cycle a step is encountered that is set to "0", that step is skipped and the following/next step is performed.

(b) Cycle Continuous/Stop

b_{14}	Cycle Continuous/Stop	Single-Axis Teaching Loader Display	
0	Cycle Continuous	CYCLE	CONTINUE
1	Cycle Stop		END

- In automatic mode 2 and 3, operation is continuous from the first step to the b_{14}=1(Cycle Stop) step. The cycle then repeats itself. See ***8.3 Auto RUN.***

(c) Unused Bit

This should be set to "0". (Even if it is set to 1, it is ignored.)

(d) Control Mode

b_{11}	b_{10}	Control Mode	Single-Axis Teaching Loader Display	
0	0	Position Control Mode	CNTRL	POS
0	1	Speed + Position Control Mode		SPEED + POS
1	0	Speed Control Mode		SPEED

1. Position Control Mode

Positioning is performed via the positioning mode selected in b_8 and b_9.

2. Speed + Position Control Mode

After start-up, the unit operates in Speed Control Mode, and positioning is performed according to the position data entered in Control (CTL) bit 7.

- In Speed Control Mode, the current position is not exact.
- In Positioning Mode, regardless of the mode set in position settings b_8 and b_9, Incremental Mode is used.

3. Speed Control Mode

- Position data is ignored and only speed is used for control.
- Control (CTL) bit 13 (decelerate and stop) can be used to stop the unit.
- In Speed Control Mode, the current position is not exact.
- Rotation direction is determined by the Position Data's + and - setting.

(e) Position Settings

b_9	b_8	Position Setting	Single-Axis Teaching Loader Display	
0	0	Absolute	ABS/INC	ABS
0	1	Incremental		INC

Absolute/Incremental (b_8 and b_9)

- Absolute Mode: Operation is performed using absolute coordinates.
- Incremental Mode: When FN-PC unit is started, current position is used as the "0" point. Movement distance becomes position data.

5.1.3 Direct RUN Data

This data is required for the Direct RUN Command Data.

■ Direct RUN Command Data Summary

	CMD				WD/RD	
Par. No.	Write CMD	Read CMD	Name	Description	Setting Range	Init. Val.
19	19 (13h)	147 (93h)	Direct RUN Speed Data	Direct RUN Mode Speed Data Settings*1 (Not saved to EEPROM)	1 - 40000 (1 - 9C40h)	10 (Ah)
20	20 (14h)	148 (94h)	Direct RUN Accel./Decel. Time	Direct RUN Mode Accel./Decel Time Settings (Unit:10ms) (Not saved to EEPROM)	1 - 65535 (1 - FFFFh)	10 (Ah)

**1 For Speed Data settings, see 5.1.1Parameters ■ Parameters No.4,5,6,7,8,9 and ◆ Speed Data Calculation.*

5.1.4 Internal Information Data

This internal data is read out.

■ Internal Information Data Summary

	CMD				WD/RD	
Par. No.	Write CMD	Read CMD	Name	Description	Setting Range	Init. Val.
21		254 (FEh)	Error Code	Read out error code from Positioning Unit		
22		255 (FFh)	Version	Read out version data from Positioning Unit		

Chapter 6 Data Settings

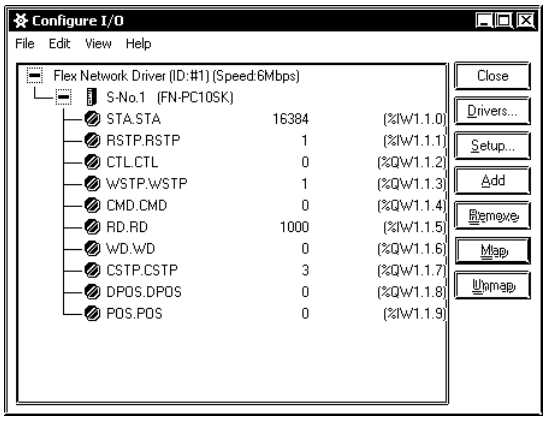
6.1 Flex Network Driver Settings

The use of integer variables depends on the integer variable allocated to each tree structure terminal in the Flex Network Driver.

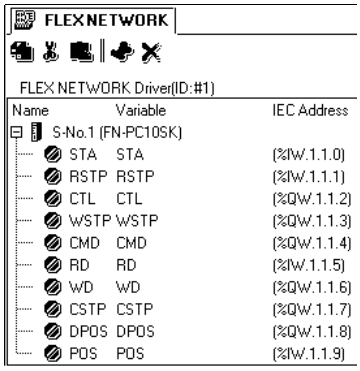
When using GLC2000 series/LT series, integer variables can be allocated in GP-PRO/PBIII C-Package (Pro-Control Editor) or LT Editor. For details of each setup method, refer to each Editor's online Help.

When using GP3000 series, refer to GP-Pro EX Reference Manual.

<GLC2000/LT Series>



<GP3000 Series>



The integer variables allocated to each terminal are as follows:

STA : Status Register
RSTP: Read Out Current Step No.
CTL : Control Register
WSTP: Write Current Step No.
CMD: Command Register
RD : Read Data register
WD : Write Data register
CSTP: Command Write Step No.
DPOS: Direct RUN Command
POS: Current Position

If variables are not allocated to all terminals, an error message will occur at the time of error check or download.

■ Status Register (STA) (Read Only)

Stores bit information, such as the Single-Axis Positioning unit's status.

Each bit is used as follows:

Bit Position	Feature	Description
0	RUN Mode Check 0: 1 Step, 1:Continuous Step 2: 1 Cycle, 3: Direct RUN	Allows checking of RUN mode.
1		
2	COIN Input	Displays input condition of COIN teminal.
3	+O.T. Input	Displays input condition of +O.T. terminal
4	-O.T. Input	Displays input condition of -O.T. terminal
5	S-ALM Input	Displays input condition of S-ALM terminal
6	PORG Input	Displays input condition of PORG
7	Z phase Input Latch	Latches the Z-phase input.
8	Command Complete Flag*1	Turns ON after a command is performed. Turns OFF if any other command is received.
9	Positioning Completed Flag	Turns ON atter positioning movement is completed.
10	Step Out	Turns ON after one RUN step is completed.
11	RUN	Turns on during RUN operation.
12	Standby	Turns ON during RUN preparation.
13	+/- O.T. Latch	Latches the O.T. input.
14	RUN Latch	Latches the RUN bit.
15	RUN Mode/Setting Mode Changeover	Allows checking of current RUN mode status.

**1 At startup, Command Complete flag is OFF.*

■ Read Out Current Step No. (RSTP) (Read Only)

Stores the number of the step currently being performed. (FN-PC unit's internal step.)

■ Control Register (CTL) (Can Write)

Used to control the Single-Axis Positioning unit's operation.

Each bit is used as follows:

Bit Position	Feature	Description
0	RUN Mode Check 0: 1 Step, 1:Continuous Step 2: 1 Cycle, 3: Direct RUN command	Allows checking of RUN mode.
1		
2	Reset *1	Clears Alarms and Latches.
3	Reserved	Reserved.
4	Reserved	Reserved.
5	Reserved	Reserved.
6	Reserved	Reserved.
7	Control Mode Change	Changes the Control Mode. (Only Speed + Position Control Mode during Auto RUN's Control Mode) See ***5.1.2 Auto RUN Position Data***
8	Decelerate	When this bit is turned ON during RUN mode, operates at Manual Jog Speed. (Only in Manual RUN Mode.) When this bit is turned ON during RUN mode, operates at Manual Speed (Only in Automatic Mode.)
9	Reverse Rotation (CCW)	Unit rotates in reverse (only in Manual Mode)
10	Forward Rotation (CW)	Unit rotates forward (only in Manual Mode)
11	Unit Start	Starts FN-PC unit. (only in Manual Mode)
12	Origin Point Return	Returns unit to origin point.
13	Deceleration/Stop	Unit will decelerate and then stop.
14	Immediate Stop*2	Stops the unit immediately.
15	RUN Mode / Setting Mode Switchover 0: RUN Mode; 1: Setting Mode	Allows checking of current RUN mode status.

**1 Turns OFF after processing is received.*

**2 When Immediate Stop is ON, data cannot be written.When Immediate Stop is ON, the subsequent position data cannot be guaranteed. Therefore, be sure to perform Origin Point Return before operating the unit.*

Prior starting the FN-PC unit or performing origin point return, be sure to change to RUN mode if your are in Setting mode. Then, after using the status (STA) bit 15 to confirm that the mode has actually changed, start the FN-PC unit or perform origin point return

■ Write Current Step No. (WSTP) (Can Write)

Any of the FN-PC unit's 90 step numbers can be set in advance.

■ Command Register (CMD/Enabled in Setting Mode) (Can Write)

This command is used when writing data to the FN-PC unit, or when reading out data from the unit. Used in conjunction with the WD and RD commands.

When RUN data is written, RD can be used to confirm the actual value written. Whenever a command is received, the value of RD is cleared to "0", and when an incorrect value is entered, that value will remain. Also, STA bit 8 (Command Complete Flag) can be used to check if the command has been completed.

■ Read Data Register (RD/Enabled in Setting Mode) (Read Only)

Used to store information when the command (CMD) to read information from the FN-PC unit is issued. Also, stores actual data written after the command to write RUN data to the FN-HC unit is issued.

■ Write Data Register (WD/Enabled in Setting Mode) (Can Write)

Used to store Setting Data before the command (CMD) to send it to the FN-PC unit is issued.

■ Command Write Step No. (CSTP/Enabled in Setting Mode) (Can Write)

Used to designate the step number to write when automatic RUN data is written. (Range: 1 to 90)

■ Direct RUN Command (DPOS) (Can Write)

Designates the position to use for movement to a specific position during direct RUN operation. (Setting range: -214783647 to 2147483647)

■ Current Position (POS) (Read Only)

Stores the unit's current position. (Cannot be changed in setting mode.)

6.2 Data Settings

Data settings are performed in the Setting Mode. The Mode setting can be changed via bit 15. Reference **4.1 Operation Mode**

■ RUN Data Write Procedure

Values written to the FN-PC unit are set in the Command Data Write (WD) register.

When you enter a Write command value in the WD register, the WD value is written to the FN-PC unit as RUN data.

- If an incorrect value is entered as a CMD, that value is left as-is and not processed.
- When a command is received, the value entered in CMD and the Status (STA) area's bit 8 (Command Completed Flag) will be cleared.
- When a CMD is used as the Write Command that is outside the allowed WD range, the range's max. or min. value will be written.

The data written to the FN-PC unit is reflected in the Command Data Read (RD). Also, when the command operation (Write) is completed, the STA area's bit 8 (Command Completed Flag) will turn ON, and can be used for command completion check.

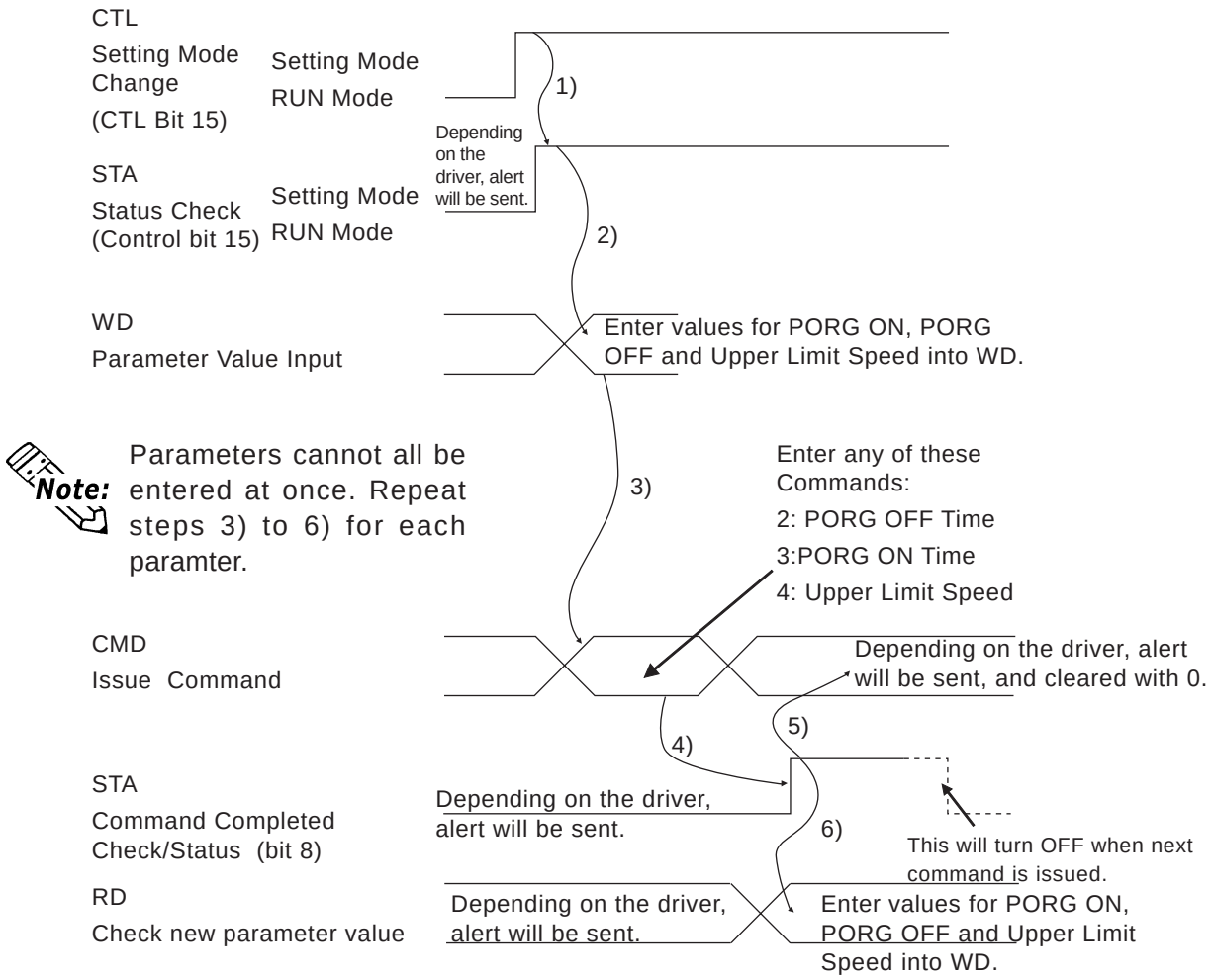
■ RUN Data Read Out Procedure

When the command is set to Read, the value read out from the FN-PC unit is stored in the Command Data Read (RD).

- If an incorrect value is entered as a CMD, that value is left as-is and not processed.
- When a command is received, the value entered in CMD and the Status (STA) area's bit 8 (Command Completed Flag) will be cleared.

Also, when the command operation (Read) is completed, the STA area's bit 8 (Command Completed Flag) will turn ON, and can be used for command completion check.

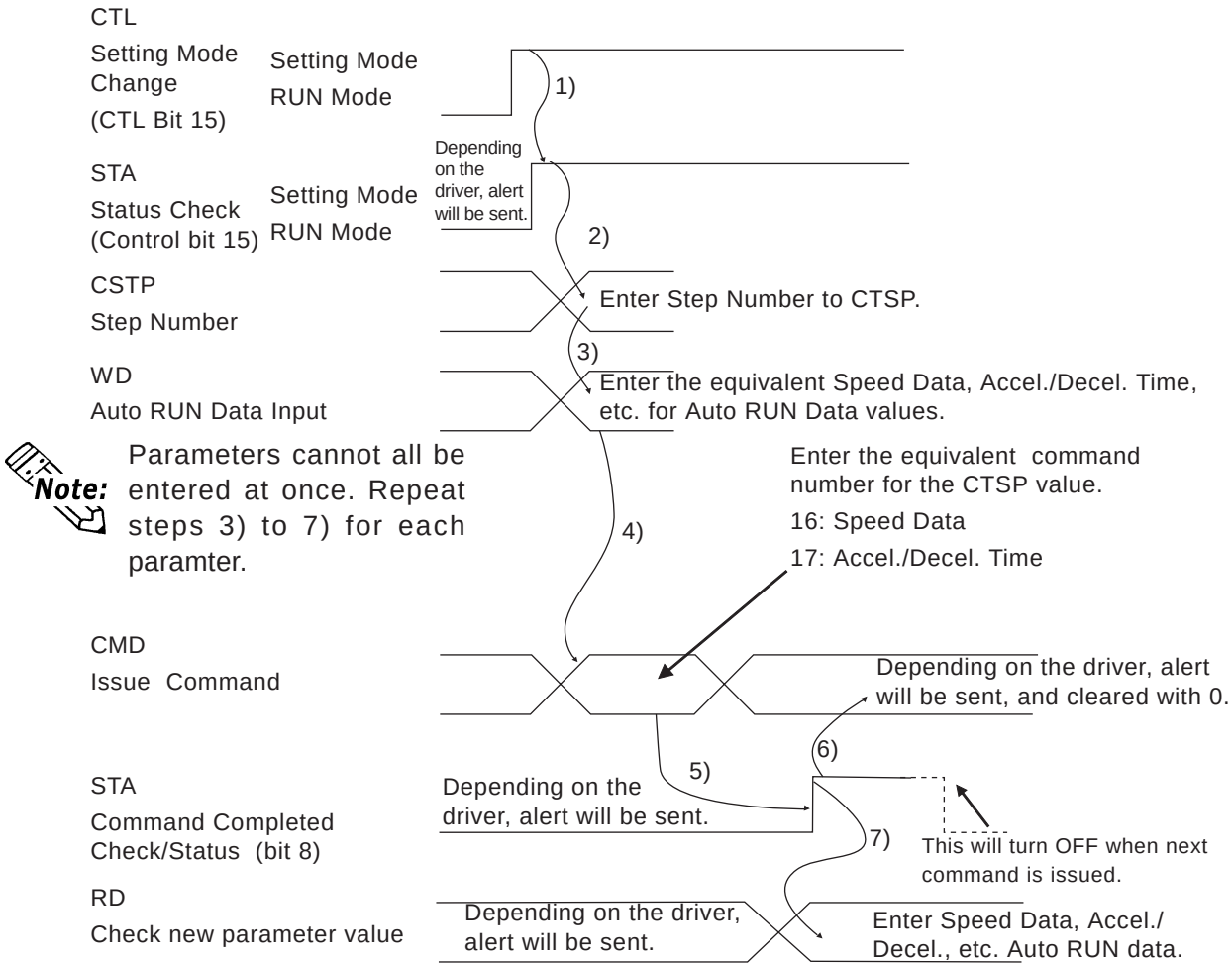
■ Parameter, Direct RUN Data Setting Procedure



Important

The signal reset from the Flex Network Driver is recorded with the driver. All other signals are set/reset via the User's software.

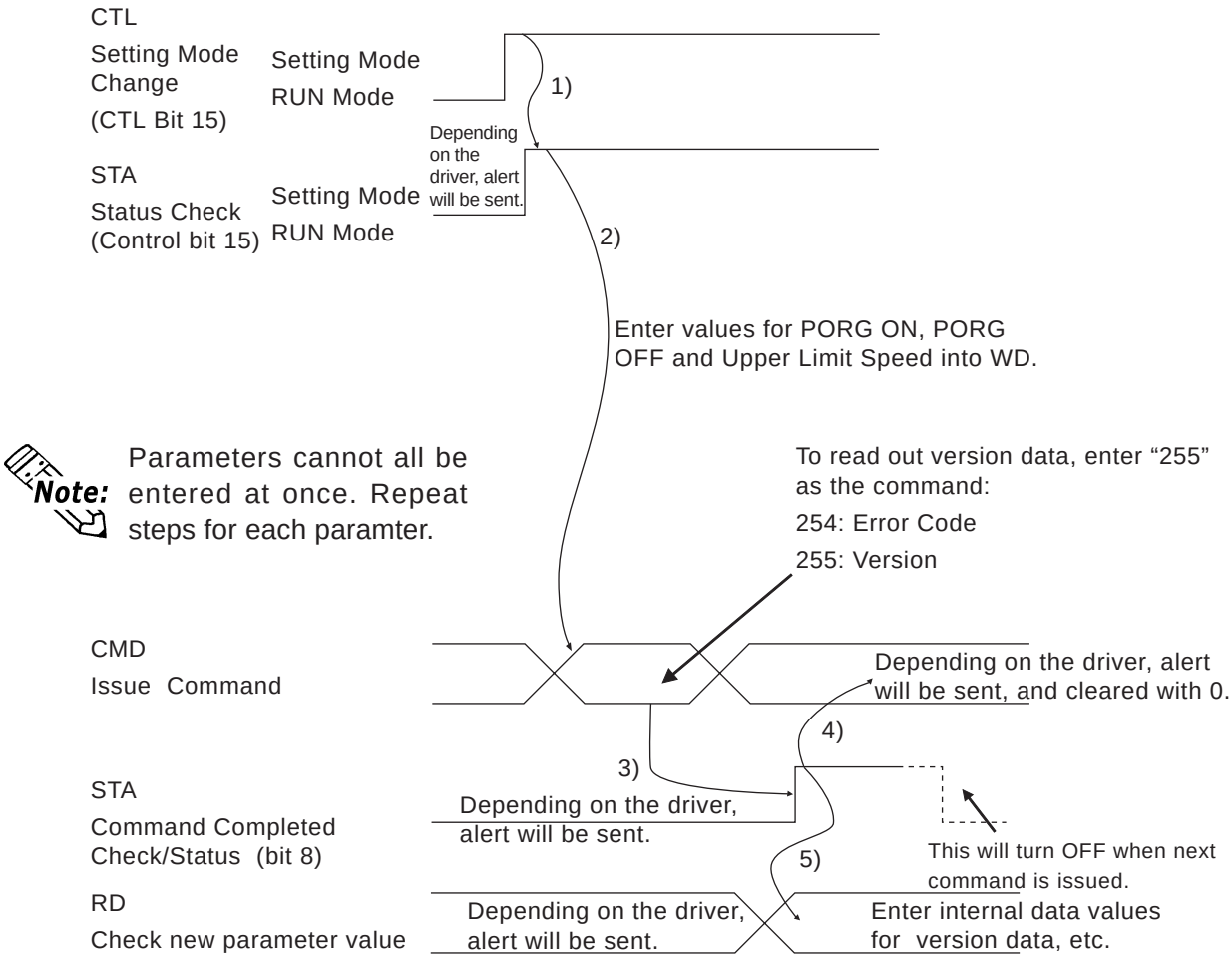
■ AutoRUN Data Setting Procedure



Important

The signal reset from the Flex Network Driver is recorded with the driver. All other signals are set/reset via the User's software.

■ Internal Information Data Setting Procedure



Important

The signal reset from the Flex Network Driver is recorded with the driver. All other signals are set/reset via the User’s software.

Chapter 7 Single-Axis Teaching Loader

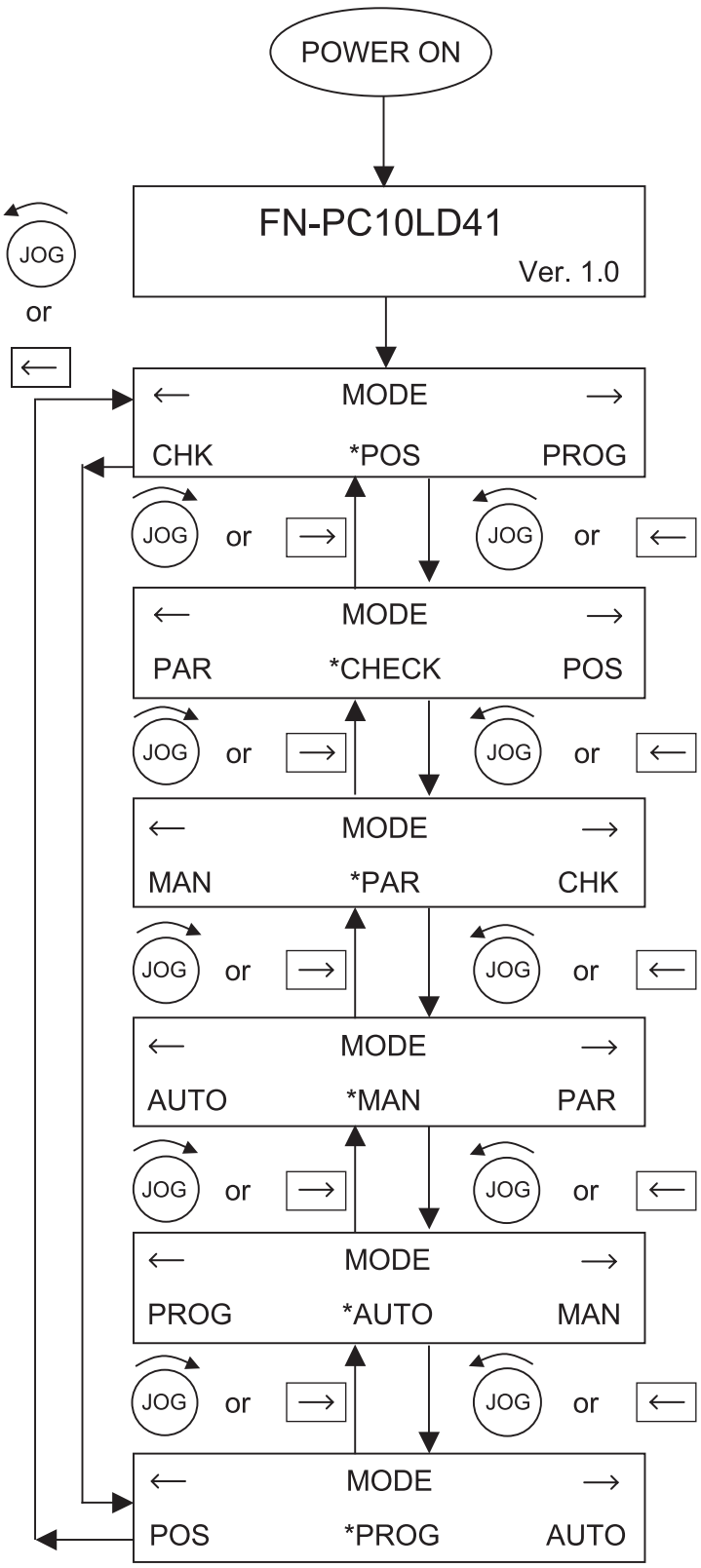
7.1 Operation Mode Summary

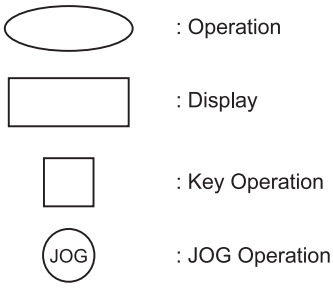
The FN-PC unit has the following operation modes.

Mode	Description
POS (Current Position Display)	Displays the controller's current position. See ***7.3 Current Position Display***
PROG (Program Input)	Allows input of Program Data from the Teaching unit. See ***7.4 Program Input***
AUTO (Auto RUN)	Allows performance of Auto RUN or Origin Point Return from the Teaching unit. See ***7.5 Auto RUN***
MAN (Manual RUN)	Allows performance of Manual RUN from the Teaching unit. See ***7.6 Manual RUN***
PAR (Parameter Input)	Allows input of Parameter Data from the Teaching unit. See ***7.7 Parameter Input***
CHECK (Check Feature)	Allows checking via the following features: Input Check Teaching unit keyboard check Data display check Memory Initialization See ***7.8 Check (Check feature)***

7.2 Mode Selection

Use the following steps to select the operation mode.

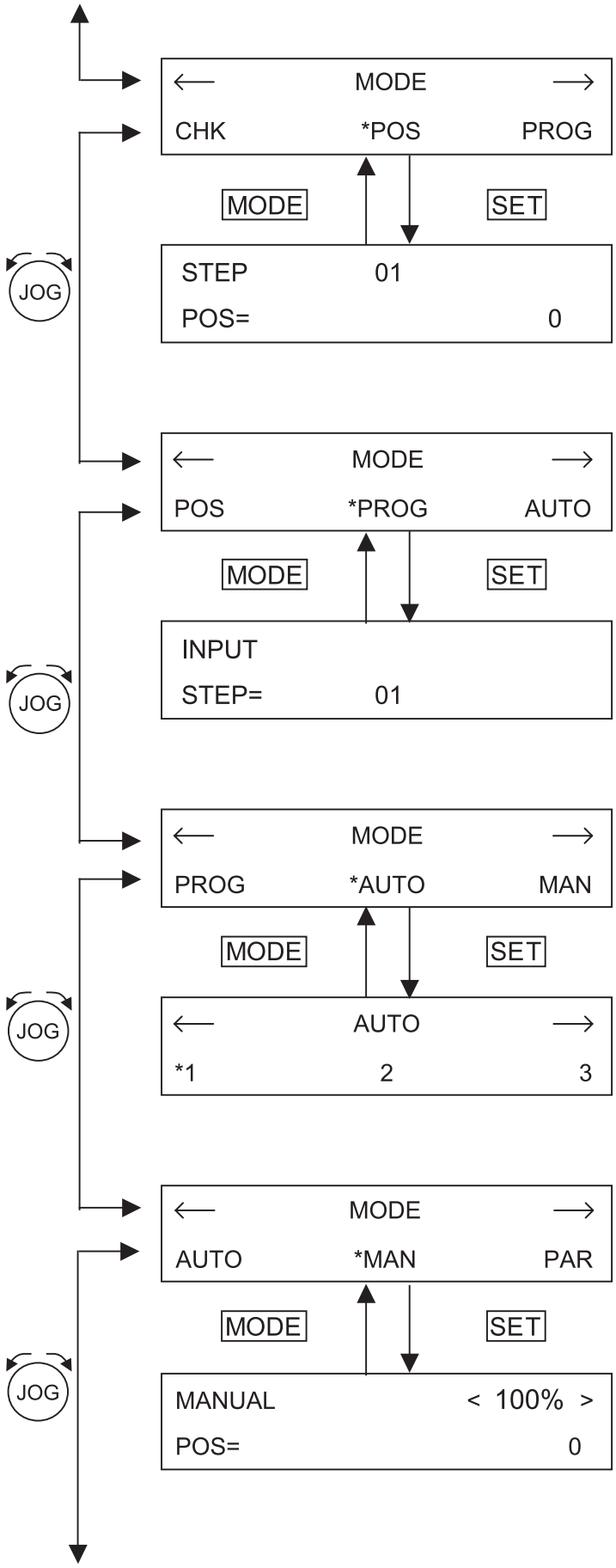




After turning the Teaching unit ON, the mode selection screen will appear. Regardless of the mode you are in, pressing MODE will return control to this screen.

To scroll through the mode selections, use either the JOG wheel, or the arrow keys (←,→) to move the display to the desired MODE.

When the desired MODE appears, press the [SET] key to select it.



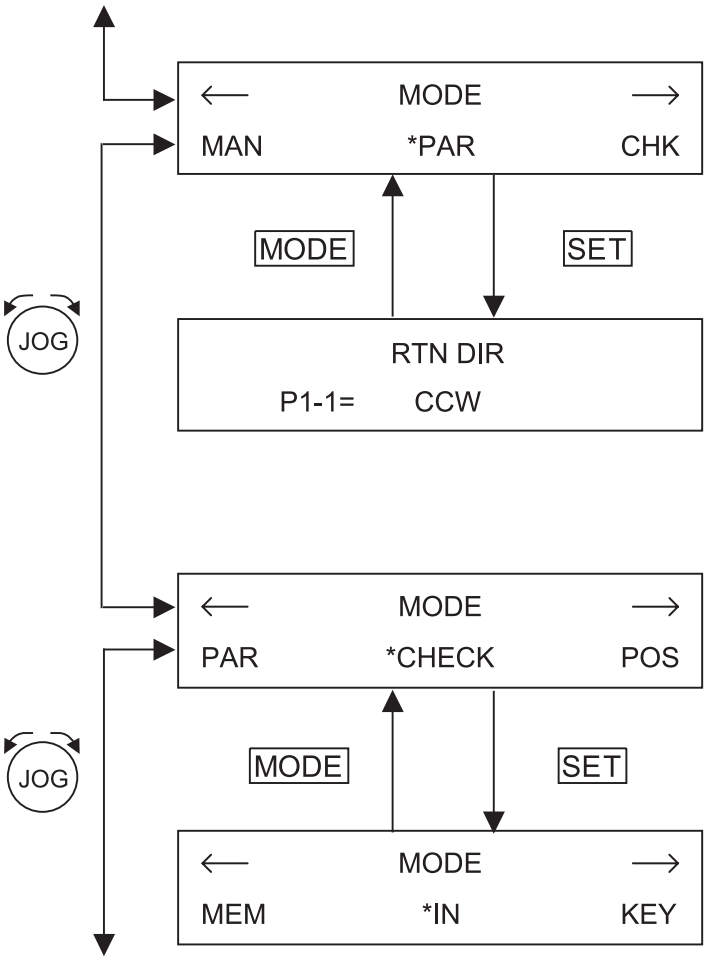
Once you have pressed the SET key and entered a MODE, pressing the [MODE] key again will return you to the main MODE selection screen.

For POS mode details, refer to 7.3 POS (Current Position Display)

For PROG mode details, refer to 7.4 PROG (Program Input)

For AUTO mode details, refer to 7.5 AUTO (Auto RUN)

For MAN mode details, refer to 7.6 MAN (Manual RUN)



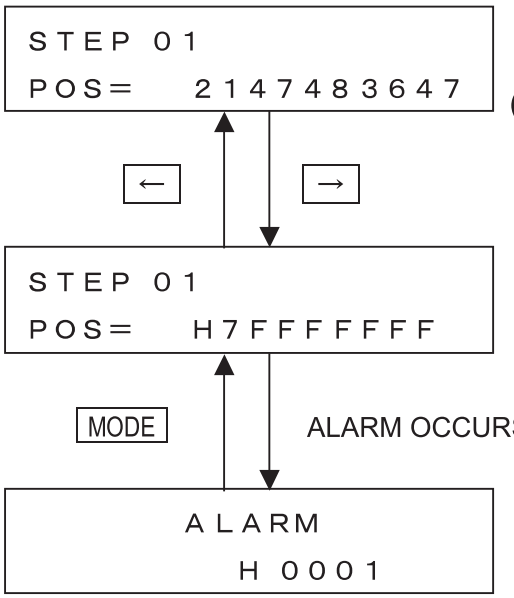
For PAR mode details, refer to 7.7 PAR (Parameter Input)

For CHECK mode details, refer to 7.8 CHECK (Check Feature)

7.3 Current Position Display (POS)

For information about entering POS mode, refer to ***7.2 Mode Selection.***

CURRENT POSITION DISPLAY SCREEN



The current position or STEP No. will appear.

Use the arrow keys (←,→) to designate if the position is shown in base 10 or base 16.

If an alarm has occurred, an error code will appear. Pressing the MODE key will clear/reset the alarm.

POS (Current Position Display) mode Features

(1) Decelerate and Stop (during operation) ([STOP] key)

Pressing the STOP key during operation will cause the unit to decelerate and stop.

7.4 Program Input (PROG)

For information about entering POS mode, refer to ***7.2 Mode Selection.***

The FN-PC unit can use up to 90 steps, and each is factory set to the default values shown in ***5.1.2 Automatic RUN Position Data.***

7.4.1 Input Method

(1) Entering a STEP No.

PROG MODE INITIAL SCREEN

INPUT		
STEP=	H	01

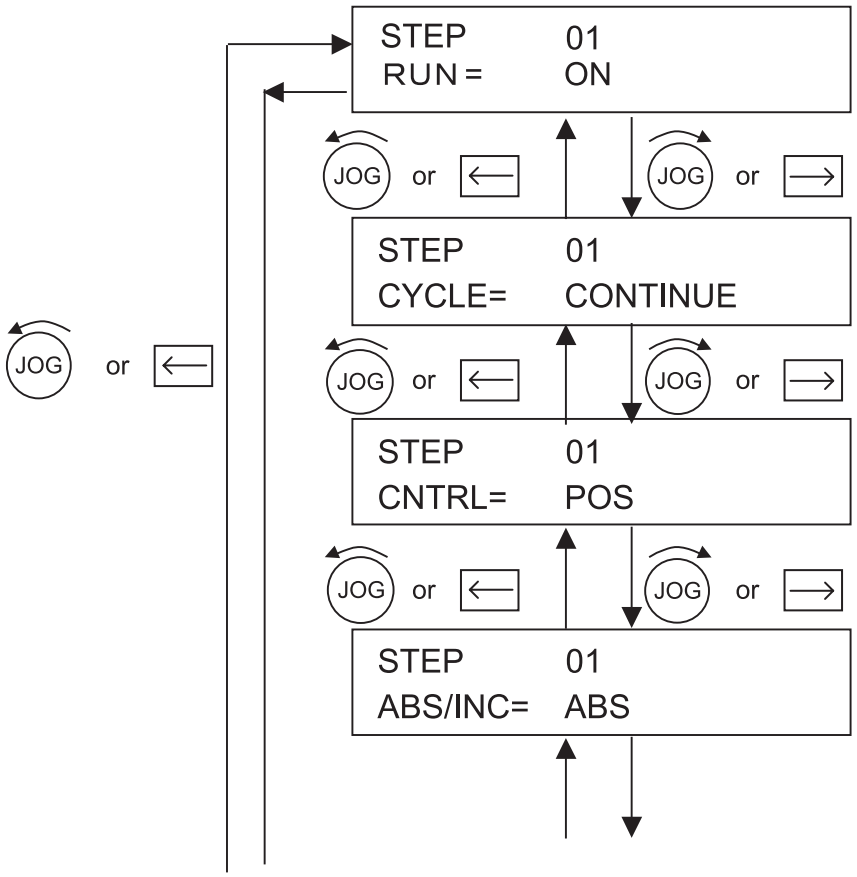
1) Rotate the JOG wheel to select STEP.

2) Press the arrow keys (←,→) to designate the digit position. Press the [COM/RTN] key to designate if the position is shown in base 10 or base 16.

3) Press the [SET] key to select the desired step, and the display will change to that screen. STEP numbers can be from 1 to 90 (H01 to H5A).

(2) Entering Data/Selections

Use either the JOG wheel or the arrow keys (←,→) to select the desired item. Pressing he [SET] key will call up that setting screen. Pressing the MODE key will return you to the MODE menu.

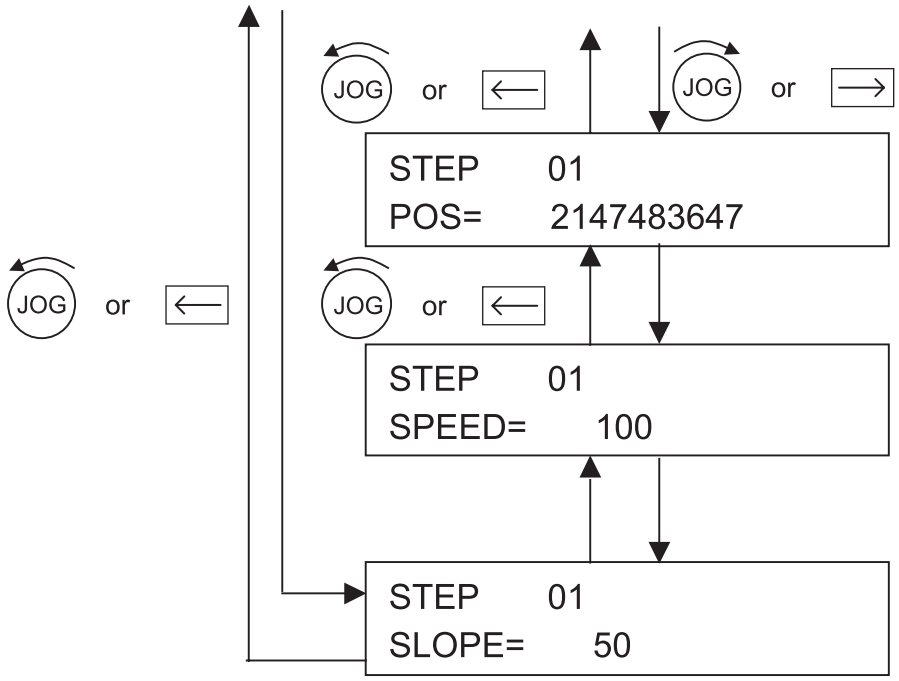


RUN operation ON or OFF screen.

Cycle [CONTINUE/ END] selection screen.

CNTRL (Control) mode selection screen.

Position setting selection screen.



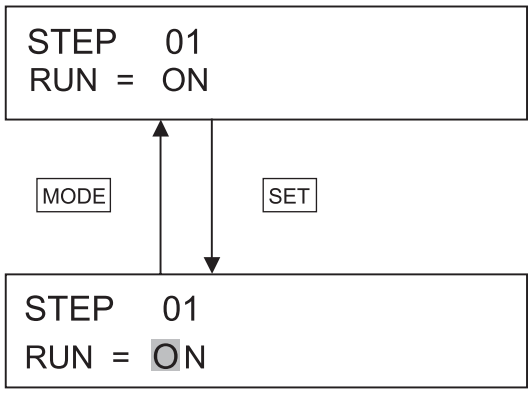
Target position data entry screen.

Speed data entry screen.

SLOPE (Accel/Decel time) entry screen.

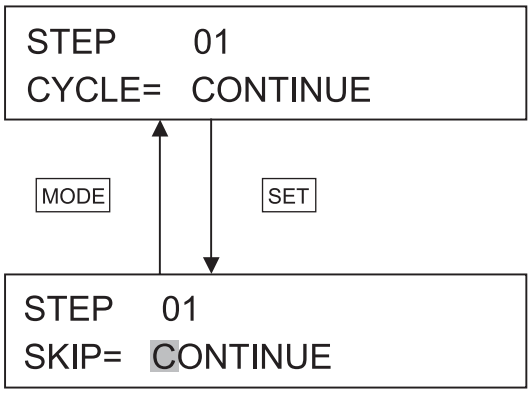
(3) Data Entry

1. RUN ON/OFF Input



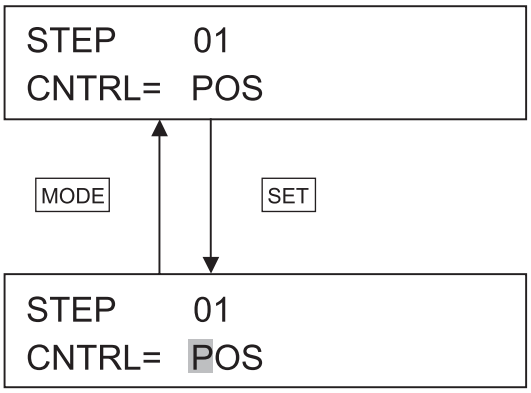
1) Press the [SET] key to enter data input mode. The display's cursor will begin to flash.
2) Use the JOG wheel to select either ON or OFF.
   ON: RUN enabled
   OFF: RUN disabled
3) Press the [SET] key and the CYCLE CONTINUE/END selection screen will appear.

2. Cycle CONTINUE/END Input



1) Press the [SET] key to enter data input mode. The display's cursor will begin to flash. If the cursor is already flashing, you do not need to press the [SET] key again.
2) Use the JOG wheel to select either CONTINUE or END.
   CONTINUE: Cycle continues
   END: Cycle stops
3) Press the [SET] key and the CNTRL selection screen will appear.

3. CNTRL Mode Input



1) Use the JOG wheel to select either POS, SPEED+POS, or SPEED.

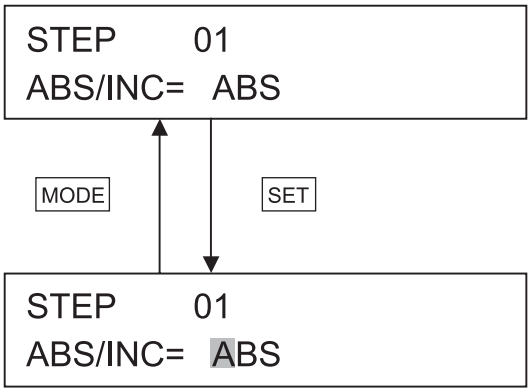
POS: Position control mode

SPEED + POS: Speed + Position control mode.

SPEED: Speed control mode

2) Press the [SET] key to select the desired setting, and the following Position Setting Input screen will appear.

4. Position Setting Input

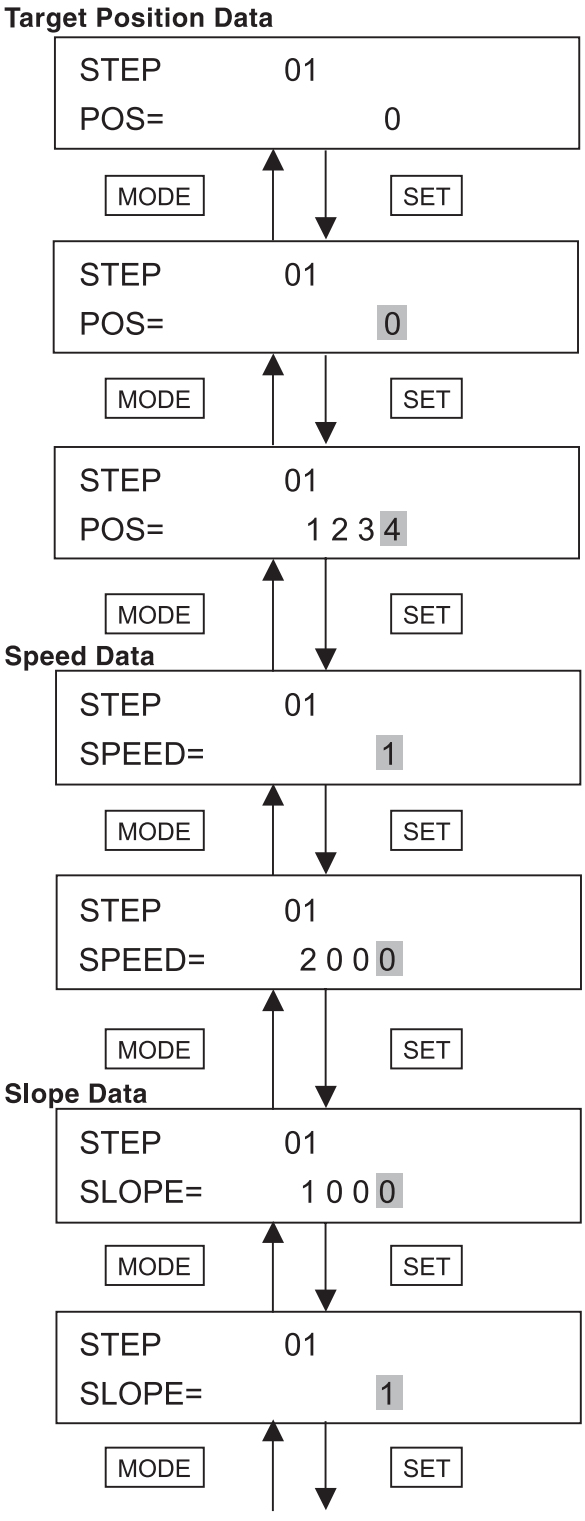


1) Use the JOG wheel to select ABS/INC.

2) Press the [SET] key to select the desired setting, and the Target Position Data Input screen will appear.

ABS/INC can be set for each step.

5. Target Position Data Input



After SLOPE input, go to next step (STEP2)

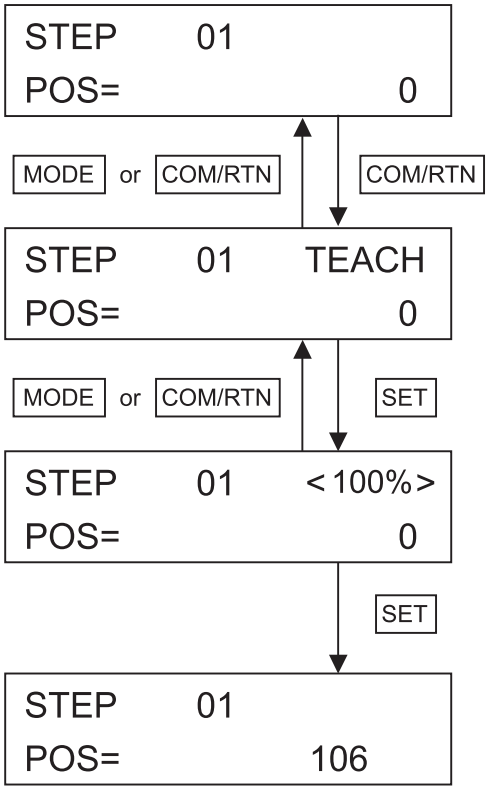
1) Rotate the JOG wheel to select Target Position Data, Speed Data or Slope Data. Press the arrow keys (←,→) to designate the digit position.

2) Press the [COM/RTN] key to designate if the position is shown in decimal or hexadecimal.

3) Press the [SET] key to select the desired item.

7.4.2 Position Data Input (via Teaching Unit)

When using the Teaching unit for data entry, Standby is turned ON. As a result, you will need to perform origin position return prior to using the Teaching feature.



Press [COM/RTN] in the Positioning Data Selection Screen, and the Teaching screen will appear.

In the Teaching screen, press [SET] to call up the Teaching Input screen.

The JOG wheel is used to perform positioning. Use the arrow keys (←,→) to change the unit's positioning. Each push of these keys equals one click of the JOG dial and changes the output speed one setting.

The JOG dial can be turned one notch at a time to adjust the output speed.

Output speed = (Man. speed - Man. JOG speed)
x n% + Man. JOG speed

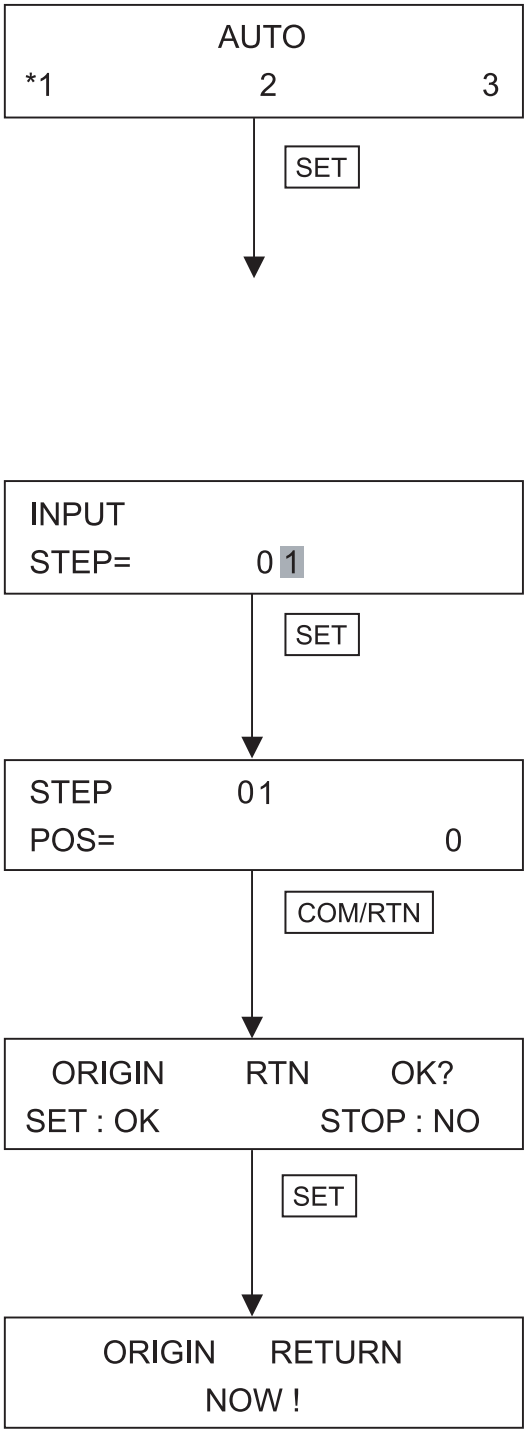
1) When Standby is set to OFF, press the [COM/RTN] key to perform origin point reset.
2) Press the [START] key to change from base10 to base16 (decimal or hex).

When correct position data is entered, press [SET] to write the data, and the Speed Data setting screen will now appear.

7.5 Automatic RUN (AUTO)

For information about entering AUTO mode, refer to ***7.2 Mode Selection.***

AUTO MODE INITIAL SCREEN



This area explains the AUTO Mode selections available. Rotate the JOG wheel or press the arrow keys (←,→) to move the "*" (asterisk) mark. Press the [SET] key to designate a selection.

AUTO1: Single (1) step operation.

AUTO2: Continuous step oper.

AUTO3: Single (1) cycle operation.

For operation details, refer to ***8.3 Auto RUN.***

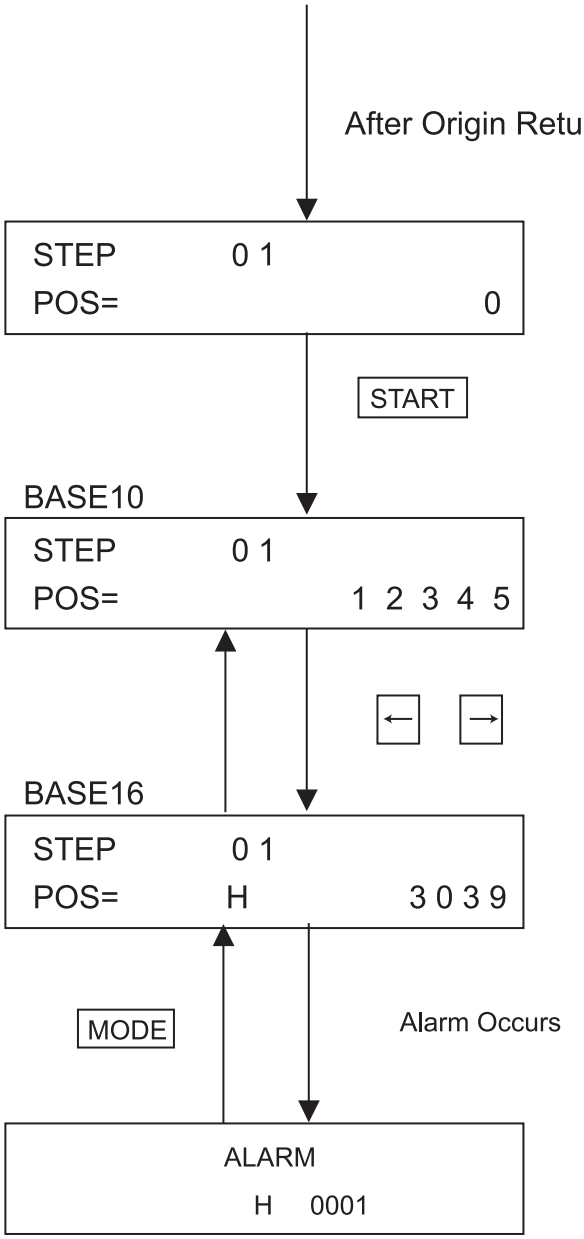
Rotate the JOG wheel to designate the initial operation step. STEP numbers can be from 1 to 90 (H01 to H5A).

The current position or the current step no. will be displayed.

To start Automatic RUN, perform origin point return to change Standby mode to ON.

When the [ORIGIN RTN OK?] message appears, press the [SET] key to start the origin point return.

(This message displays during the origin point return.)



Once origin point return is completed and the following screen appears, Automatic RUN will begin using the settings entered in the Teaching unit.

During Automatic RUN, the current position or the current step will be displayed.

Press the arrow keys (←,→) to change from base10 to base 16.

If an alarm has occurred, an error code will appear. Pressing the MODE key will clear/reset the alarm.

When alarms 768 (300h), 2049 (801h), 2050 (802h), or 36865 (9001h) occur, control returns to the Mode selection screen. See ***9.1.4 Error Code List***

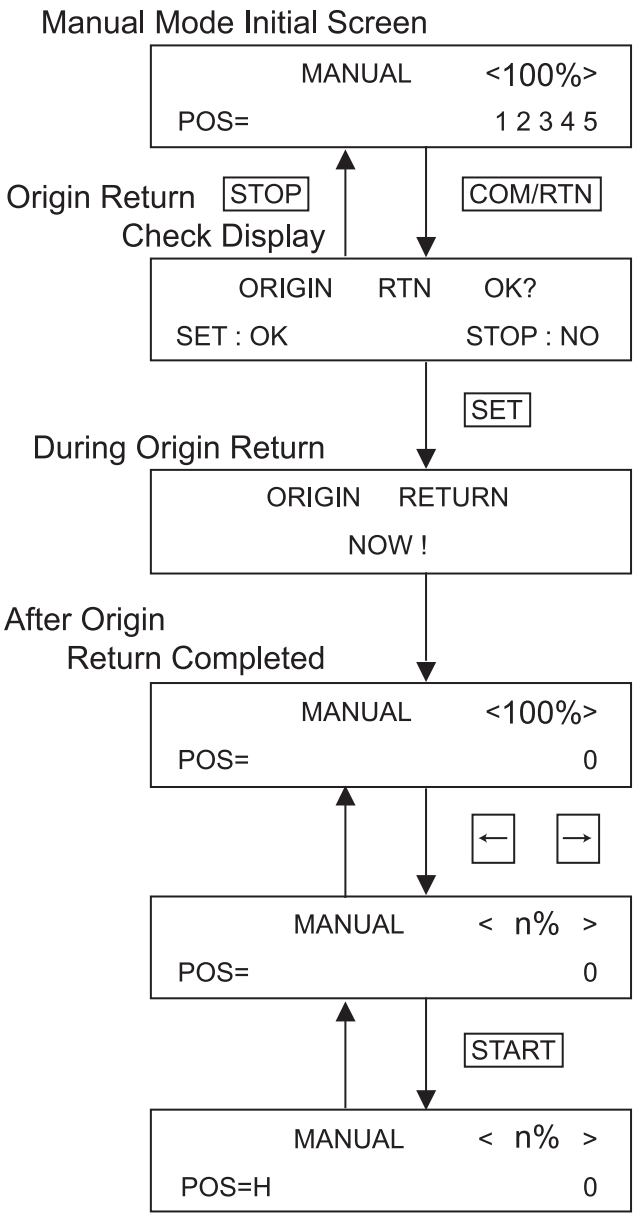
AUTO (Automatic RUN) mode Features

(1) Decelerate and Stop (during operation) ([STOP] key)

Pressing the [STOP] key during operation will cause the unit to decelerate and stop.

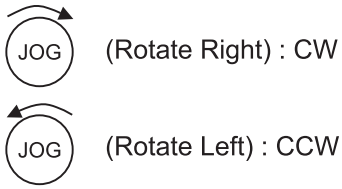
7.6 Manual RUN (MANUAL)

For information about entering Manual RUN (MANUAL) mode, refer to ***7.2 Mode Selection.***



The Teaching Loader unit can be used to perform Manual RUN and Origin Point Return.

In this mode, the JOG dial is used to perform manual operation.



When Origin Point Return is completed, the POS (Current Position) value will be "0". POS data is displayed during Manual RUN.

Use the arrow keys (←,→) to change the unit's positioning. Each push of these keys equals one click of the JOG dial and changes the output speed one setting.

Output Speed = (Manual Speed - Man. Jog Speed) x n% + Man. Jog Speed

Press the [START] key to change from base10 to base16 (decimal or hex).

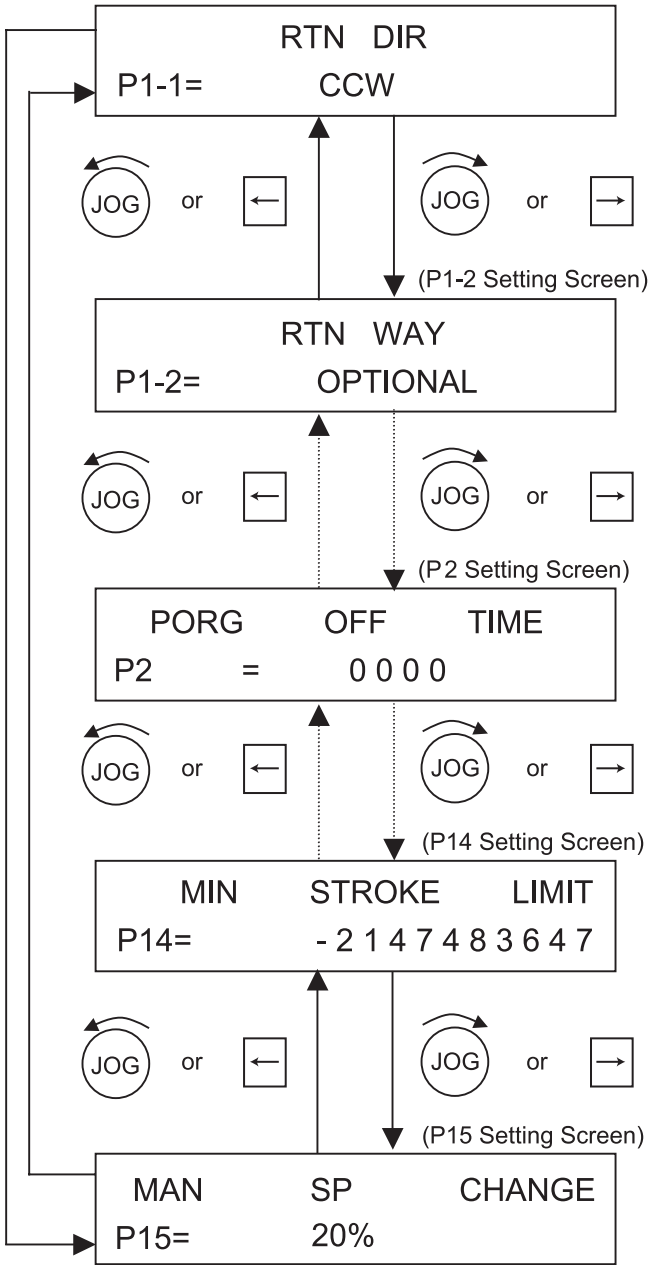
7.7 Parameter Input (PAR)

For information about entering Parameter (PAR) data, refer to ***7.2 Mode Selection.***

For information about individual parameter settings, refer to ***5.1.1 Parameter List***
While entering data in this mode, pressing [MODE] will return control to the PAR Mode selection screen.

Parameter Selection Method

Parameter Mode Initial Screen (P1-1 Selection Screen)

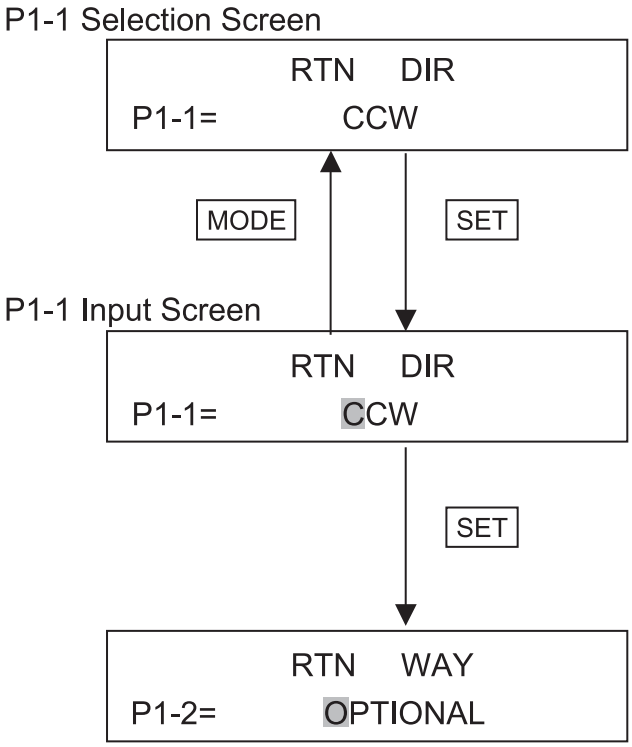


Use either the JOG wheel, or the arrow keys (←,→) to select the desired parameter. Press the [SET] key to select that parameter. Next, the cursor will start to blink, indicating that the entry of parameter values is possible. No matter what input screen you are in, press [MODE] to return to parameter selection mode.

Set the JOG dial's change rate. Setting range is from 10% to 100%

Output Speed = (Manual Speed - Man. Jog Speed) x n% + Man. Jog Speed

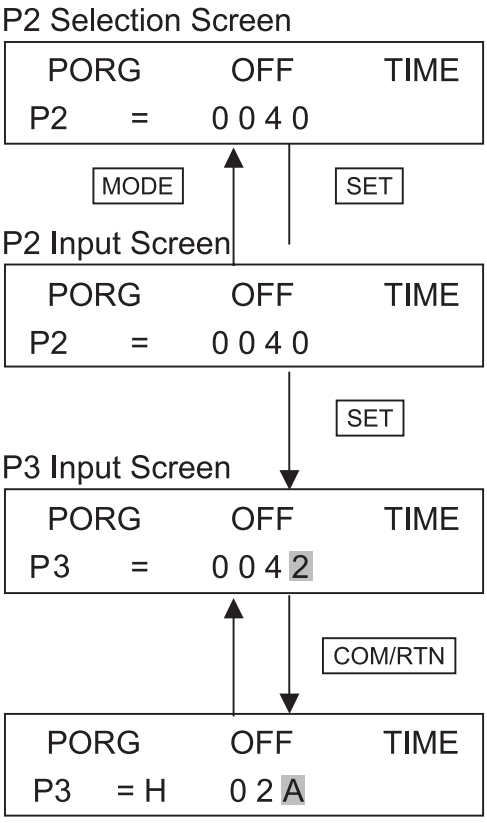
Parameter Value Input Method



After the cursor starts to blink, rotate the [JOG] wheel to select parameter values.

For example, P1-1 (parameter 1-1) has two selections, CCW or CW. After displaying one with the JOG wheel, press [SET] to select it.

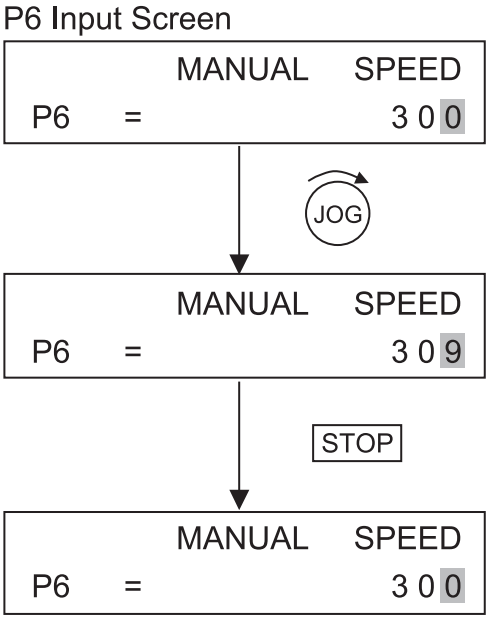
After entry of P1-1 data is completed, the P1-2 entry screen will appear. The cursor will continue to blink, indicating input is possible. Use the JOG wheel to choose selection items.



Use the JOG wheel to enter individual digits, and press the arrow keys (←,→) to designate the digit.

When data entry is completed, press the [SET] key. The next parameter (P3) will then appear.

Press the [COM/RTN] key to designate if the position is shown in base 10 or base 16.



Pressing [STOP] during the data input will clear the current data and revert to the previously set data.

Note: If the [STOP] key is pressed after the [SET] key is pressed, the data entered with the [SET] key will be unchanged.

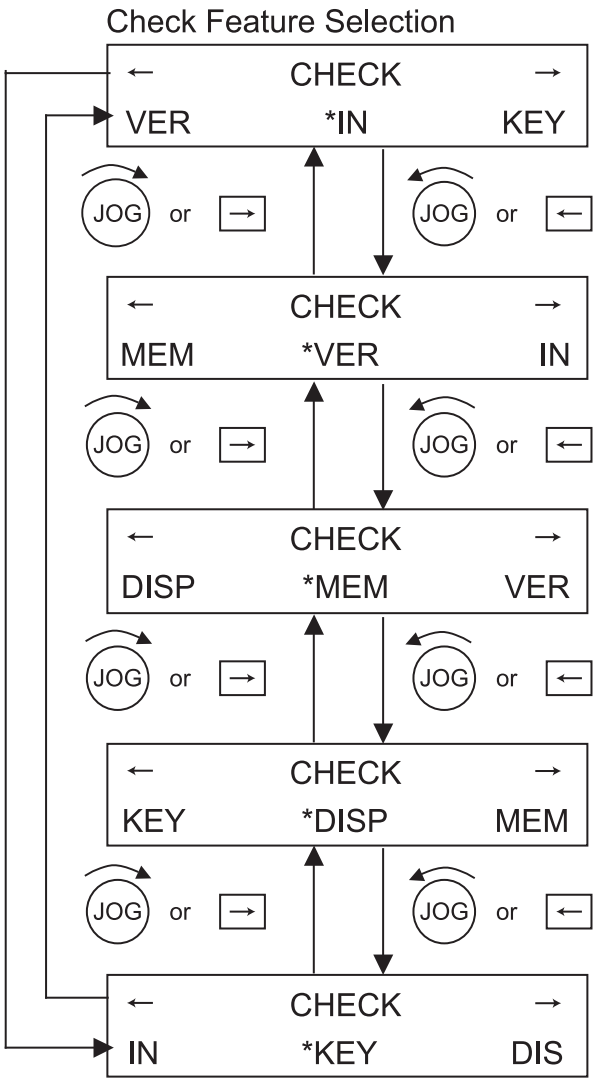
Here, after "9" is entered, [STOP] is pressed.

The "9" value is deleted and the original "0" is restored.

7.8 Check Feature (CHECK)

For information about entering the Check Feature (CHECK) Mode, refer to ***7.2 Mode Selection.***

This area explains the Input check, Display check, and Memory Initialization.

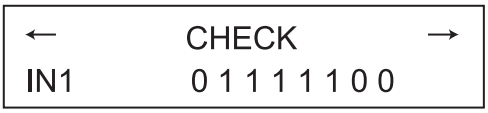


Use the arrow keys (←,→) to designate the desired Check feature. Press the [SET] key to select the feature.

MEM:	Initialize Memory
IN:	Input Check
KEY:	Key & Jog Input Check
DISP:	Display Check

Also, to return to the Mode selection menu after entering a selection area, press [MODE].

(1) Input (IN) Check Screen



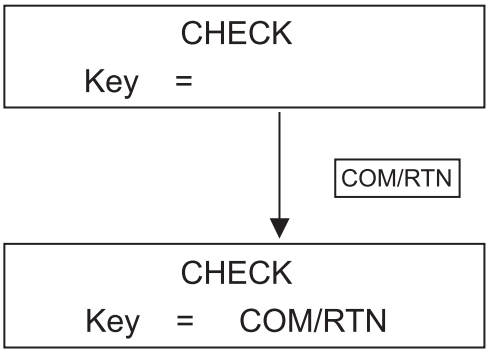
In this area, the input values can be either 1 or 0. Pressing the [MODE] key will return to the Check feature selection.

Input Correspondence Table

	7	6	5	4	3	2	1	0
IN1	Z-phase INPUT LATCH	+0.T	-0.T	PORG	COIN	S-ALM	NOT USED	NOT USED

ON=1
OFF=0

(2) Key Input Jog Input Check (Key) Screen



In this area, the Key Input values are displayed. If the JOG wheel is used, rotating it to the right (CW) will produce a ">>>>" display, and rotating it to the left (CCW) will produce a "<<<<" display.

(3) Display Check (DISP) Screen

```
A B C D E F G H I J K L M N O P
Q R S T U V W X Y Z 1 2 3 4 5 6
```

In this area, the display shown here will appear three times, and the display will return to the Check feature selection screen.

(4) Memory Initialization (MEM) Screen

```
        MEMORY    CLEAR
*PROG             PAR            ALL
```

To scroll through the initialization mode selections, use the JOG wheel, or the arrow keys (←,→) to select the desired MODE.

PROG: Initialize all 90 steps of Auto RUN data.

PAR: Initialize all parameter data.

ALL: Initialize all PROG and PAR data.

Press the [SET] key to enter the Initialization screen for the item selected.

① Auto Run Data Initialization Screen

```
      PROG   CLEAR   OK?
SET : OK              STOP : NO
```

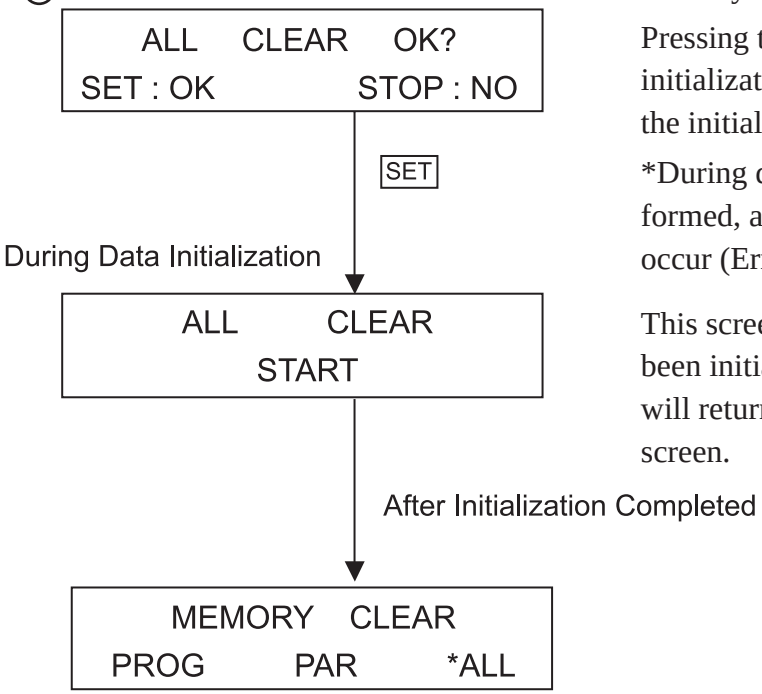
Pressing the [SET] key will initialize all designated memory data. When completed, control will return to the (MEM) screen.

Pressing the [STOP] key will cancel the initialization request and return control to the (MEM) screen.

② Parameter Data Initialization Screen

```
      PAR    CLEAR   OK?
SET : OK              STOP : NO
```

③ All Data Initialization Screen



Pressing the [SET] key will initialize all memory data.

Pressing the [STOP] key will cancel the initialization request and return control to the initialization selection screen.

*During data initialization is being performed, a GLC communication error can occur (Error code: 847)

This screen will display when all data has been initialized. When completed, control will return to the Initialization Selection screen.

(5) FN-PC10SK41 Version No. Display Screen

This screen displays the FN-PC unit's version information number. Press the [MODE] key to return to the Check Feature menu.

Chapter 8 RUN Mode

The FN-PC unit's main operation modes are Origin Point return, Manual RUN, Auto RUN, and Direct RUN Commands

To Start/Stop RUN mode, Control (CTL) bits 9 to 11, and 13, 14 must be turned ON.

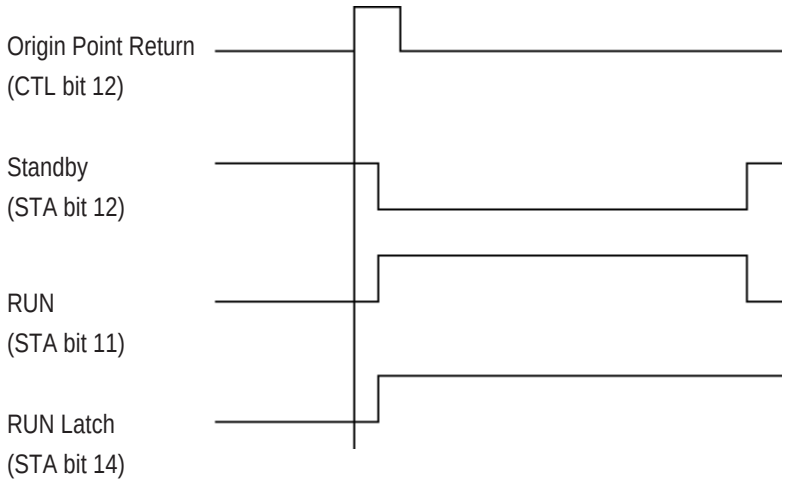
8.1 Origin Point Return

Origin Point Return is enabled by turning control (CTL) bit 12 ON.
For detailed Control Bit information,

Reference *6.1 Flex Network Driver Settings ■ Control (CTL).*

The Origin Point Return feature uses parameter No. 1 to set one of four options. These are Optional Origin Point Return, Low-Speed Origin Point Return, High Speed Origin Point Return1 (1 origin point), and High Speed Origin Point Return2 (2 origin points).

When Origin Point Return is performed, the Current Position (FN-PC unit's internal counter value) becomes "0". This can be checked via the Status (STA) parameter bits 12 (Standby) and 14 (RUN Latch), which will both turn ON. After this, be sure to turn CTL's bit 12 OFF.



8.1.1 Optional Origin Point

Without using the Origin Point Sensor, you can confirm if the Current Position is "0" by checking if the Control (CTL) parameter's bit 12 has turned ON.

The Optional Origin Point Return can be performed when Parameter No. 1 is either 0***h or 8***h, which indicates the FN-PC unit is in Optional Origin Point Mode.

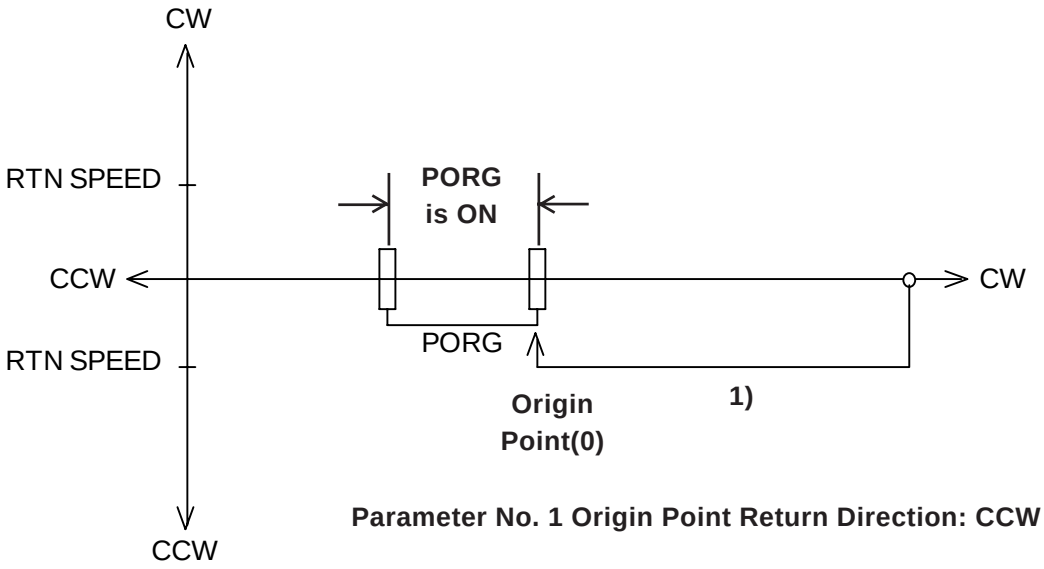
8.1.2 Low Speed Origin Point Return

When Parameter No. 1 is set to 1***h or 9***h, the FN-PC unit is in Low Speed Origin Point Return Mode.

Depending on the start point for the Origin Point Return, the following actions will be performed.

■ Origin Point Return (PORG) in CW direction

1) Origin Point Return is performed in CCW direction at RTN SPEED (Origin Point Return Speed). When completed, movement stops when the PORG Input (Origin Point SW)'s ON edge is reached.

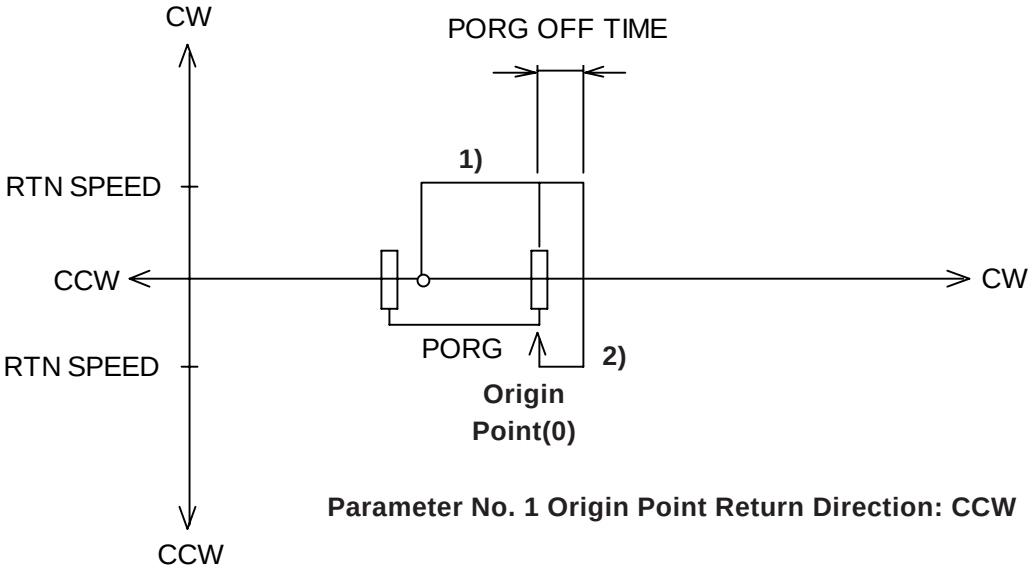


Parameter No. 1 Origin Point Return Direction: CCW

■ Origin Point Return with (PORG) ON

1) The unit will move in the CW direction at RTN SPEED (Origin Point Return Speed). Then, the unit will move at RTN SPEED and when it reaches the PORG Input (Origin Return SW)'s OFF edge, it will stop, and reverse direction.

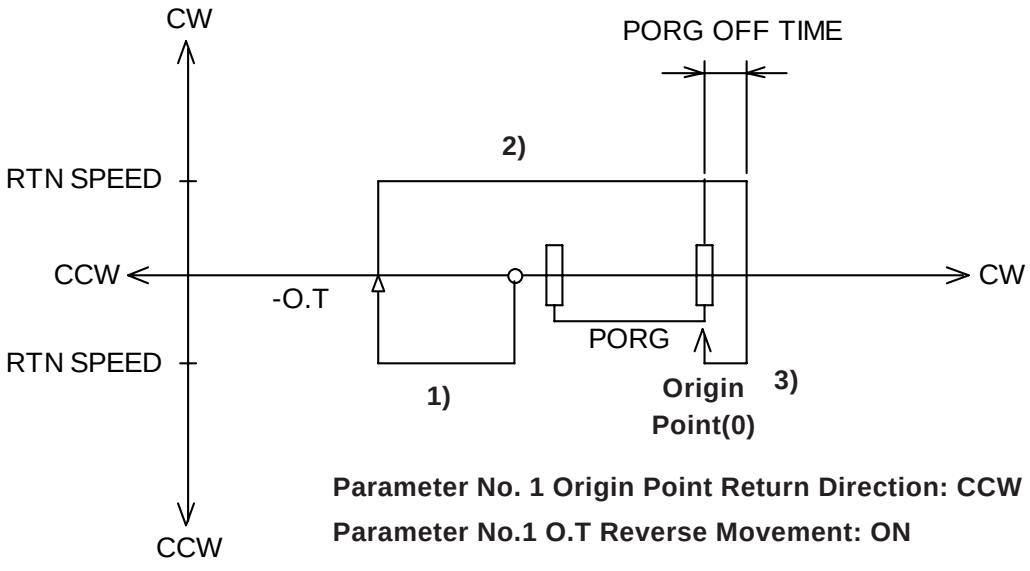
2) Movement continues in CCW direction at RTN SPEED (Origin Point Return Speed) and unit stops when the PORG Input (Origin Point SW)'s ON edge is reached.



Parameter No. 1 Origin Point Return Direction: CCW

■ Origin Point Return (PORG) in CCW direction

1) The unit will move in the CCW direction at RTN SPEED (Origin Point Return Speed). When completed, movement stops when the -O.T. ON edge is reached and direction is reversed.
2) Movement continues in CW direction at RTN SPEED. When the PORG Input (Origin Point SW) OFF edge is reached, unit continues at RTN SPEED for period designated in PORG OFF TIME (PORG OFF TIME), then stops and reverses direction.
3) Unit moves in CCW direction at RTN SPEED, and stops when PORG Input's ON edge is reached.



Parameter No. 1 Origin Point Return Direction: CCW
Parameter No.1 O.T Reverse Movement: ON

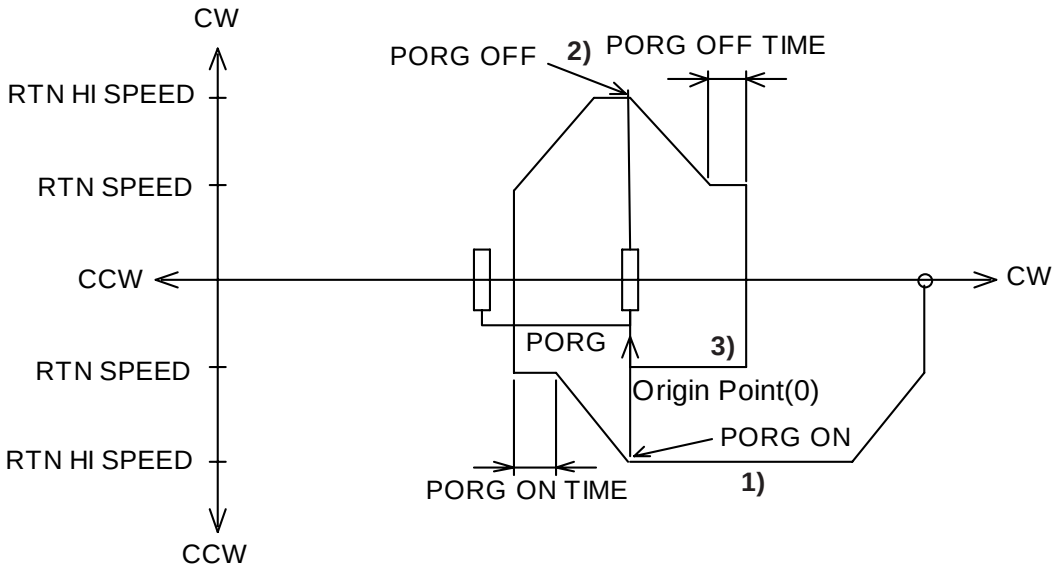
8.1.3 High Speed Origin Point Return (1 Origin Point)

When Parameter No. 1's Origin Point Return Method is set to 2***h or A***h, the mode becomes High Speed Origin Point Return 1. Only when PORG input is received will origin point return be performed at high speed.

Depending on the start point for the Origin Point Return, the following actions will be performed.

■ Origin Point Return (PORG) in CW direction

1) When Control (CTL) bit 12 turns ON, Origin Point Return movement starts at the speed (Parameter No. 8 - RTN SPEED) designated in the common Origin Point Return Method parameter, and then accelerates to Parameter No. 9's RTN HI SPEED value, using Parameter No. 10's Accel/Decel Time (Slope) setting.
2) Movement continues at RTN HI SPEED until PORG Input's OFF edge is reached. The unit then decelerates at SLOPE to RTN SPEED, and continues at RTN SPEED until PORG OFF TIME is completed. The unit then stops and reverses direction.
3) Movement continues in CCW direction at RTN SPEED (Origin Point Return Speed) and unit stops when the PORG Input (Origin Point SW)'s ON edge is reached.



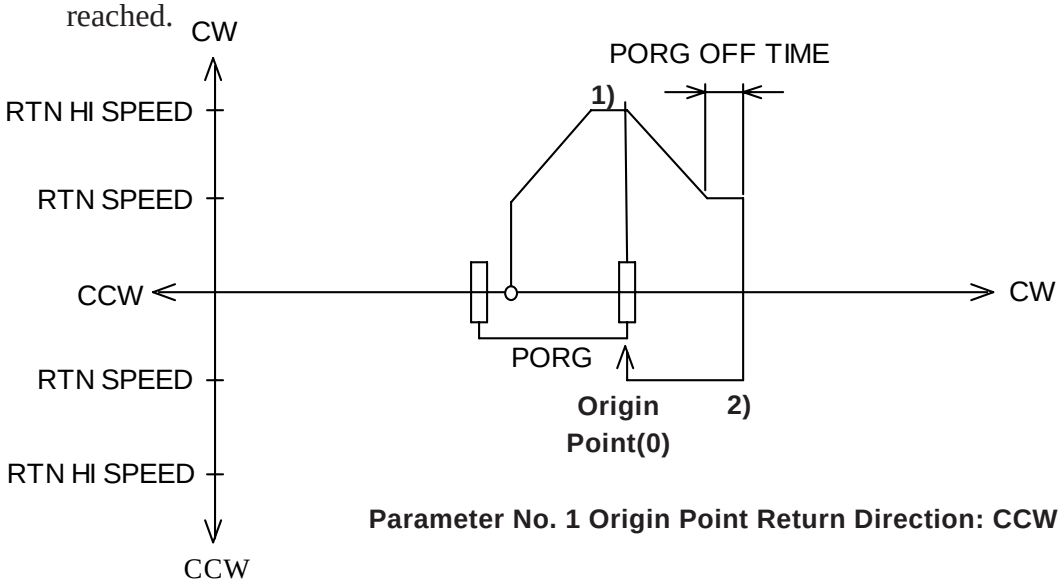
Parameter No. 1 Origin Point Return Direction: CCW

When a value is entered for the Accel./Decel. Time, or High Speed Origin Point Return Speed that is higher than the standard value, the unit may go past the PORG range limit, stop, and reverse direction rather than stopping inside the PORG range and reversing direction. This will cause the origin point to become inaccurate. In this case, please re-enter the Accel./Decel. Time, or High Speed Origin Point Return Speed value.

■ Origin Point Return with (PORG) ON

1) The unit will move in the CW direction at RTN SPEED (Origin Point Return Speed), then accellerate to RTN HI SPEED (High Speed Origin Point REturn Speed) at SLOPE (Accel/Decel. Time). Then, the unit will then decellerate at SLOPE when it reaches the PORG Input (Origin Return SW)'s OFF edge, continue at RTN SPEED for PORG OFF TIME (PORG OFF Time), then stop, and reverse direction.

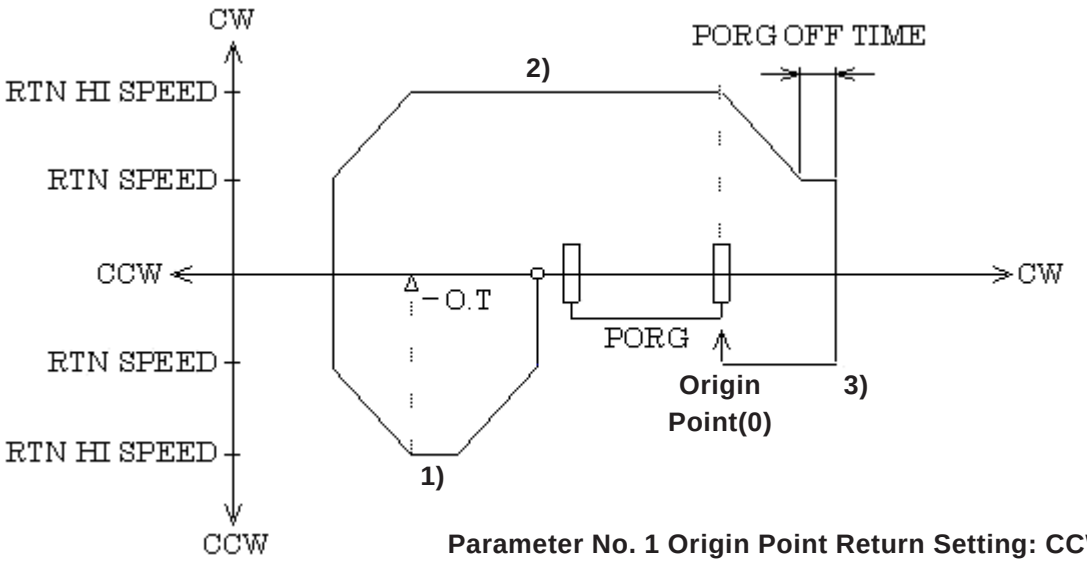
2) Movement continues in CCW direction at RTN SPEED (Origin Point Return Speed) and unit stops when the PORG Input (Origin Point SW)'s ON edge is reached.



Parameter No. 1 Origin Point Return Direction: CCW

■ Origin Point Return (PORG) in CW direction

1) The unit will move in the CW direction at RTN SPEED (Origin Point Return Speed), then accellerate to RTN HI SPEED (High Speed Origin Point REturn Speed) at SLOPE (Accel/Decel. Time). Then, the unit will then decellerate at SLOPE when it reaches the +O.T.'s ON edge, then stop, and reverse direction.
2) Movement continues in CW direction, accellerating by SLOPE to RTN HI SPEED until PORG Input (Origin Point SW) OFF edge is reached, when unit decellerates at SLOPE speed. Unit then continues at RTN SPEED for period designated in PORG OFF TIME (PORG OFF TIME), then stops and reverses direction.
3) Unit moves in CCW direction at RTN SPEED, and stops when PORG Input's ON edge is reached.



Parameter No. 1 Origin Point Return Setting: CCW

Parameter No.1 O.T Reverse Movement: ON

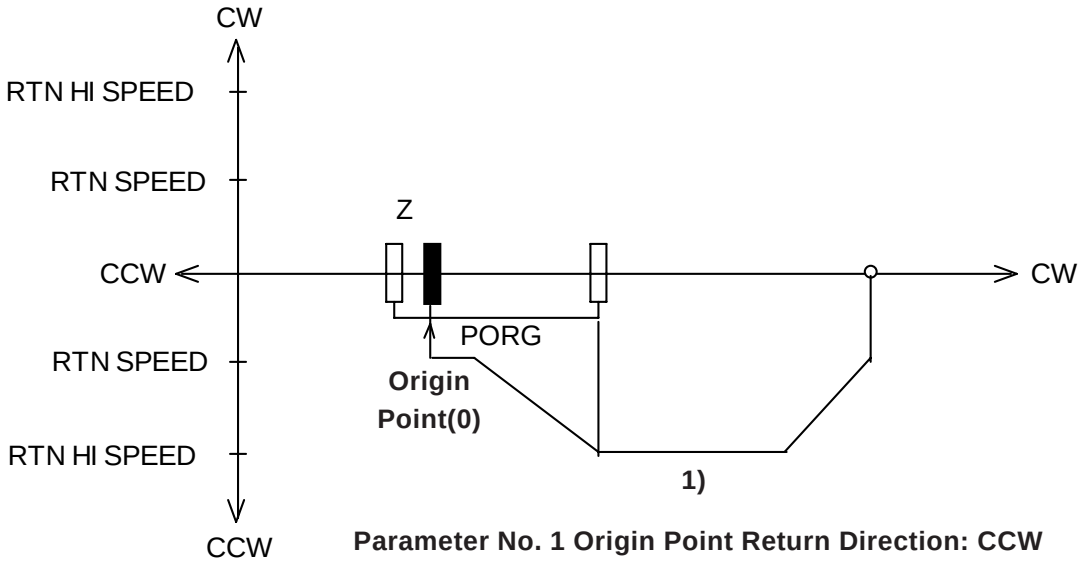
8.1.4 High Speed Origin Point Return (2 Origin Points)

When Parameter No. 1's Origin Point Return Method is set to 3***h or B***h, the mode becomes High Speed Origin Point Return 2. This method uses PORG input and Z-phase input to produce a high-accuracy High Speed Return.

Use the following steps to perform this origin point return.

■ CW Direction Origin Point (PORG) Return

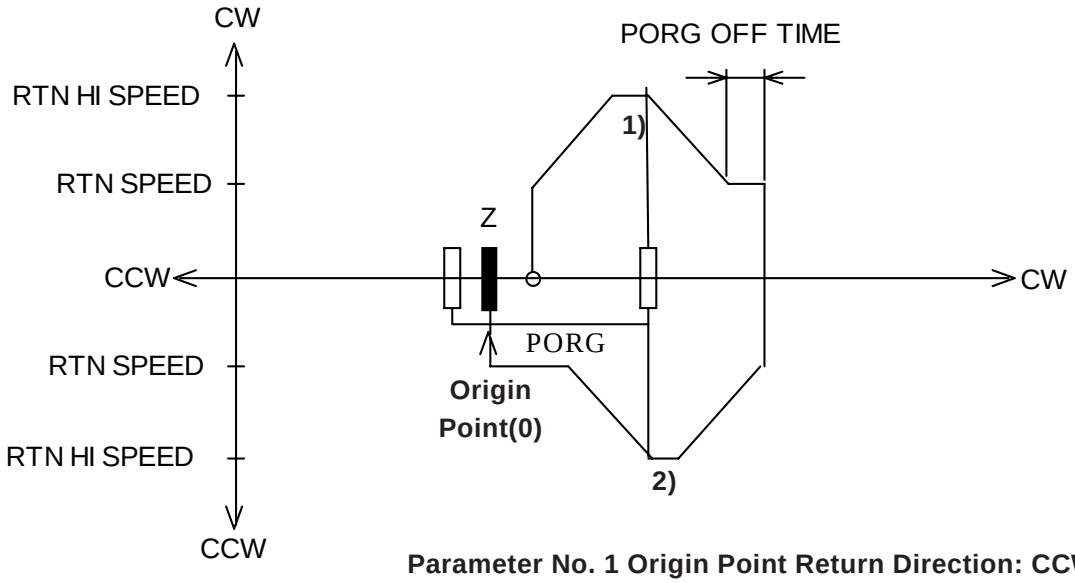
1) The unit will move in the CCW direction at RTN SPEED (Origin Point Return Speed), then accellerate to RTN HI SPEED (High Speed Origin Point Return Speed) at SLOPE (Accel/Decel. Time). Then, the unit will then decellerate at SLOPE to RTN SPEED when it reaches the PORG Input (Origin Point SW)'s ON edge and continue at RTN SPEED until it reaches the Z-phase Input's ON edge, where it stops.



Parameter No. 1 Origin Point Return Direction: CCW

■ Origin Point (PORG) is ON

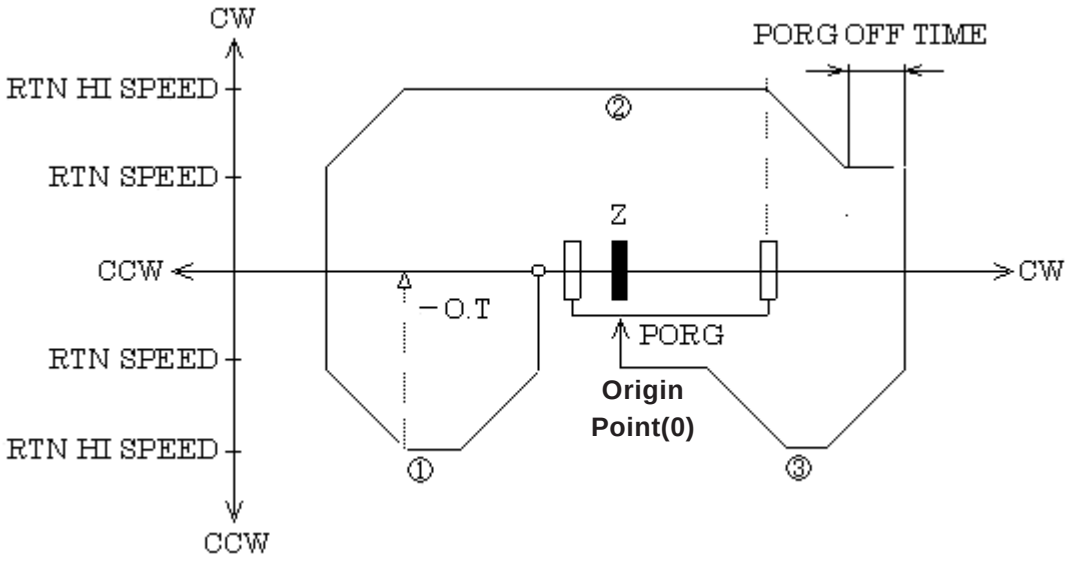
1) The unit will move in the CW direction at RTN SPEED (Origin Point Return Speed), then accellerate to RTN HI SPEED (High Speed Origin Point Return Speed) at SLOPE (Accel/Decel. Time). Then, the unit will then decellerate at SLOPE to RTN SPEED when it reaches the PORG Input (Origin Point SW)'s OFF edge and continue at RTN SPEED for PORG OFF TIME (PORG OFF Time). It will then stop and reverse direction.
2) Movement continues in CCW direction, accellerating by SLOPE to RTN HI SPEED until PORG Input (Origin Point SW) ON edge is reached, when unit decellerates at SLOPE speed. Unit then continues and stops at Z Input's ON edge.



Parameter No. 1 Origin Point Return Direction: CCW

■ CCW Direction Origin Point (PORG) Return

1) The unit will move in the CW direction at RTN SPEED (Origin Point Return Speed), then accellerate to RTN HI SPEED (High Speed Origin Point REturn Speed) at SLOPE (Accel/Decel. Time). Then, the unit will then decellerate at SLOPE when it reaches the +O.T.'s ON edge, then stop, and reverse direction.
2) Movement continues in CW direction, accellerating by SLOPE to RTN HI SPEED until PORG Input (Origin Point SW) OFF edge is reached, when unit decellerates at SLOPE speed. Unit then continues at RTN SPEED for period designated in PORG OFF TIME (PORG OFF TIME), then stops and reverses direction.
3) Unit moves in CCW direction at RTN SPEED, and continues to PORG Input's OFF edge, and decellerates at SLOPE. When it reaches the Z Input's ON edge, unit will stop.



Parameter No. 1 Origin Point Return Direction: CCW
Parameter No. 1 O.T Reverse Movement: ON

8.2 Manual RUN

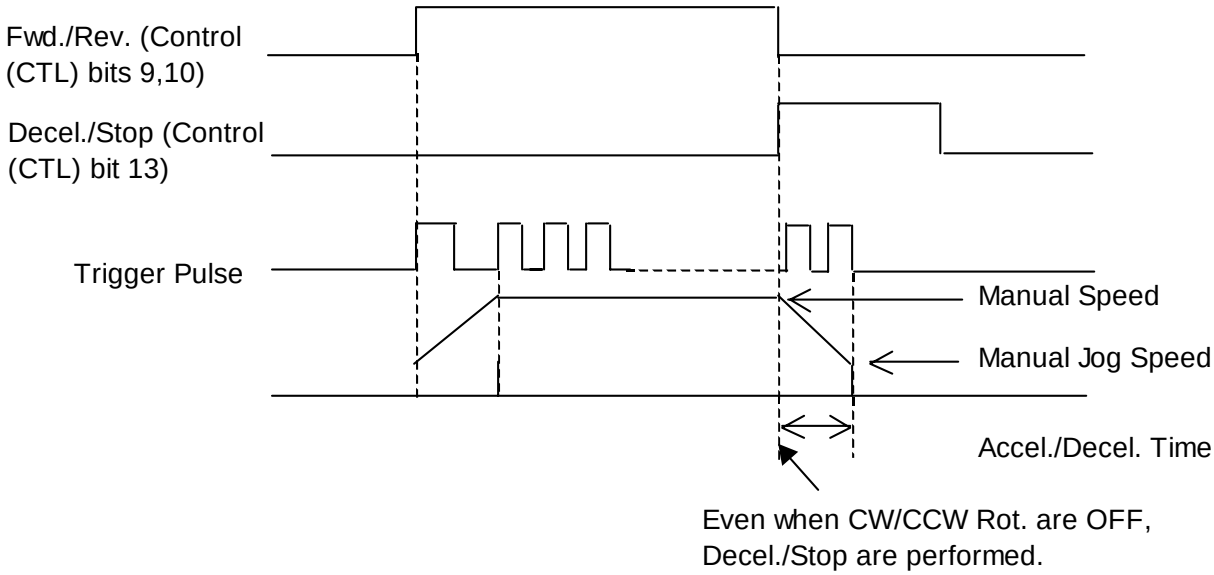
In Manual RUN mode, when the FN-PC unit's Control (CTL) parameter bits 9 (CW) and 10 (CCW) turn ON, the CW or CCW direction pulse is output. If either of these output pulses occurs at the same time as bit 8 deceleration turns ON, the unit will move at Manual JOG speed.

If Control (CTL) bit 13 (Decel./Stop) turns ON, the unit will slow and then stop.

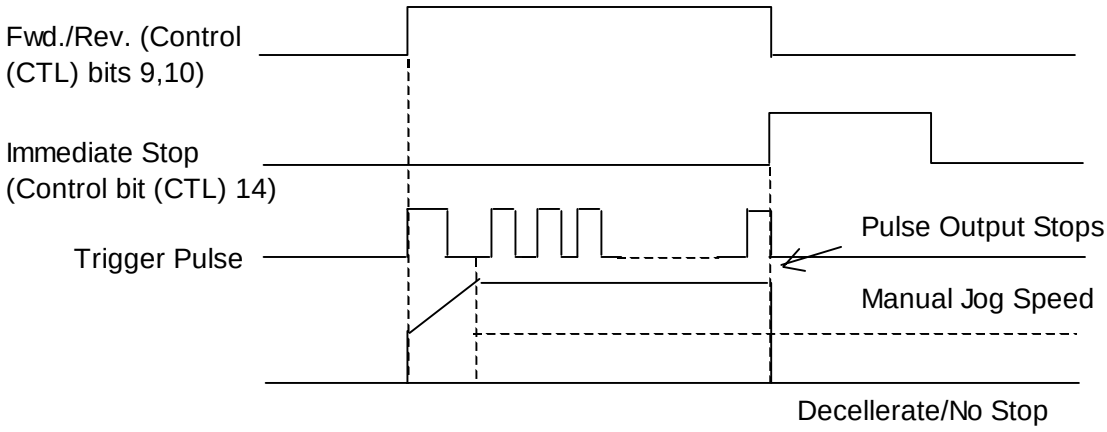
If, during normal operation, the Control (CTL) bit 14 (Emerg. Stop) turns ON, the unit will stop immediately, without decelerating.

After an Immediate Stop occurs, when returning to Manual Mode, set Immediate Stop (Decelerate/Stop), and CW(CCW) to OFF and set the GLC/LT logic to wait one scan or longer before executing. Next, turn the CW (CCW) ON.

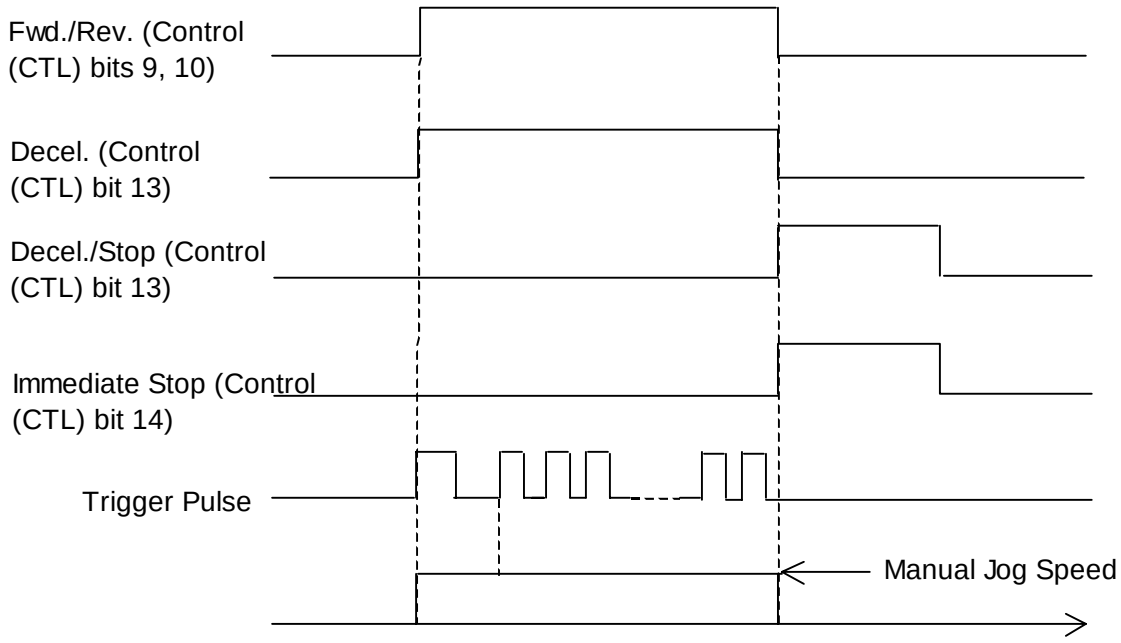
Manual JOG CW, CCW Input



Manual CW, CCW Input



Manual Deceleration CW, CCW Input



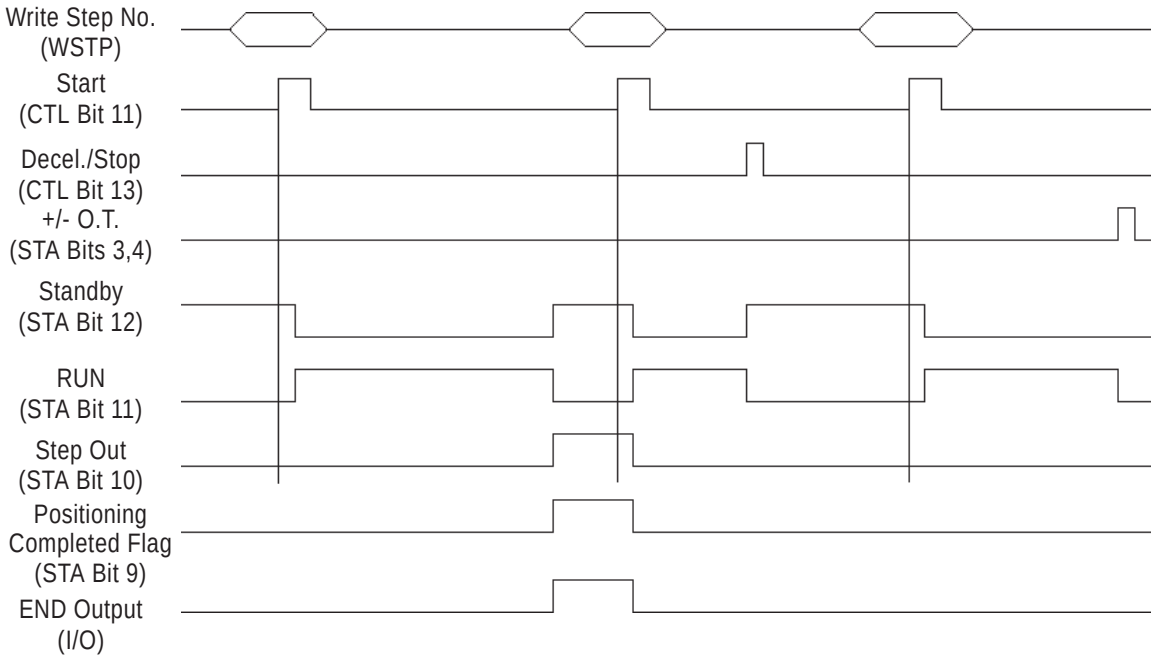
8.3 Auto RUN

Use of Auto RUN mode relies on previously set Auto RUN data. Within Auto RUN mode are three types of operation: Auto1 (Single-Step RUN), Auto2 (Continuous Step RUN), and Auto3 (Cycle RUN). These are designated using Control (CTL) bits 0 and 1.

8.3.1 Single-Step RUN

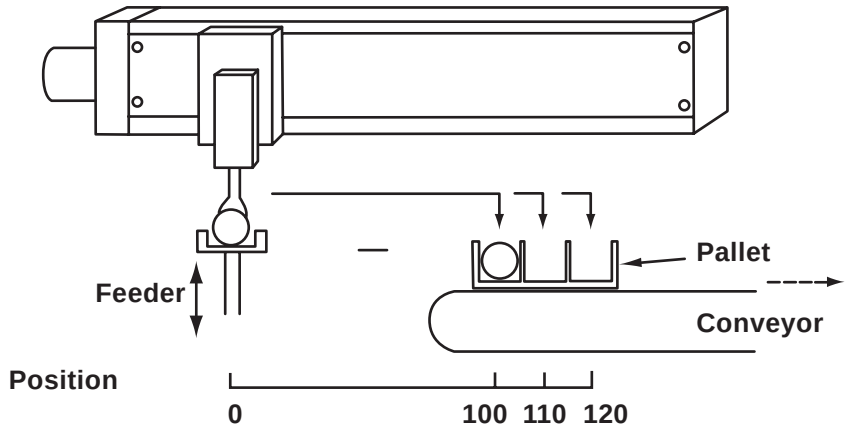
To begin operation in this mode, enter the Step No. to be performed in the Write Step No. (WSTP) data, and set Control (CTL) bit 11 ON. Also, the Status (STA) parameter's "Standby" bit 12 must be set to ON. If this mode is OFF, the FN-PC unit will not operate in this mode.

When started up, the unit produces pulses that are equivalent to the designated target position and then stops.



■ Palletizing Operation (Single-Step RUN)

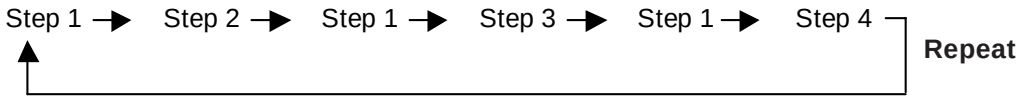
This device carries workpieces from the feeder to the Pallet. After setting each position value, the unit's movement starts.



[Auto RUN Data]

Step No.	RUN Enable/Disable	Cycle Contin./Stop	Control Mode	Position Setting	Target Position	Speed Data	Slope
1	RUN Enable	Cycle Stop	Position Control Mode	Absolute	0	1000	20
2	RUN Enable	Cycle Stop	Position Control Mode	Absolute	100	1000	20
3	RUN Enable	Cycle Stop	Position Control Mode	Absolute	110	1000	20
4	RUN Enable	Cycle Stop	Position Control Mode	Absolute	120	1000	20

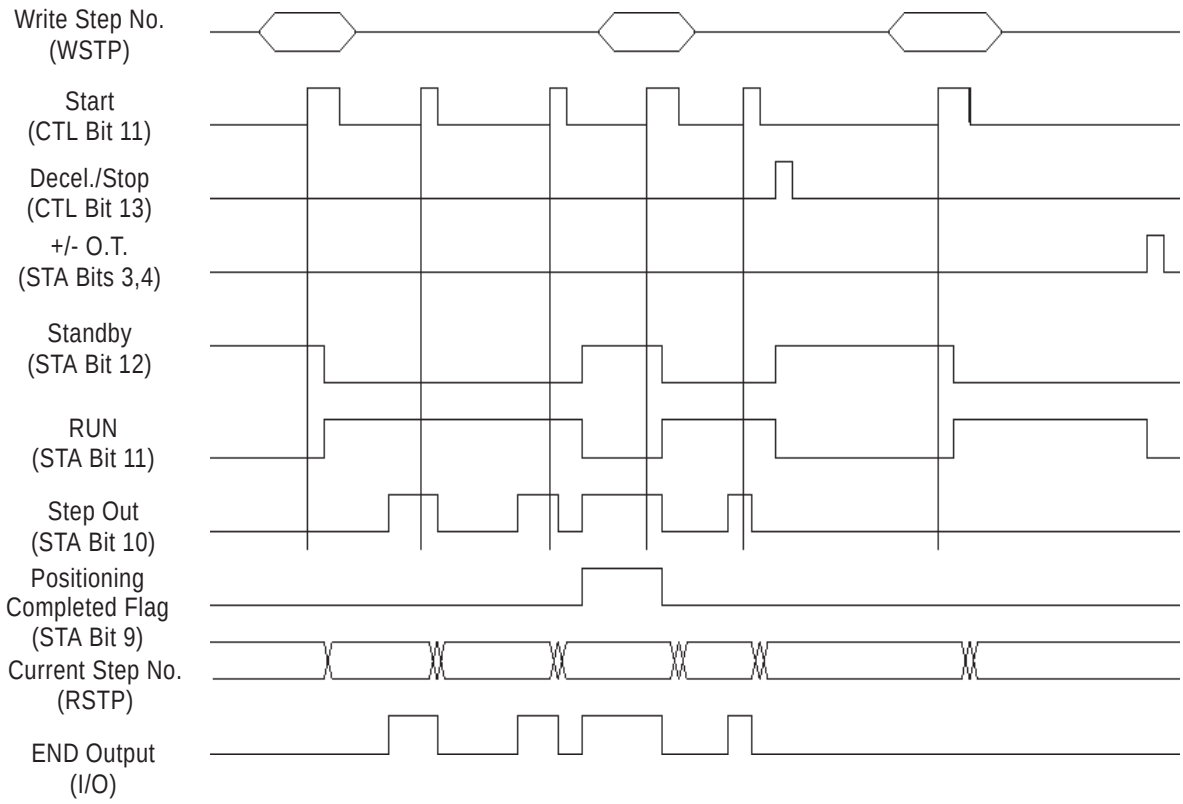
In Single-Step RUN Mode:



8.3.2 Continuous-Step RUN

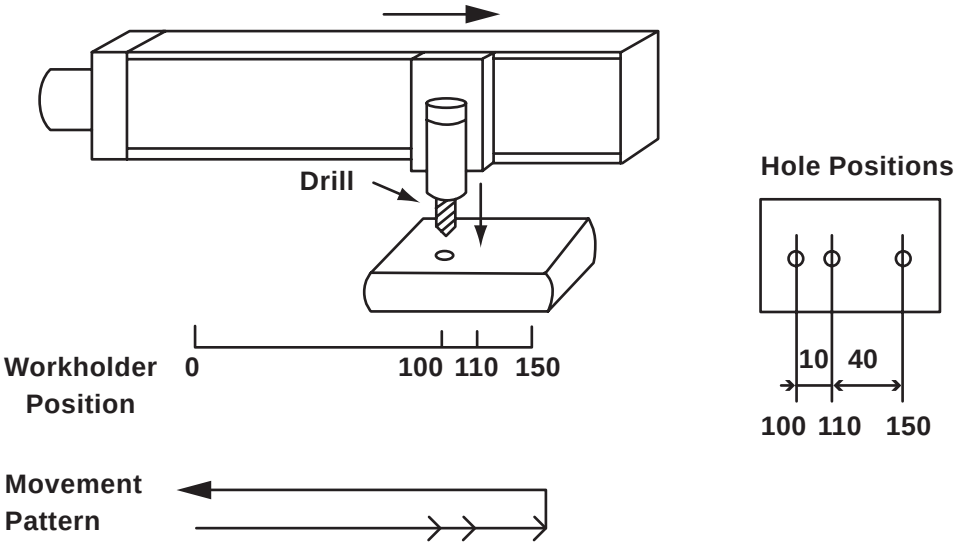
To begin operation in this mode, enter the Step No. to be performed in the Write Step No. (WSTP) data, and set Control (CTL) bit 11 ON. Also, the Status (STA) parameter's "Standby" bit 12 must be set to ON. If this mode is OFF, the FN-PC unit will not operate in this mode.

When started up, consecutive steps are performed until the Auto RUN Data's RUN Mode Cycle Continue/Stop bit (bit14) becomes "1" (STOP).



■ Drilling Holes (Continuous-Step RUN)

In this example, holes are drilled in a workpiece by a drilling machine. Machining starts after selecting the processing step and sending a Start signal. Only the Start signal is required to begin each processing step, until all steps in the cycle are completed.



[Auto RUN Data]

Example 1 Using Absolute Data

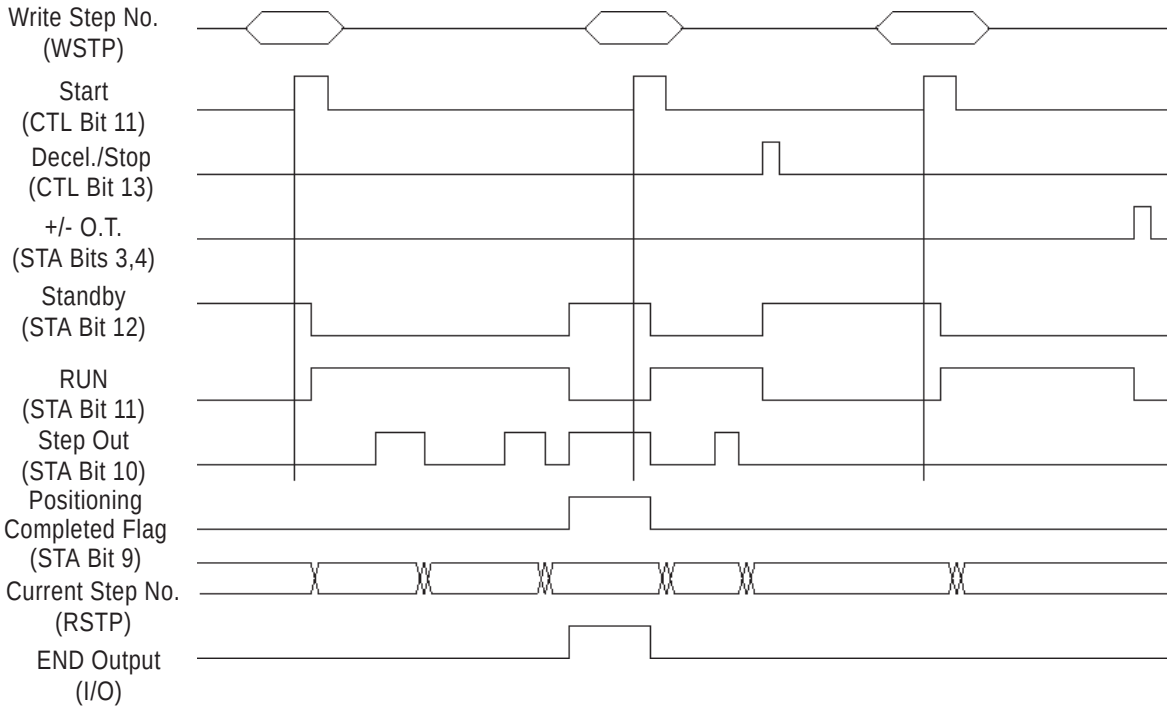
Step No.	RUN Enable/Disable	Cycle Contin./Stop	Control Mode	Position Setting	Target Position	Speed Data	Slope
1	RUN Enable	Cycle Contin.	Position Control Mode	Absolute	100	5000	10
2	RUN Enable	Cycle Contin.	Position Control Mode	Absolute	110	5000	10
3	RUN Enable	Cycle Contin.	Position Control Mode	Absolute	150	5000	10
4	RUN Enable	Cycle Stop	Position Control Mode	Absolute	0	5000	10

Example 2 Using Incremental Data

Step No.	RUN Enable/Disable	Cycle Contin./Stop	Control Mode	Position Setting	Target Position	Speed Data	Slope
1	RUN Enable	Cycle Contin.	Position Control Mode	Incremental	100	5000	10
2	RUN Enable	Cycle Contin.	Position Control Mode	Incremental	10	5000	10
3	RUN Enable	Cycle Contin.	Position Control Mode	Incremental	40	5000	10
4	RUN Enable	Cycle Stop	Position Control Mode	Absolute	0	5000	10

8.3.3 Single Cycle RUN

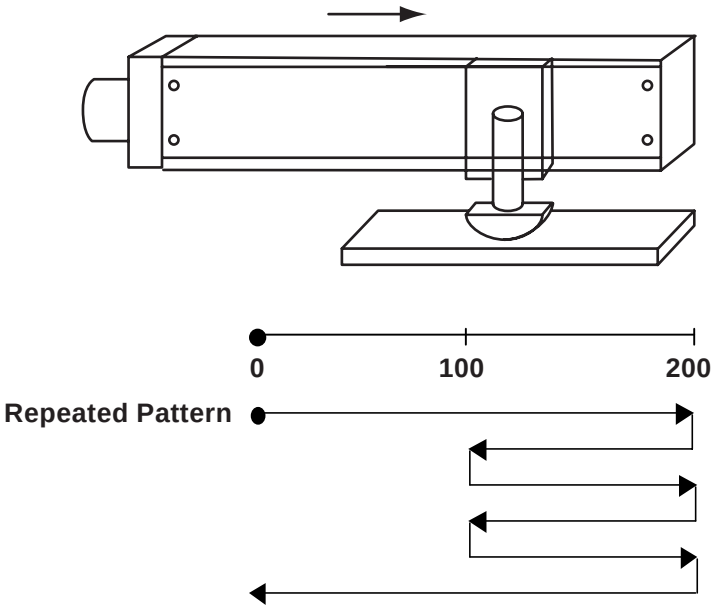
This feature allows the previously explained steps to be performed continuously, as part of a single cycle. When Control (CTL) bit 11 is turned ON, consecutive steps are performed until the Auto RUN Data's RUN Mode Cycle Stop bit (bit14) becomes "1" (STOP).



■ Polishing Machine (Single-Cycle RUN)

In this example, a workpiece is polished by a simple machine.

The repeating action is performed, based on the polishing position.



[Auto RUN Position Data]

Step No.	RUN Enable/Disable	Cycle Contin./Stop	Control Mode	Position Setting	Target Position	Speed Data	Slope
1	RUN Enable	Cycle Contin.	Position Control Mode	Absolute	200	1000	10
2	RUN Enable	Cycle Contin.	Position Control Mode	Absolute	100	1000	10
3	RUN Enable	Cycle Contin.	Position Control Mode	Absolute	200	1000	10
4	RUN Enable	Cycle Contin.	Position Control Mode	Absolute	100	1000	10
5	RUN Enable	Cycle Contin.	Position Control Mode	Absolute	200	1000	10
6	RUN Enable	Cycle Stop	Position Control Mode	Absolute	0	1000	10

If, during Cycle RUN, "Speed and Position Control Mode", or "Speed Control Mode" Control Mode selections are used, cycle operation will continue, however positioning accuracy cannot be guaranteed.

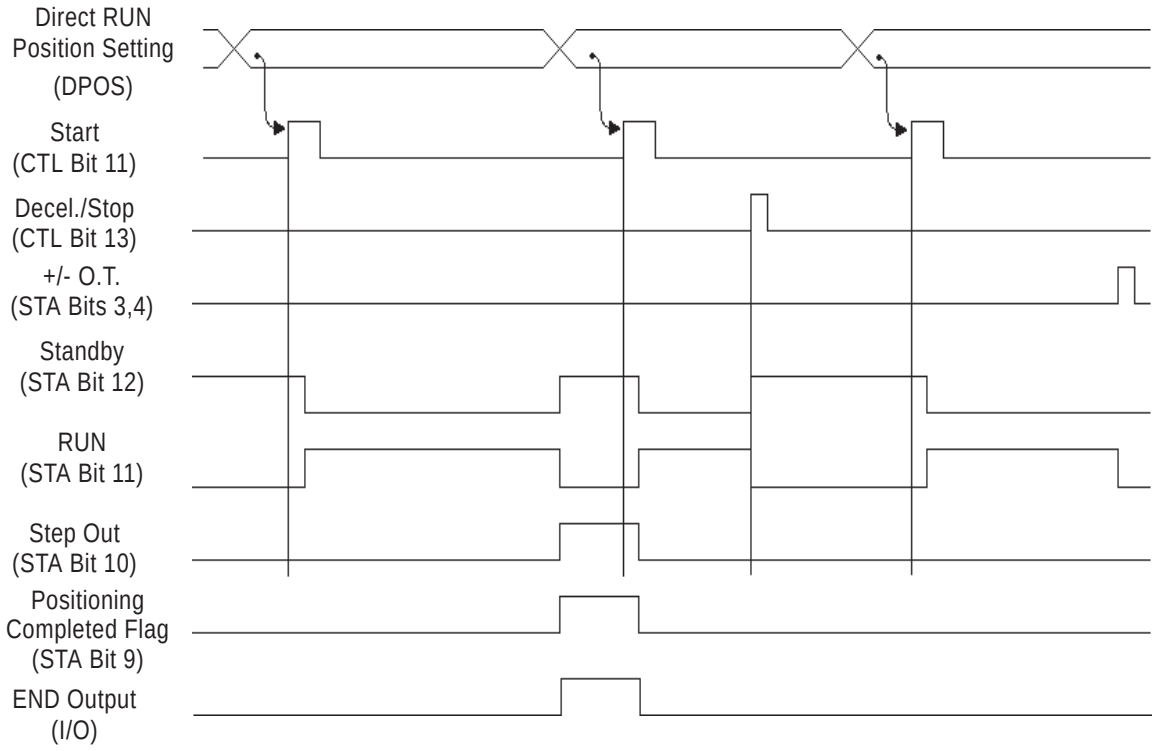
Reference *5.1.2 Automatic RUN Data*

8.4 Direct RUN

Direct Run can be used for direct positioning movement, via Absolute Value (Absolute Coordinates Value).

To use this method, enter Direct Position Command data or Direct Command Position data (DPOS), and turn Control (CTL) parameter's bit 11 ON.

Direct RUN mode is designated by setting Control (CTL) bits 0 and 1 to ON.



When the Direct RUN Speed Data or the Direct RUN Accel/Decel Time parameters are changed, Origin Point Return is performed. Any parameters not related to Origin Point Return cannot be changed.

Chapter 9 Problems and Solutions

This section describes the Flex Network system's error messages and countermeasures.

9.1 Prior to Troubleshooting

Before reading this chapter's ***"Troubleshooting Checklist"*** section for the cause(s) of a unit's problem, first identify the type of problem itself, and then check other basic items.

Flex Network errors are classified, as follows, into three types of errors:

1. Logic Program Error

   The logic program does not run (GLC status LED: Green is not lit).

2. Flex Network I/F Error

   Communication cannot be performed with any Flex Network unit.

3. Flex Network Unit Error

   Flex Network unit cannot input or output signals.

■ Check Items

After completing your preliminary check, and before troubleshooting for the cause(s) of a unit's problem, be sure to check the following items:

- Is the correct power voltage supplied to the GLC and Flex Network units?
- Is the power supplied to the GLC and Flex Network units within the allowable voltage range?
- Are all connected cable wiring and connections (communication cable, I/O cable) secure and correct?
- Are any Flex Network unit terminals loose or disconnected?
- Are all Flex Network unit switches (S-No. switch, dip switch, terminal switch) set correctly?
- Is the required communication cable being used?

9.2 Error Code Display

By displaying an error code on the GLC screen with using the system variables that indicate the I/O driver error codes, troubleshooting can be performed quickly.

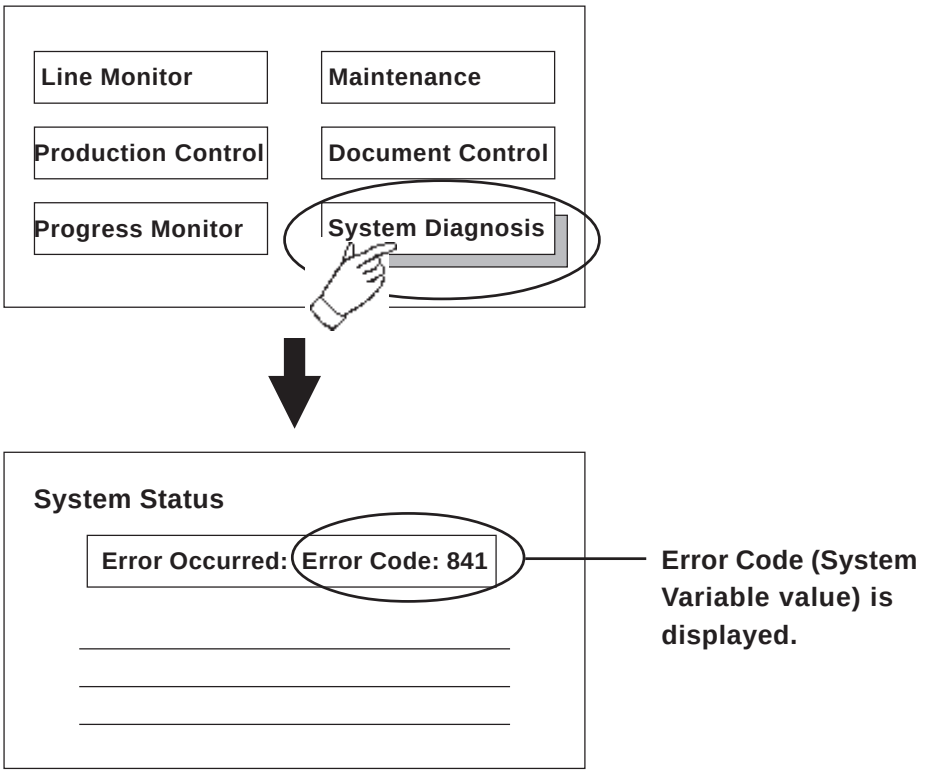
Model	System Variable
GLC2000/LT Series	#IOStatus
GP3000 Series	#L_IOStatus

Note: For GP3000 series, an error code is displayed in the system window on the GP screen without using the system variables.

The following is an example of an error code display application.

■ Example Application

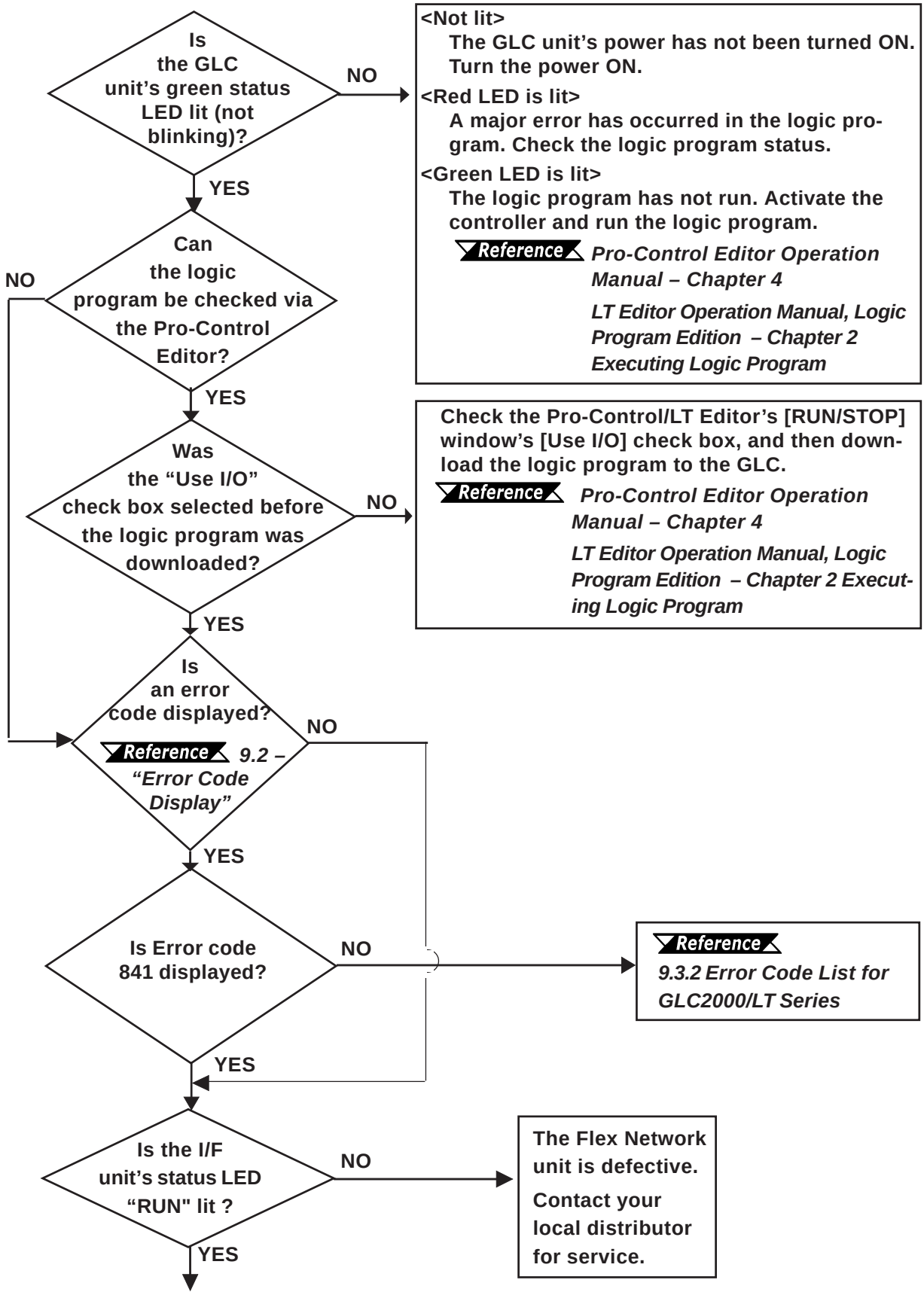
1. Create an I/O System Diagnosis button.
2. Create a ladder logic program that displays the system status as an error code when the [System Diagnosis] button is pressed.

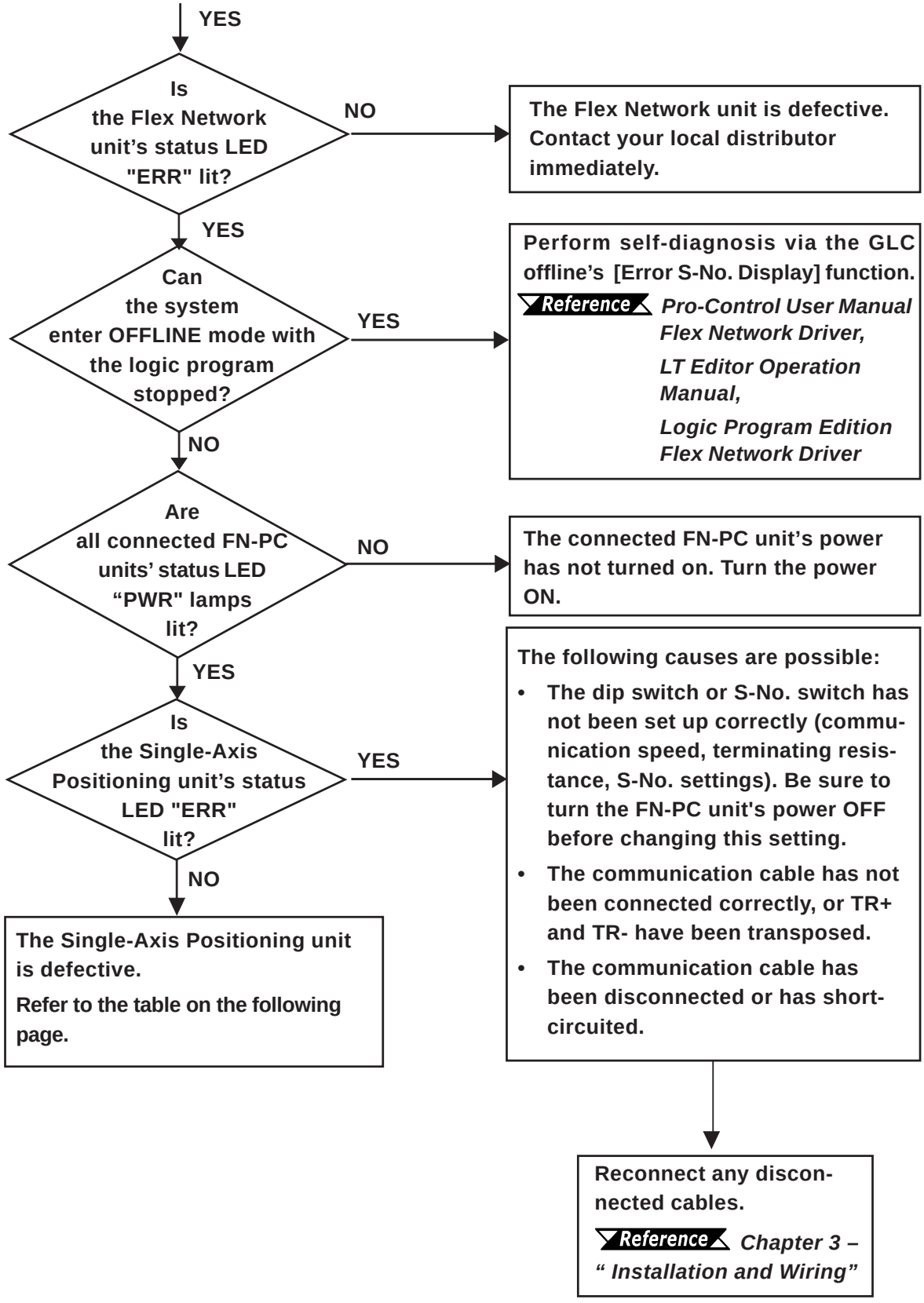


9.3 Troubleshooting for GLC2000/LT Series

9.3.1 Troubleshooting Checklist for GLC2000/LT Series

Use the following flowchart to locate the problem cause(s) and take appropriate countermeasure(s).





Note: To minimize the amount of system downtime, Pro-face recommends that you prepare Flex Network unit substitutes in case of unexpected errors or problems.

If you cannot find the source of the problem in the Troubleshooting flowcharts (see Section 9.3.1), the Single-Axis Positioning unit itself may be the problem. Use the following table to take the appropriate problem-solving measures.

Condition	Check Item	Solution
Cannot write set value correctly	Is the operation mode set to RUN Mode?	Set the RUN Mode /Setting Mode switch (Control bit 15) to ON.
	Does the previous Command value remain in CMD (has the value not been cleared to 0)?	Re-check the values entered in the Command (CMD) setting, and enter correct values.
	Is the Teaching Loader being used?	Stop the Teaching Loader and return to the menu screen.
Operation via Teaching Loader is not possible	Is the FN-PC unit's power ON?	Turn the FN-PC unit's power ON.
	Has the GLC unit's control feature caused an Immediate stop?	Release the GLC unit's Immediate stop command.
	Is the FN-PC unit's wiring correct?	Wire all terminals correctly.
	Is the COIN or Z Phase Input correctly set?	Re-enter the COIN or Z Phase Input values.
	Has the unit changed to the mode set in the GLC's Control (CTL) area?	Set the GLC to RUN mode.
Motor operates but unit movement is not correct	Is there too much noise in the lines?	- Use shielded, twisted-pair wires - Repair all incorrect wiring - Repair all cut Terminal and Connector wiring - Separate all AC Circuit and Pulse Signal lines - Place the lines in metal ducts to protect them from peripheral noise, large magnets and power cables - Use the minimum amount of wiring to connect the Controller to the Amp using Digital Electronics Corporations cable - Make the Encoder wires as short as possible
	Is the alignment of the U, V and W lines for the Amp and the Motor Terminal numbers the same?	If the wiring is incorrect, the FN-PC will rotate only for the final pulse amount. Occasionally, depending on the type of incorrect encoder wiring and the U.V.W. power lines, the FN-PC unit will rotate, however, confirm that the amp and motor's wiring is correct.
	Is +/-O.T. (Status bits 3, 4) turned ON?	Turn the +/-O.T. (Status bits 3, 4) OFF. Correct Parameter 1 (O.T. Logic). (If performing Origin Point Return, correct the Origin Point Return Method and Direction.)
	Did an error occur and unit stop during High Speed Origin Point Return 2?	- Check the Z-Phase Input wiring. - Check if the Z-Phase signal is occurring during the PORG ON period.
	Has an overflow error occurred?	Clear the overflow error by executing Reset or Preset.
	Is the value 846 in #IOSTATUS?	An error was detected in the FN-PC unit. Reference 9.3.2 – "Error Code List for GLC2000/LT Series"

Condition	Check Item	Solution
Motor operation is not normal	Is there a problem with the electrical circuit? - Does the Teaching Loader display operate properly? - Does the FN-PC unit's LED operate correctly?	- Is the GLC unit using the correct level of power and currect? - Is the FN-PC unit using the correct level of power and current? - Is the connector loose or disconnected? - Is the cable damaged or cut?
	Are all parameter settings entered correctly?	Correct any incorrect settings.
	Is the Servo Alarm Input Logic correct?	Confirm that the connection between the FN-PC unit's servo alarm and the Amp's servo alarm is correct. If necessary, adjust the FN-PC unit's parameters and/or logic settings.
	Is motor excitation impedance occuring?	Release any alarm that may have occurred due to Amp unit's Servo ON, Inhibit, Variance Clear, EMS (Emerg. Stop), Pulse Input Method (CW/CCW) settings, or external switch connections. Also, check all Amp setting parameters and RUN logic.
	Is 846 present in "#IOSTATUS"?	An FN-PC unit alarm has occurred. Reference 9.3.2Error Code List for GLC2000/LT Series.

⚠ WARNING

When checking the motor's impedance, do not touch or stand near the motor.

9.3.2 Error Code List for GLC2000/LT Series

■ System Design Errors

Error Code	Definition
501	Internal variable mapped to I/O terminal.
502	Input variable mapped to output terminal.
503	Output variable allocated to input terminal
504	Discrete variable mapped to integer terminal.
505	Integer variable mapped to discrete terminal
506	Variable type not supported by driver.
507	Variable is not mapped to terminal.
801	Duplicate terminal number encountered.
802	Duplicate S-No.
803	S-No. exceeded the range.
804	Analog unit S-No. is duplicated
805	FN-HC unit S-No. is duplicated
806	FN-PC unit S-No. is duplicated

■ Initialization Errors

Error Code	Definition
821	There is no hardware unit, or the unit type is incorrect.
822	Initial error
823	Analog unit setting error

■ Runtime Errors

Error Code	Definition
841	Error (disconnection, malfunction) among connected I/O units.
842	Error (disconnection, malfunction) in analog input unit. (Input range: set at 4 - 20mA)
843	FN-HC unit error occurred. For details, use a command to call up the unit's error code. Reference *Flex Network High Speed Counter Unit User Manual*
844	Initial error in the FN-HC Unit
845	FN-HC unit Write Command error
846	FN-PC unit error. For details, use a command to call up the unit's error code. Reference ■ *Single-Axis Positioning Unit Errors*
847	FN-PC unit Write Command error

■ Internal Error

Error Code	Definition
850 -	Driver error #850. Please contact your local distributor.

■ Single-Axis Positioning Unit Errors

Error Name	Error Code	Description	RUN
Command Error	1 (0001h)	During RUN mode, Start Movement was input.	Cont.
	3 (0003h)	Auto RUN's Control Mode designates an undefined mode.	Stop
	4 (0004h)	When Auto RUN's Speed Data is set to a value lower than the designated Start value, Auto RUN will begin using the designated Start value.	Cont.
	5 (0005h)	Auto RUN's Acceleration Time setting is lower than the Minimum value. Auto RUN will begin using the Minimum value.	Cont.
	7 (0007h)	Auto RUN's Speed Data is set to "0".	Stop
	8 (0008h)	Auto RUN's Auto Startup Speed Data is set to "0".	Cont.
	9 (0009h)	During teaching operation, the position setting has been changed to INC instead of ABS. Please change to ABS	Stop
	19 (0013h)	During Manual RUN, a manual movement command was issued for the direction opposite the current direction. Decellerate and Stop.	Cont.
	20 (0014h)	When Manual RUN speed data is set to lower than the minimum JOG speed, Manual RUN's speed data is used as the Startup speed.	Cont.
	21 (0015h)	When the High Speed Origin Point Return's Speed data is lower than the Origin Point Return Speed data, the High Speed Origin Point return is performed using the Origin Point Return Speed data.	Cont.
	22 (0016h)	Manual RUN's Acceleration Time setting is lower than the Minimum value. Acceleration will begin using the Minimum time value.	Cont.
	23 (0017h)	Manual RUN's Auto Startup Speed data is set to "0".	Cont.
	24 (0018h)	Manual RUN's Speed data is set to "0".	Stop
	25 (0019h)	After Origin Point Return, the Minimum Origin Point Return Speed data is set to "0".	Stop
	32 (0020h)	After High Speed Origin Point Return, the High Speed Origin Point Return Speed data is set to "0".	Stop
	35 (0023h)	Common Parameter/Auto RUN Position data's speed data exceeds the maximum speed.	Stop
	38 (0026h)	Common Parameter's designated Origin Point Return Method is undefined.	Stop
	39 (0027h)	Origin Point Return cannot be performed.	Stop

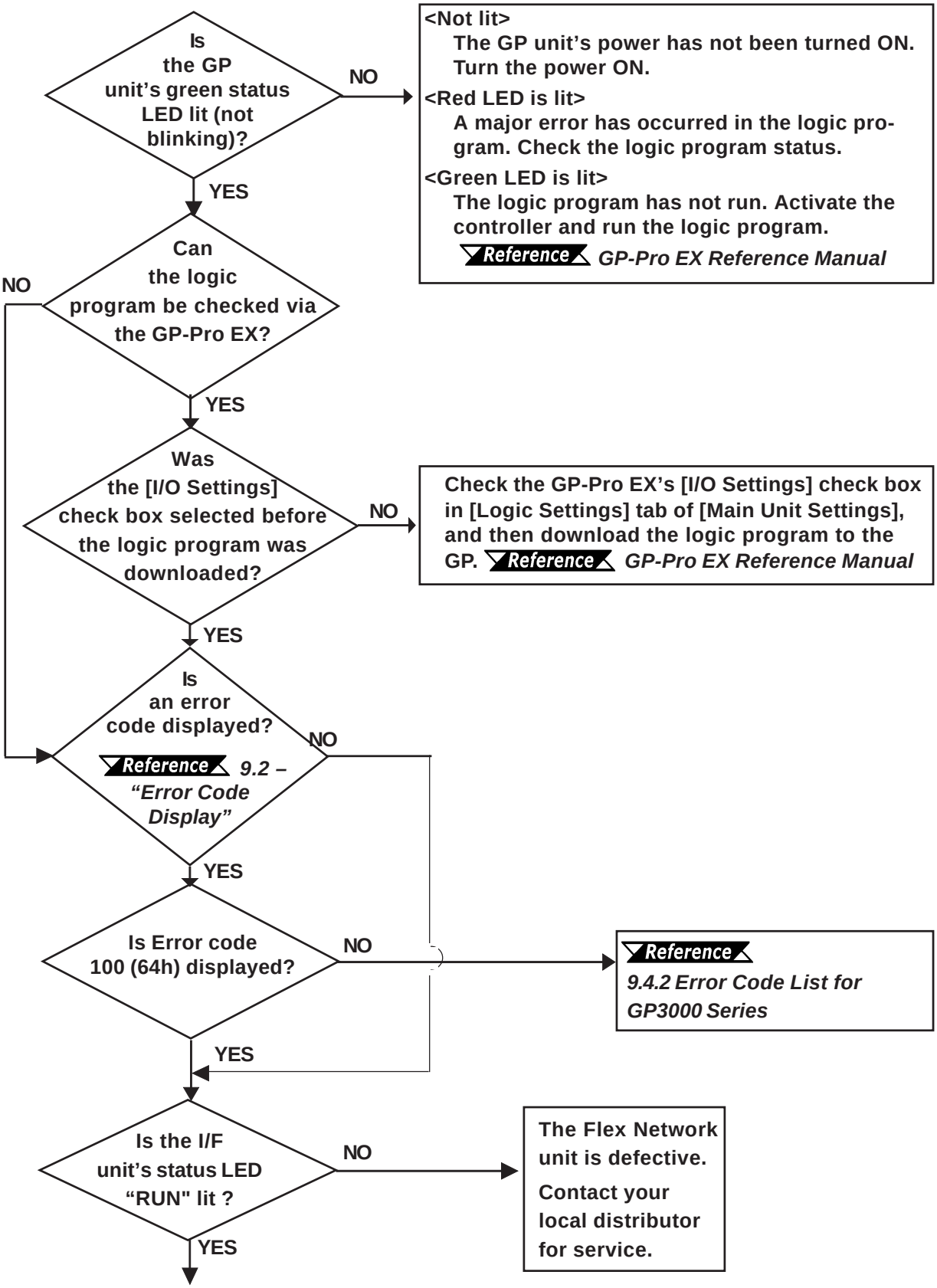
Error Name	Error Code	Description	RUN
Hardware Error	513 (0201h)	EEPROM parameter area error.	Stop
Servo Error	768 (0300h)	The servo driver has caused an alarm.	Stop*1
Data Error	1025 (0401h)	Decelerate and stop using Speed + Position Mode	Stop
	1026 (0402h)	In Speed + Position Mode, Control Mode Switchover Input changes from ON to OFF during acceleration or deceleration.	Cont.
	1040 (0410h)	The Speed data entered exceeds the Max. Speed setting set in the Parameter. During Manual RUN, if the data entered in the Speed Change's speed data exceeds the Max Speed, unit decelerates and stops.	Stop
	1041 (0411h)	Auto RUN's Target Position data exceeds the range set in the Parameter's Upper Position and Lower Position values. During Manual RUN, if the Speed Change's speed data exceeds this range, unit decelerates and stops.	Stop
Overrun	2049 (0801h)	+ (CW) Direction Overtravel +OT	Stop*1
	2050 (0802h)	- (CCW) Direction Overtravel -OT	Stop*1
Comm. Error	32773 (8006h)	Communication error occurred between the Teaching Loader and the FN-PC unit.	Cont.
Operation Error	36865 (9001h)	During operation via the Teaching Loader, the FN-PC unit has received operation commands from the GLC unit.	Stop*1
	36866 (9002h)	During operation via the GLC unit, the FN-PC unit has received operation commands from the Teaching Loader.	Cont.

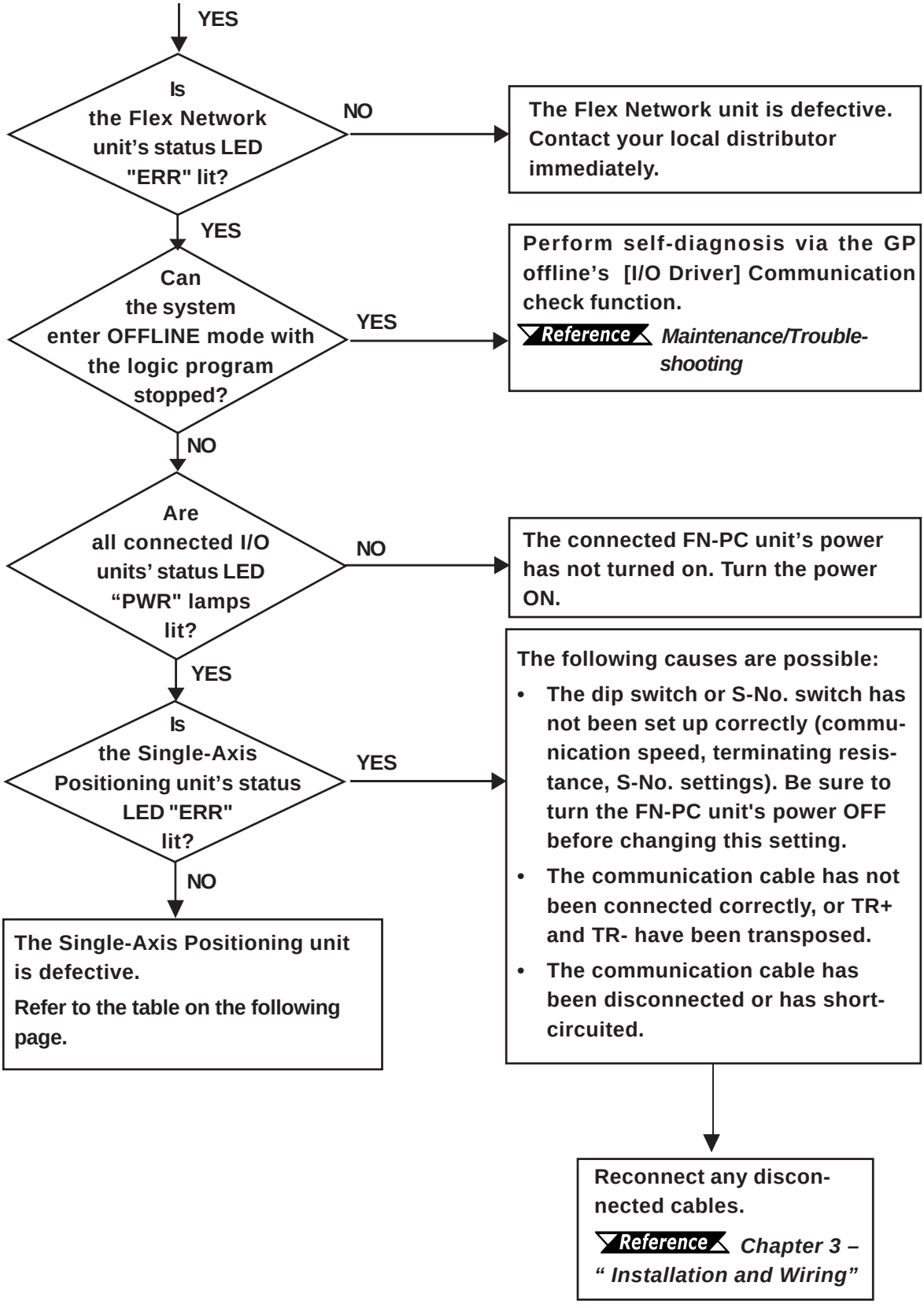
**1 When this alarm occurs, the Teaching Loader's screen will return to the MODE Selection screen.*

9.4 Troubleshooting for GP3000 Series

9.4.1 Troubleshooting Checklist for GP3000 Series

Use the following flowchart to locate the problem cause(s) and take appropriate countermeasure(s).





Note: To minimize the amount of system downtime, Pro-face recommends that you prepare Flex Network unit substitutes in case of unexpected errors or problems.

If you cannot find the source of the problem in the Troubleshooting flowcharts (see Section 9.4.1), the Single-Axis Positioning unit itself may be the problem. Use the following table to take the appropriate problem-solving measures.

Condition	Check Item	Solution
Cannot write set value correctly	Is the operation mode set to RUN Mode?	Set the RUN Mode /Setting Mode switch (Control bit 15) to ON.
	Does the previous Command value remain in CMD (has the value not been cleared to 0)?	Re-check the values entered in the Command (CMD) setting, and enter correct values.
	Is the Teaching Loader being used?	Stop the Teaching Loader and return to the menu screen.
Operation via Teaching Loader is not possible	Is the FN-PC unit's power ON?	Turn the FN-PC unit's power ON.
	Has the GP unit's control feature caused an Immediate stop?	Release the GP unit's Immediate stop command.
	Is the FN-PC unit's wiring correct?	Wire all terminals correctly.
	Is the COIN or Z Phase Input correctly set?	Re-enter the COIN or Z Phase Input values.
	Has the unit changed to the mode set in the GP's Control (CTL) area?	Set the GP to RUN mode.
Motor operates but unit movement is not correct	Is there too much noise in the lines?	- Use shielded, twisted-pair wires - Repair all incorrect wiring - Repair all cut Terminal and Connector wiring - Separate all AC Circuit and Pulse Signal lines - Place the lines in metal ducts to protect them from peripheral noise, large magnets and power cables - Use the minimum amount of wiring to connect the Controller to the Amp using Digital Electronics Corporations cable - Make the Encoder wires as short as possible
	Is the alignment of the U, V and W lines for the Amp and the Motor Terminal numbers the same?	If the wiring is incorrect, the FN-PC will rotate only for the final pulse amount. Occasionally, depending on the type of incorrect encoder wiring and the U.V.W. power lines, the FN-PC unit will rotate, however, confirm that the amp and motor's wiring is correct.
	Is +/-O.T. (Status bits 3, 4) turned ON?	Turn the +/-O.T. (Status bits 3, 4) OFF. Correct Parameter 1 (O.T. Logic). (If performing Origin Point Return, correct the Origin Point Return Method and Direction.)
	Did an error occur and unit stop during High Speed Origin Point Return 2?	- Check the Z-Phase Input wiring. - Check if the Z-Phase signal is occurring during the PORG ON period.
	Has an overflow error occurred?	Clear the overflow error by executing Reset or Preset.
	Is the value 107 (6Bh) in #L_IOStatus?	An error was detected in the FN-PC unit. Reference 9.4.2 – "Error Code List for GP3000 Series"

Condition	Check Item	Solution
Motor operation is not normal	Is there a problem with the electrical circuit? - Does the Teaching Loader display operate properly? - Does the FN-PC unit's LED operate correctly?	- Is the GP unit using the correct level of power and currect? - Is the FN-PC unit using the correct level of power and current? - Is the connector loose or disconnected? - Is the cable damaged or cut?
	Are all parameter settings entered correctly?	Correct any incorrect settings.
	Is the Servo Alarm Input Logic correct?	Confirm that the connection between the FN-PC unit's servo alarm and the Amp's servo alarm is correct. If necessary, adjust the FN-PC unit's parameters and/or logic settings.
	Is motor excitation impedance occuring?	Release any alarm that may have occurred due to Amp unit's Servo ON, Inhibit, Variance Clear, EMS (Emerg. Stop), Pulse Input Method (CW/CCW) settings, or external switch connections. Also, check all Amp setting parameters and RUN logic.
	Is 846 present in "#IOSTATUS"?	An FN-PC unit alarm has occurred. Reference 9.4.2 Error Code List for GP3000 Series.

⚠ WARNING

When checking the motor's impedance, do not touch or stand near the motor.

9.4.2 Error Code List for GP3000 Series

In the system window on the GP screen, an error code is displayed with RGE* put to the top of the error code.

Ex.) RGE*001 Not supported unit

■ System Design Errors

Error Code	Error Message	Definition
001	Not supported unit.	The type of the unit is different.
002	Illegal Parameter.	The data type of the symbol variable assigned to the Flex Network unit is illegal. The Flex Network unit setting value is illegal.
003	Device offset beyond limit.	The address of the symbol variable assigned to the Flex Network unit is out of range.
004	Terminal config overlapped.	The number of Flex Network unit terminals exceeds the limit.
005	Illegal terminal sequence.	The I/O terminal numbers are not specified in ascending order.
006	Insufficient terminals.	The number of I/O terminals is not appropriate (insufficient).
007	Units config overlapped.	Flex Network unit S-No. is duplicated and set.
008	Units count over limit.	The maximum number of connected Flex Network units (63 units) is exceeded. The maximum value of S-No. (S-No. 63) is exceeded. S-No. of the Flex Network unit that occupies more than one node has exceeded the max. (S-No. 63).
009	Drivers config overlapped.	The driver has been registered twice.
010	Unmatched In/Out terminal.	The input/output settings of the Flex Network unit are not correct.
011	Unmatched bit/word term.	The variable type specified in the Flex Network unit is incorrect.
012	Illegal level nunber.	Something is wrong with the I/O driver.
013	Illegal data addr. Gotten.	The I/O driver information is incorrect. The controller information is incorrect.
014	No drivers/units registed.	The I/O driver or Flex Network unit is not registered.

■ Runtime Errors

Error Code	Error Message	Definition
100	Unit communication error.	A communication error has occurred between the main unit and the Flex Network unit. The communication cable is cut off. The Flex Network unit is not connected. The editor settings have problems.
101	4ch. analog setting error.	Communication with the 4ch. analog unit has failed.
102	2ch. analog setting error.	Communication with the 2ch. analog unit has failed.
103	Analog unit's wire broken.	The 4 to 20mA-ranging input signal of the 4ch. or 2ch. analog unit is cut off.
104	Counter unit's error.	An error has occurred in the high-speed counter unit. For details, use a command to call up the unit's error code. Reference *Flex Network High Speed Counter Unit User Manual*
105	Counter initial error.	Initializing the high-speed counter unit has failed.
106	Counter communication err.	A communication error with the high-speed counter unit has occurred. The communication cable is cut off. The high-speed counter unit is not connected. The editor settings have problems.
107	Positioning Unit's error.	An error has occurred in the positioning unit. For details, use a command to call up the unit's error code. Reference ■ *Single-Axis Positioning Unit Errors*
108	Comm.position error.	A communication error with the positioning unit has occurred. The communication cable is cut off. The positioning unit is not connected. The editor settings have problems.
109	2ch. analog comm. error.	A communication error with the 2ch. analog unit has occurred. The communication cable is cut off. The 2ch. analog unit is not connected. The editor settings have problems.

■ Internal Error

Error Code	Error Message	Definition
200	SetValue func.(INT) NG.	Integer-type Terminal data of the Flex Network unit could not be read.
201	SetValue func.(bit) NG.	Bit-type Terminal data could not be read.
202	GetValue func.(INT) NG.	Integer-type Terminal data could not be written.
203	GetValue func.(bit) NG.	Bit-type Terminal data could not be written.

■ Single-Axis Positioning Unit Errors

Error Name	Error Code	Description	RUN
Command Error	1 (0001h)	During RUN mode, Start Movement was input.	Cont.
	3 (0003h)	Auto RUN's Control Mode designates an undefined mode.	Stop
	4 (0004h)	When Auto RUN's Speed Data is set to a value lower than the designated Start value, Auto RUN will begin using the designated Start value.	Cont.
	5 (0005h)	Auto RUN's Acceleration Time setting is lower than the Minimum value. Auto RUN will begin using the Minimum value.	Cont.
	7 (0007h)	Auto RUN's Speed Data is set to "0".	Stop
	8 (0008h)	Auto RUN's Auto Startup Speed Data is set to "0".	Cont.
	9 (0009h)	During teaching operation, the position setting has been changed to INC instead of ABS. Please change to ABS	Stop
	19 (0013h)	During Manual RUN, a manual movement command was issued for the direction opposite the current direction. Decellerate and Stop.	Cont.
	20 (0014h)	When Manual RUN speed data is set to lower than the minimum JOG speed, Manual RUN's speed data is used as the Startup speed.	Cont.
	21 (0015h)	When the High Speed Origin Point Return's Speed data is lower than the Origin Point Return Speed data, the High Speed Origin Point return is performed using the Origin Point Return Speed data.	Cont.
	22 (0016h)	Manual RUN's Acceleration Time setting is lower than the Minimum value. Acceleration will begin using the Minimum time value.	Cont.
	23 (0017h)	Manual RUN's Auto Startup Speed data is set to "0".	Cont.
	24 (0018h)	Manual RUN's Speed data is set to "0".	Stop
	25 (0019h)	After Origin Point Return, the Minimum Origin Point Return Speed data is set to "0".	Stop
	32 (0020h)	After High Speed Origin Point Return, the High Speed Origin Point Return Speed data is set to "0".	Stop
	35 (0023h)	Common Parameter/Auto RUN Position data's speed data exceeds the maximum speed.	Stop
	38 (0026h)	Common Parameter's designated Origin Point Return Method is undefined.	Stop
	39 (0027h)	Origin Point Return cannot be performed.	Stop

Error Name	Error Code	Description	RUN
Hardware Error	513 (0201h)	EEPROM parameter area error.	Stop
Servo Error	768 (0300h)	The servo driver has caused an alarm.	Stop*1
Data Error	1025 (0401h)	Decelerate and stop using Speed + Position Mode	Stop
	1026 (0402h)	In Speed + Position Mode, Control Mode Switchover Input changes from ON to OFF during acceleration or deceleration.	Cont.
	1040 (0410h)	The Speed data entered exceeds the Max. Speed setting set in the Parameter. During Manual RUN, if the data entered in the Speed Change's speed data exceeds the Max Speed, unit decelerates and stops.	Stop
	1041 (0411h)	Auto RUN's Target Position data exceeds the range set in the Parameter's Upper Position and Lower Position values. During Manual RUN, if the Speed Change's speed data exceeds this range, unit decelerates and stops.	Stop
Overrun	2049 (0801h)	+ (CW) Direction Overtravel +OT	Stop*1
	2050 (0802h)	- (CCW) Direction Overtravel -OT	Stop*1
Comm. Error	32773 (8006h)	Communication error occurred between the Teaching Loader and the FN-PC unit.	Cont.
Operation Error	36865 (9001h)	During operation via the Teaching Loader, the FN-PC unit has received operation commands from the GP unit.	Stop*1
	36866 (9002h)	During operation via the GP unit, the FN-PC unit has received operation commands from the Teaching Loader.	Cont.

**1 When this alarm occurs, the Teaching Loader's screen will return to the MODE Selection screen.*

Memo

Appendices

Appendix 1 Connection Examples

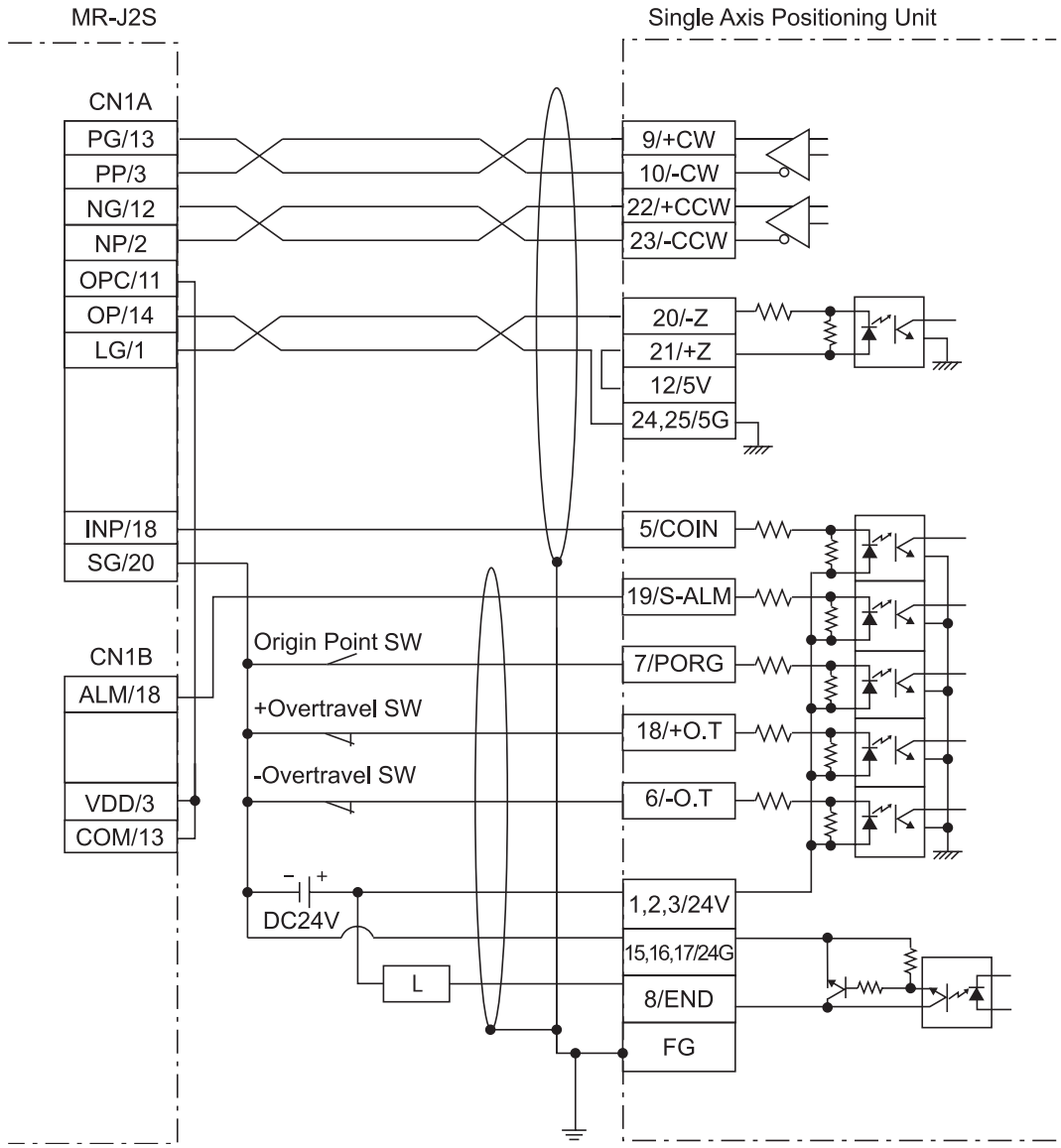
The connection examples given on the following pages are for the four manufacturers shown below.

Mitsubishi Electric	Servo Amp MR-J2S type	Line Driver
Yasukawa Electric	Servo Amp SGDA***P type	Line Driver
Sanyo Electric	Servo Amp PY type	Line Driver
		Open Collector
Panasonic	Servo Amp A type	Line Driver
Oriental Motor	Stepping Motor Amp (UPK/W type)	Open Collector

The reference connection data shown here is for connecting a pulse signal unit. When designing Servo amp power circuits, Earth circuits, Emergency Stop circuits, Motor Brake circuits, and circuit designs for other control signal lines, follow the instructions given by the respective Servo Motor Amp or Stepping Motor Amp manufacturer.

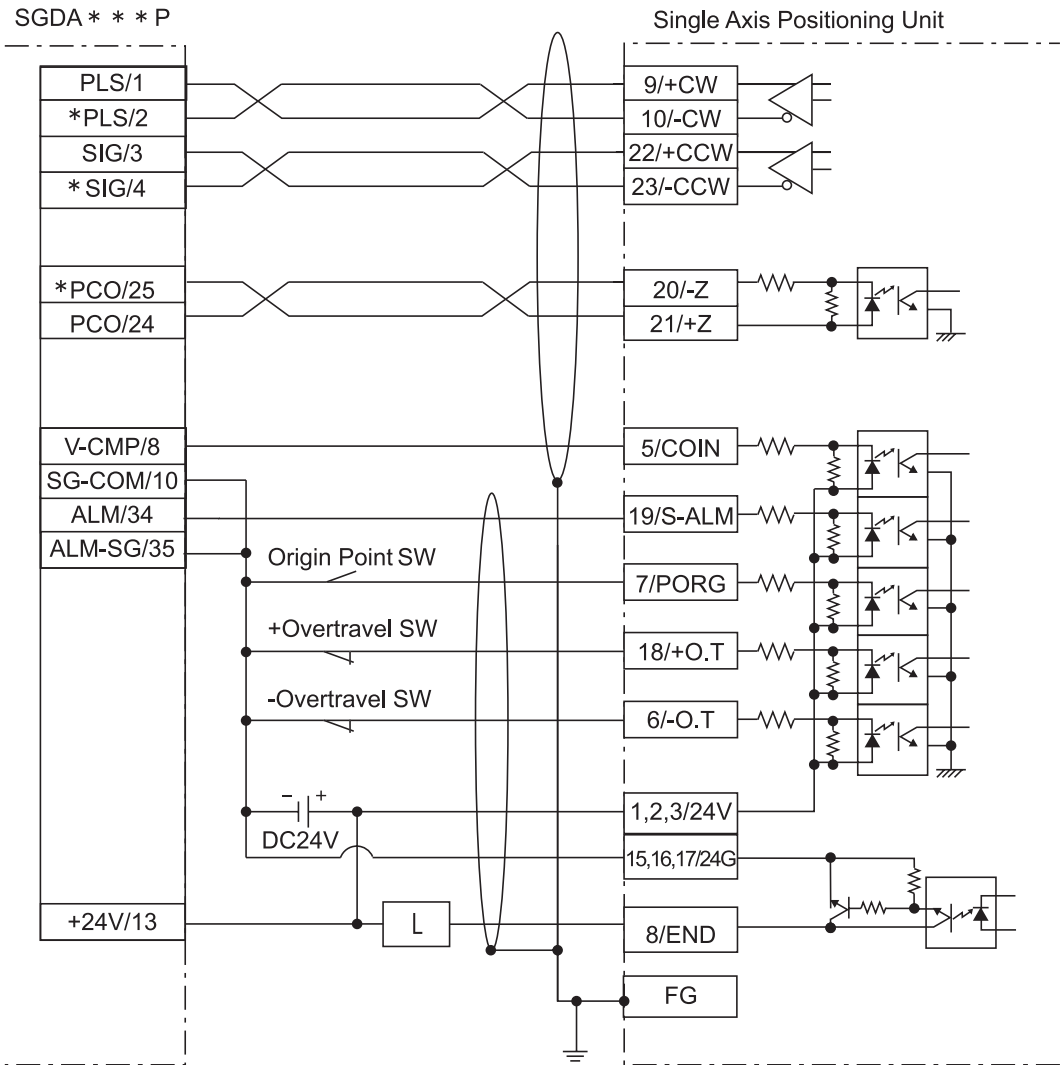
Appendix 1.1 Mitsubishi Servo Amp (MR-J2S)

■ Line Driver Connection Diagram



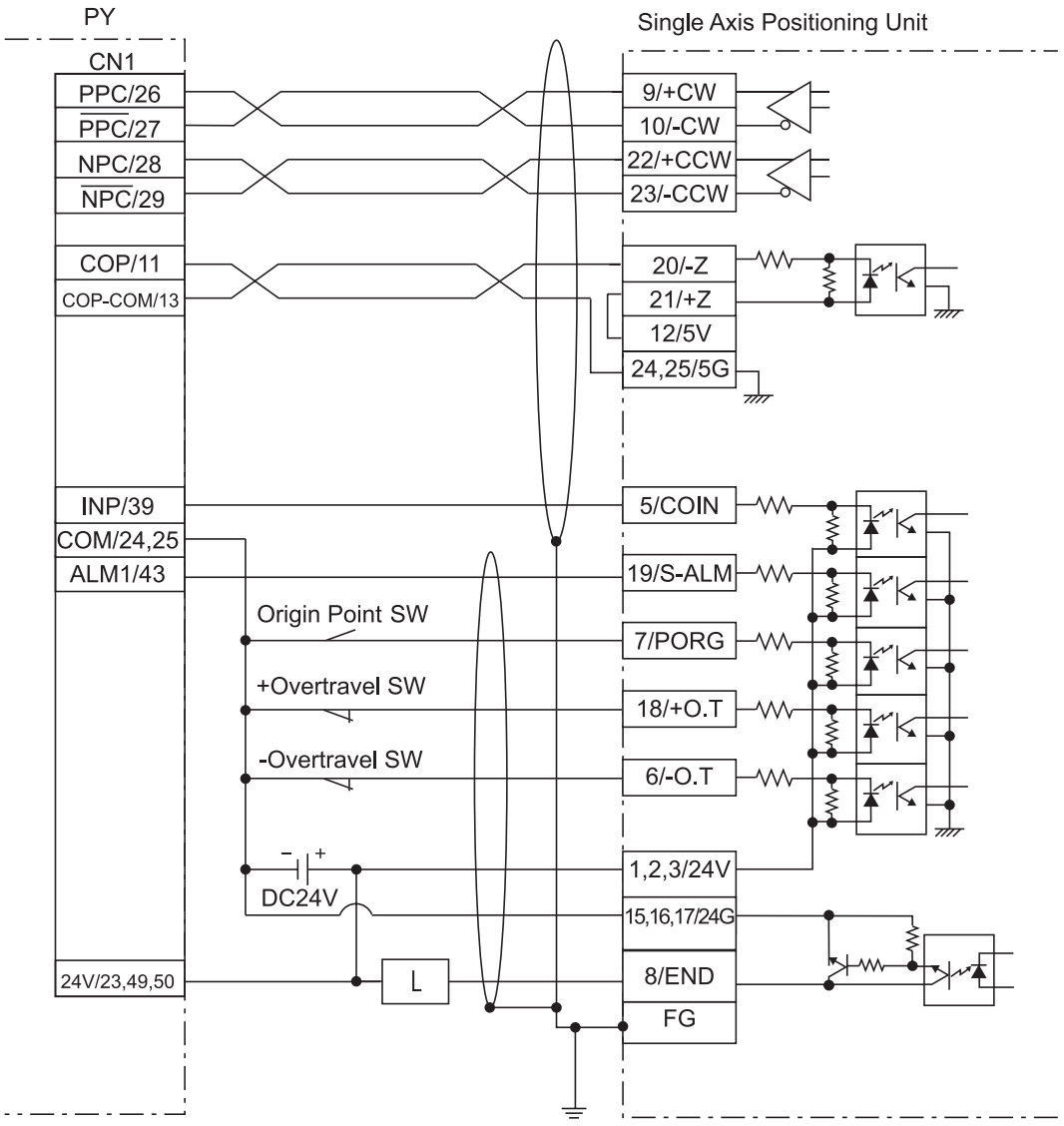
Appendix 1.2 Yasukawa Electric Servo Amp (SGDA***P)

■ Line Driver Connection Diagram

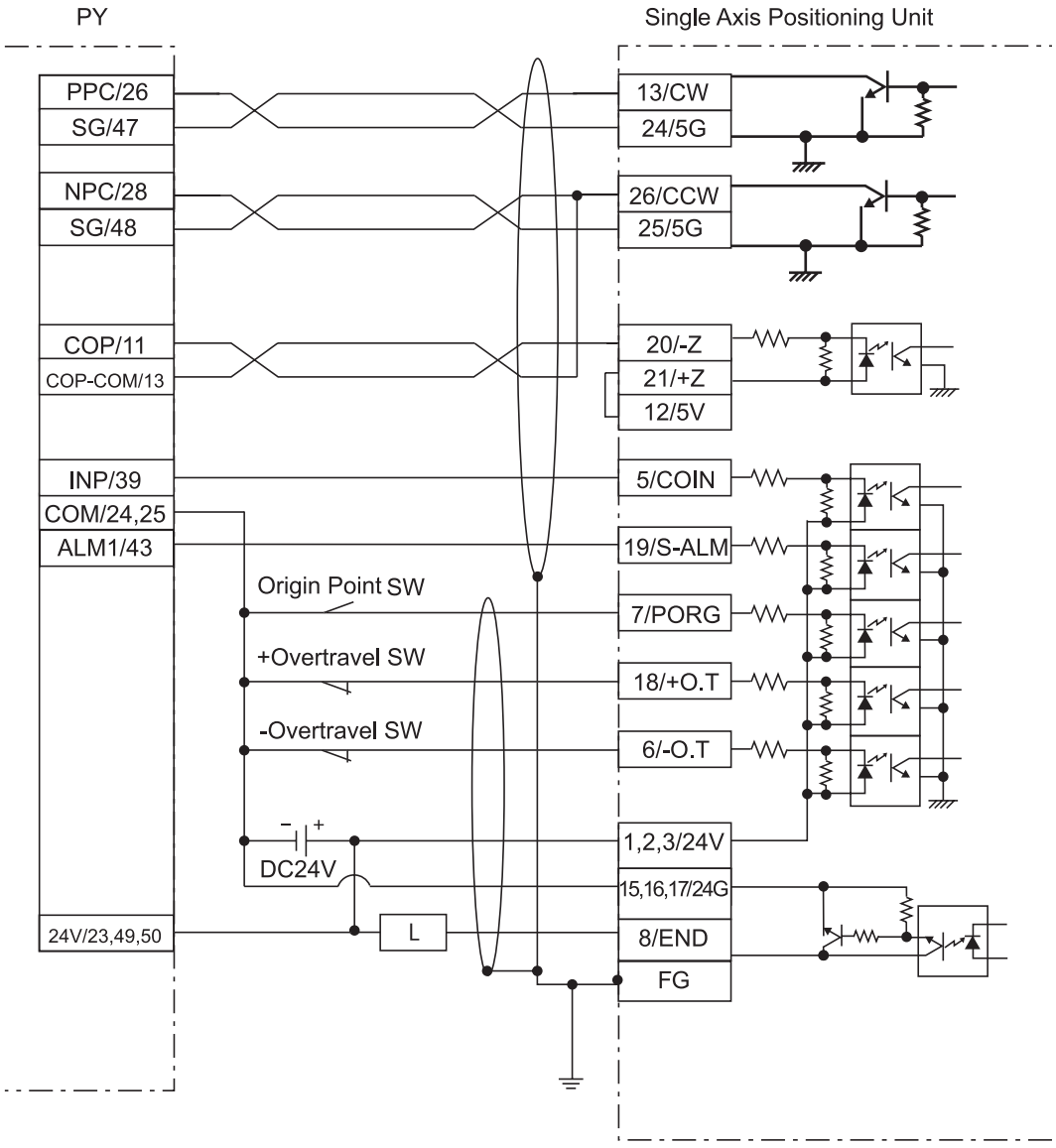


Appendix 1.3 Sanyo Electric Servo Amp (PY)

■ Line Driver Connection Diagram

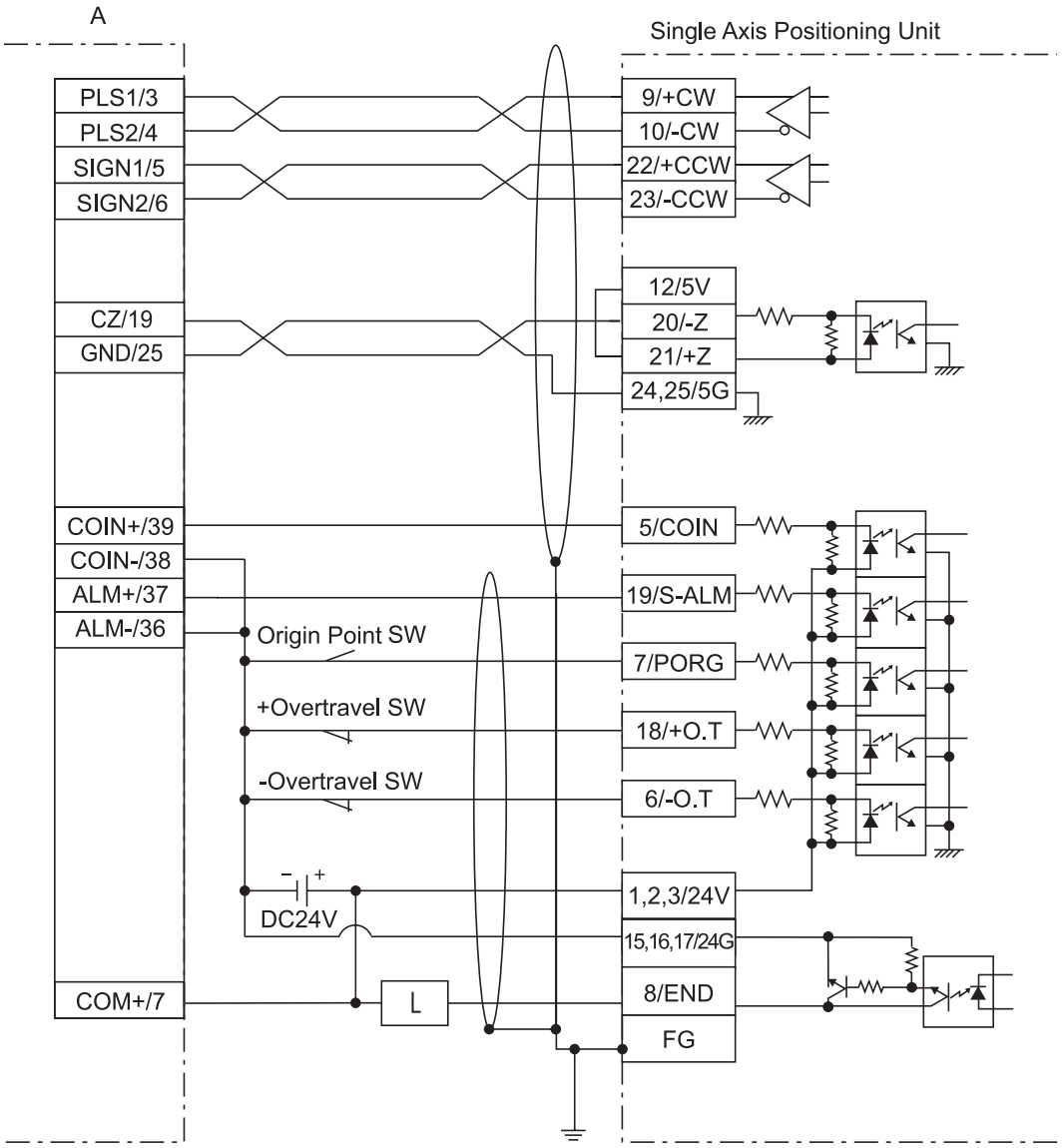


■ Open Collector Connection Diagram



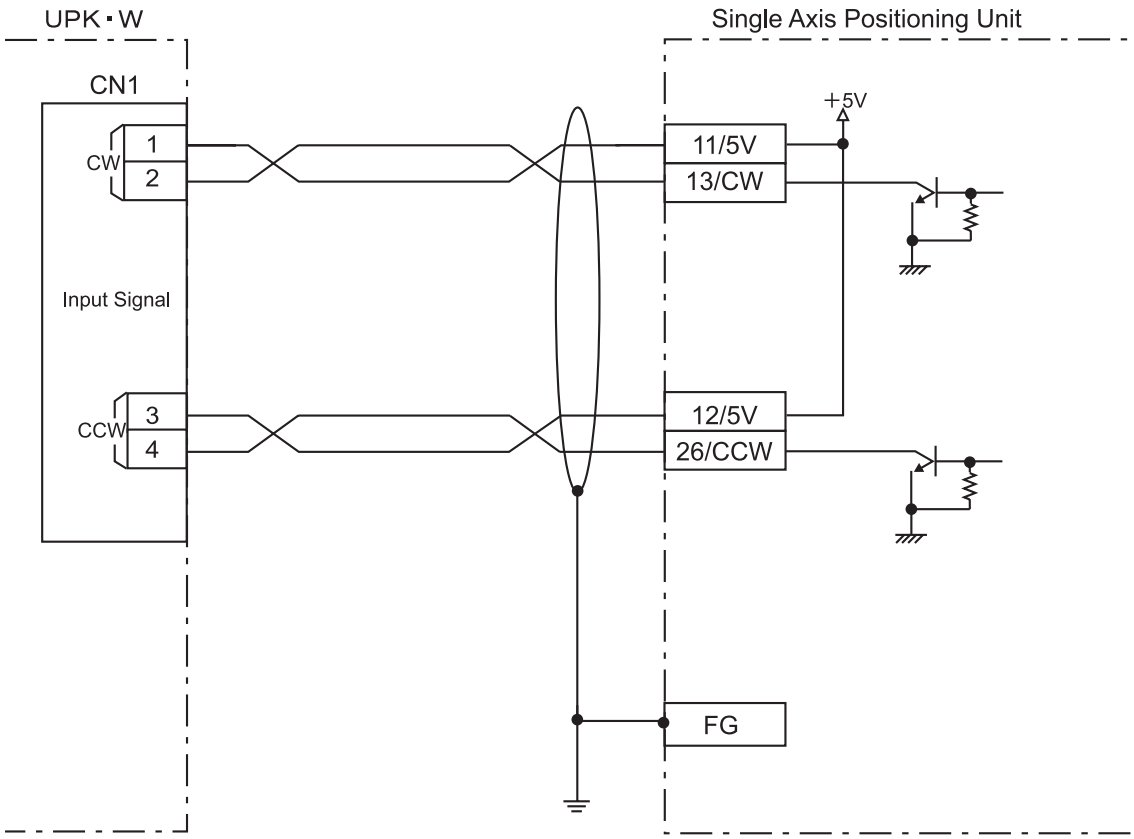
Appendix 1.4 Panasonic Servo Amp (Type A)

■ Line Driver Connection Diagram



Appendix 1.5 Oriental Motor Stepping Motor Amp (Type UPK/W)

■ Line Driver Connection Diagram



Appendix 2 Logic Program Examples

The following sample logic programs show Parameter, Automatic RUN and Direct RUN data settings.

First, use the Teaching Loader to check all movement manually. Once all connection wiring, Servo Amp Alarm logic, COIN movement and Z-phase input is entered correctly, the factory settings can be used for operation.

Once all movement has been confirmed, refer to the following programs when entering your data settings.

■ Logic Program Examples

◆ Array Variables

For the sample programs of Parameter, Automatic RUN, and Direct RUN data settings, variables that designate array are used. Using array variables enables you to create a program with "Indirect" set. Setting "Indirect" can reduce volume for program creation.

Ex.)

Variable POINTER Data	Array Variable PARAM[POINTER]	Data Value
0	PARAM[0]	100
1	PARAM[1]	200
2	PARAM[2]	300
3	PARAM[3]	400
4	PARAM[4]	500
5	PARAM[5]	600

If 6 is set for number of elements of Variable PARAM, 6 successive variables from PARAM[0] to PARAM[5] will be created.

Designating POINTER for the PARAM's array element like PARAM[POINTER] and changing the POINTER can express contents of 0 to 5 in one line.

Designation of PARAM[POINTER] can create slimmer programs than individual designation like PARAM[0], PARAM[1],.....

In the logic sample programs, variables are successively designated with array variables and that reduces the number of programs. Especially for handling commands, it•fs necessary to designate commands and setting values successively. Therefore, using array variables can simplify programs.

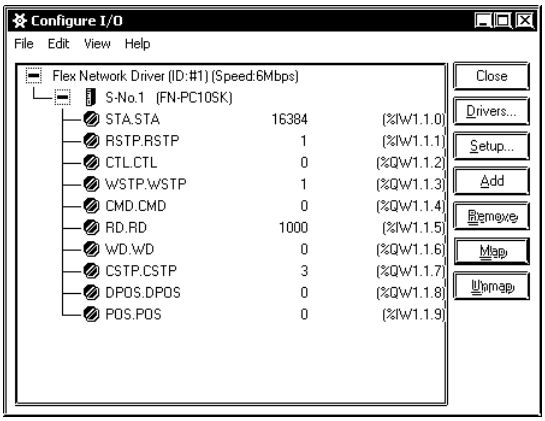
◆ Commands for the positioning unit

In the Parameter, Automatic RUN, and Direct RUN data settings, the program of WRITE interval control (rung 6) is a process to ensure command processes. In handling commands, if commands are processed with the "Scan" interval, the interval is so short that the commands may not be processed. To ensure the command processes, be sure to use the Timer Command that takes process intervals.

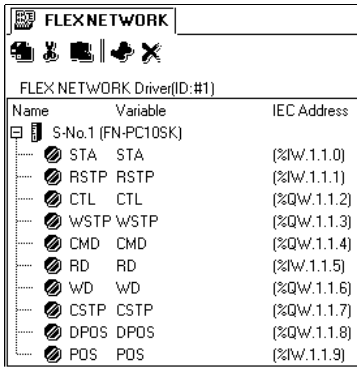
Appendix 2.1 Parameter Data Settings Program

■ I/O Configuration

<GLC2000/LT Series>



<GP3000 Series>



In rung 3 of the logic program, data is stored in various arrays. The data required to perform data write is shown in the following table.

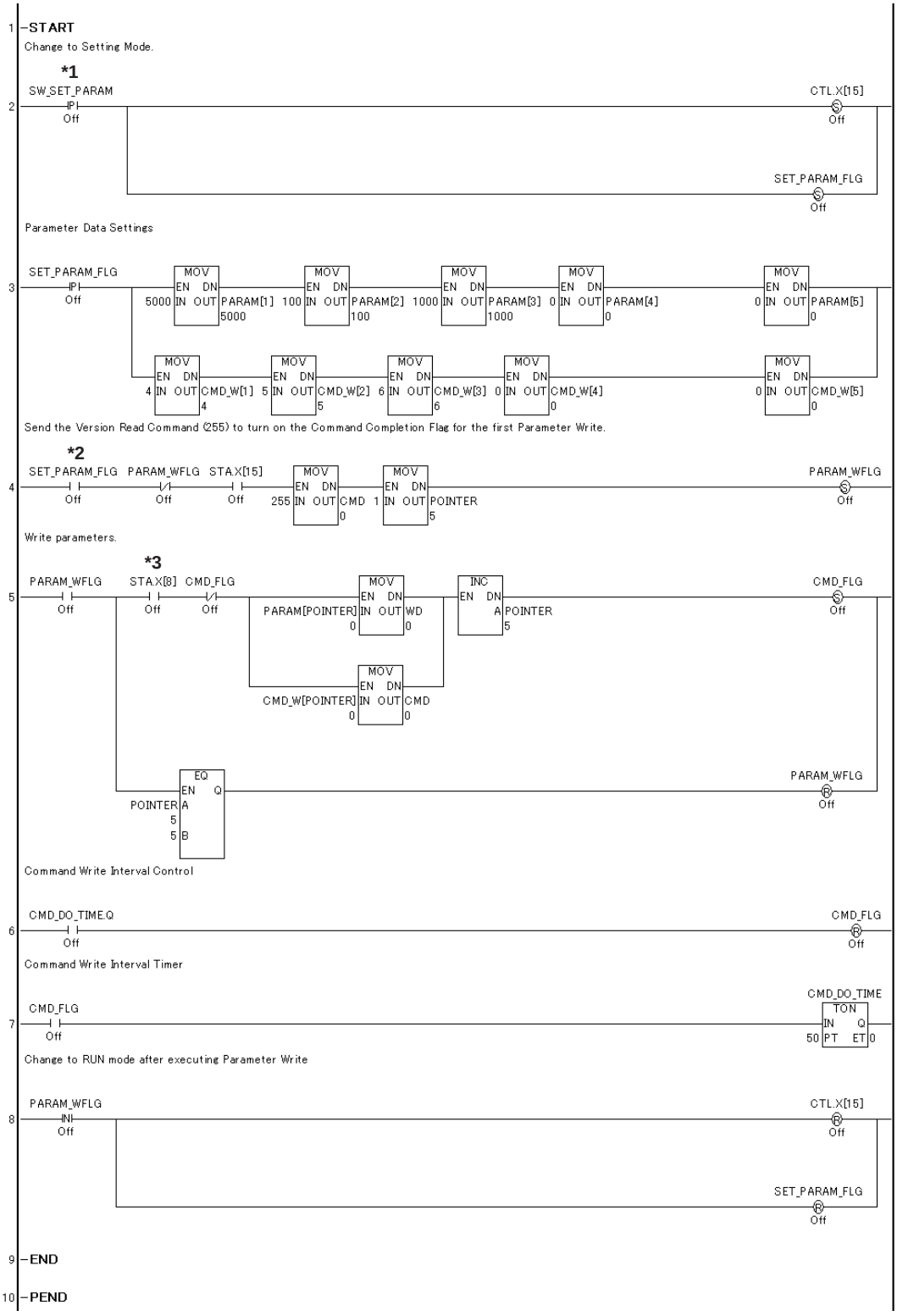
Array No.	Setting Value	Command (No.)
1	5000	4 (Upper Speed Limit)
2	100	5 (Manual Jog Speed)
3	1000	6 (Manual Speed)

When power is turned ON, changing to Setting Mode will turn the Command Completed Flag (STA bit 8) to OFF. In this case, performing a Command Read, or a Command Write will turn the Command Completed Flag back ON.

After checking that the Command Completed Flag is ON, please turn the Write Start flag ON. This will automatically start data write.

Do not use FOR-NEXT commands. While the FOR-NEXT loop is executing, I/O input/output cannot be performed.

■Logic Program Example of GLC2000/LT Series

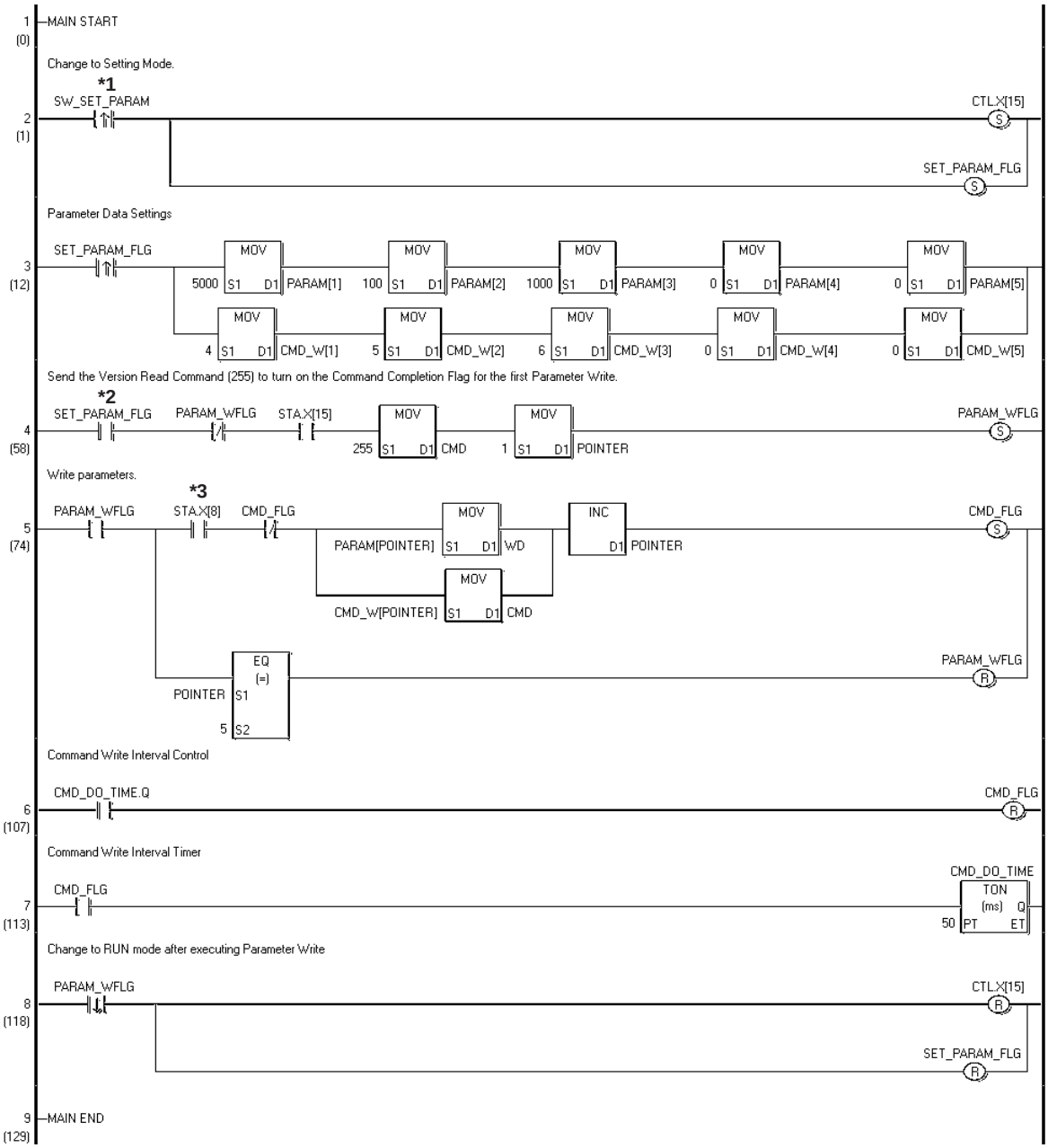


**1 Turn each ON with the switches or the programs on the screen.*

**2 This rung reads out the Flex Network Single Axis Positioning Unit's version number. However, it is not necessary for the correct performance of this feature/ program.*

**3 The Command Completed Flag (Status_Register.X[8]) turns OFF during Power ON and Setting Mode Changeover. In this case, as shown in the above program, performing Command Readout (version) or Command Write will turn the Command Completed Flag ON.*

■Logic Program Example of GP3000 Series



**1 Turn each ON with the switches or the programs on the screen.*

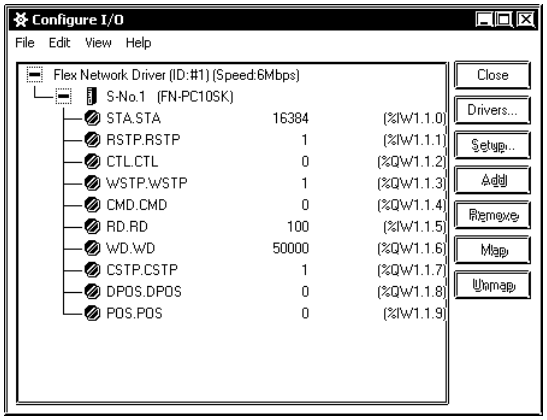
**2 This rung reads out the Flex Network Single Axis Positioning Unit's version number. However, it is not necessary for the correct performance of this feature/ program.*

**3 The Command Completed Flag (Status_Register.X[8]) turns OFF during Power ON and Setting Mode Changeover. In this case, as shown in the above program, performing Command Readout (version) or Command Write will turn the Command Completed Flag ON.*

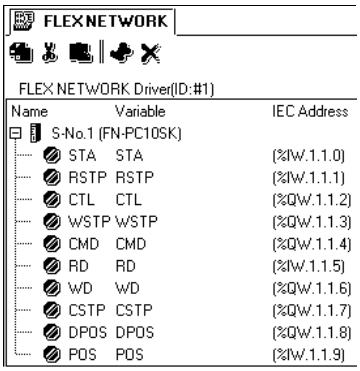
Appendix 2.2 Auto RUN Data Settings Program

■ I/O Configuration

<GLC2000/LT Series>



<GP3000 Series>



In rung 3, data is stored in various arrays. The data required to perform data write is shown in the following table.

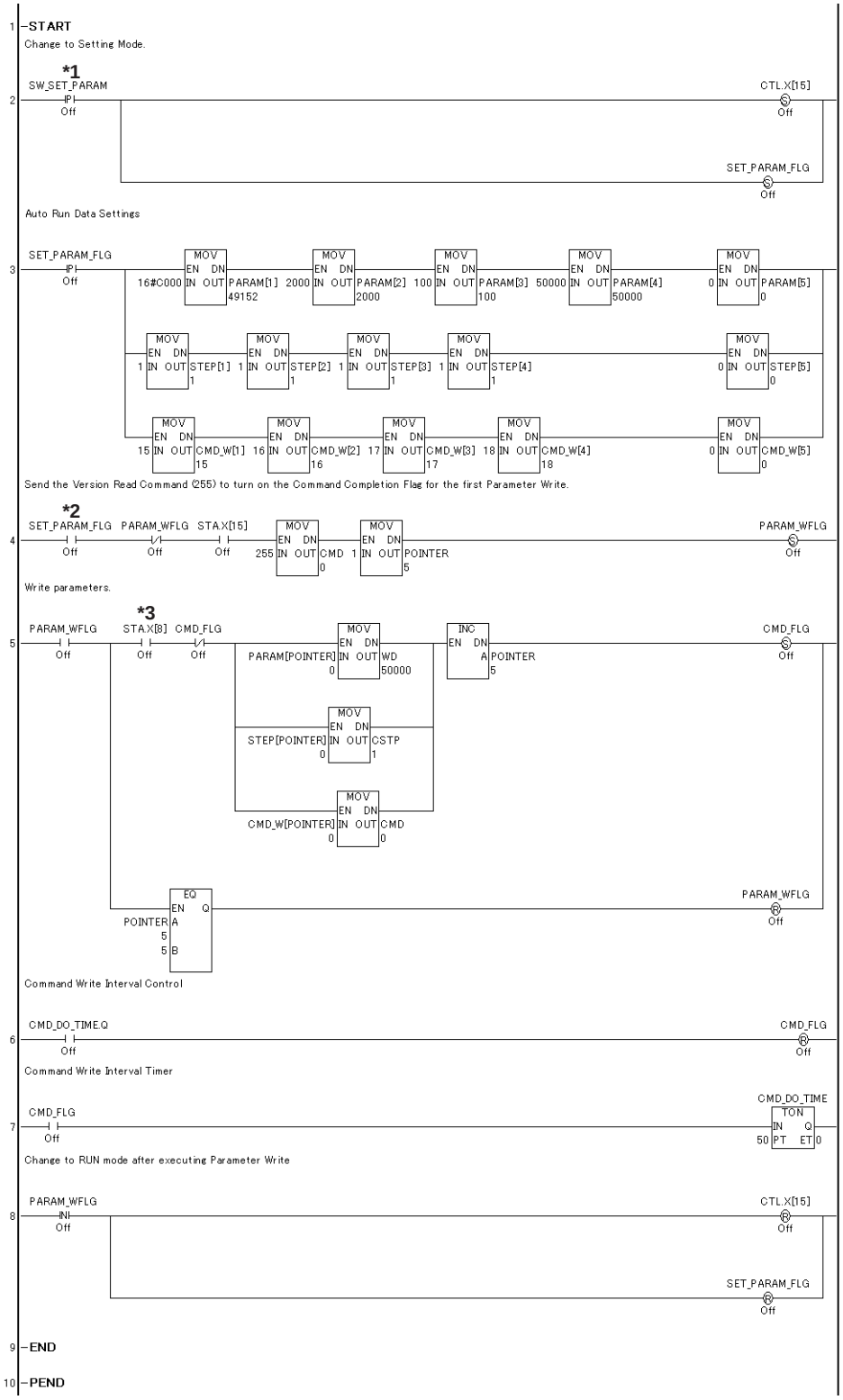
Array No.	Setting Value	Step Number	Command (No.)	Comment
1	49152	1	15 (RUN Mode)	See 5.1.2 Auto RUN Data
2	2000	1	16 (Speed Mode)	
3	100	1	17 (Accel/Decel. Time)	
4	50000	1	18 (Target Position Data)	

When power is turned ON, changing to Setting Mode will turn the Command Completed Flag (STA bit 8) to OFF. In this case, performing a Command Read, or a Command Write will turn the Command Completed Flag back ON.

After checking that the Command Completed Flag is ON, please turn the Write Start flag ON. This will automatically start data write.

Do not use FOR-NEXT commands. While the FOR-NEXT loop is executing, I/O input/output cannot be performed.

■ Logic Program Example of GLC2000/LT Series

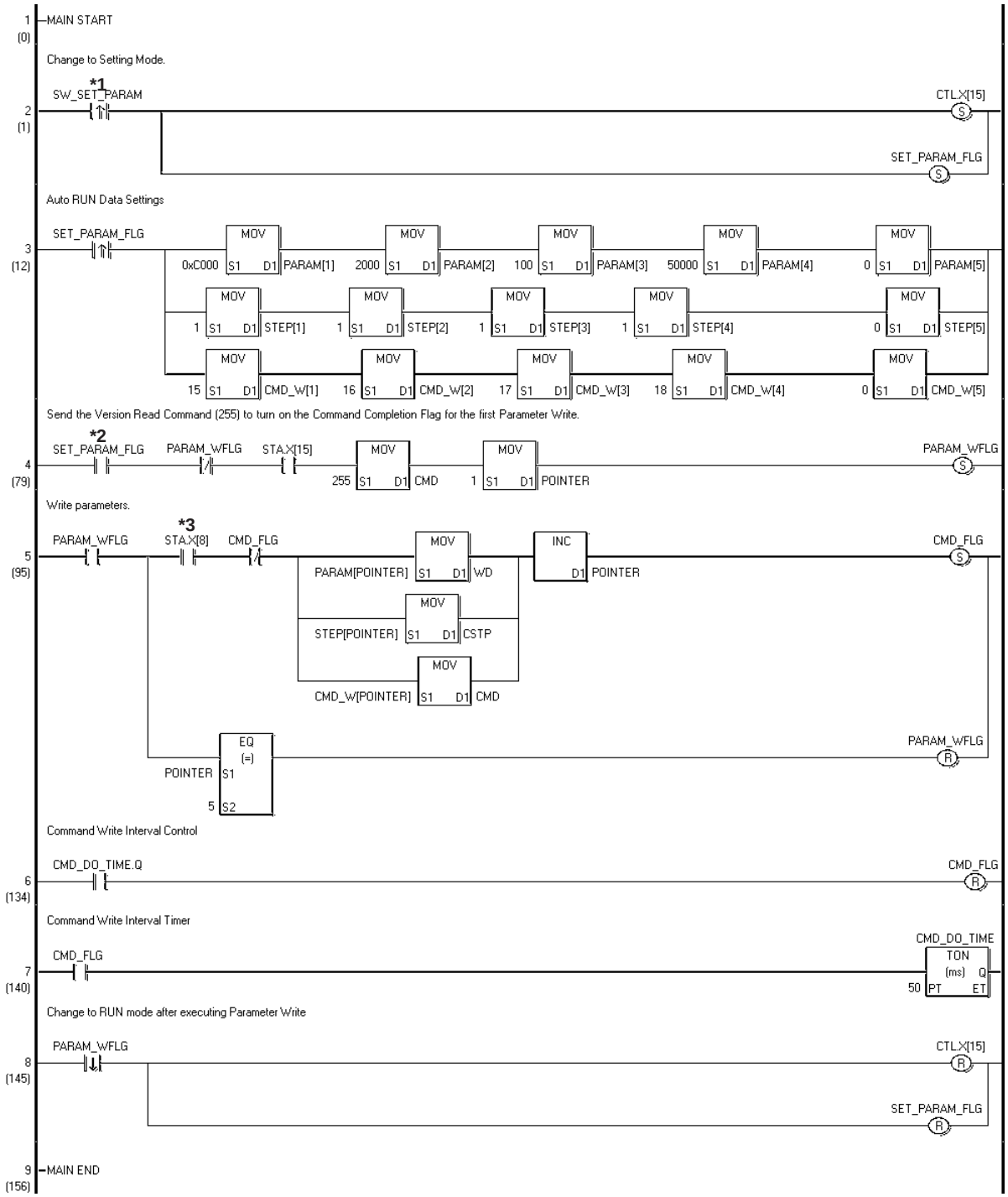


**1 Turn each ON with the switches or the programs on the screen.*

**2 This rung reads out the Flex Network Single Axis Positioning Unit's version number. However, it is not necessary for the correct performance of this feature/ program.*

**3 The Command Completed Flag (Status_Register.X[8]) turns OFF during Power ON and Setting Mode Changeover. In this case, as shown in the above program, performing Command Readout (version) or Command Write will turn the Command Completed Flag ON.*

■Logic Program Example of GP3000 Series



**1 Turn each ON with the switches or the programs on the screen.*

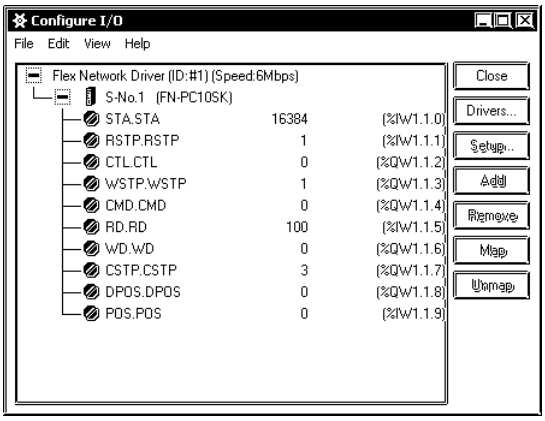
**2 This rung reads out the Flex Network Single Axis Positioning Unit's version number. However, it is not necessary for the correct performance of this feature/ program.*

**3 The Command Completed Flag (Status_Register.X[8]) turns OFF during Power ON and Setting Mode Changeover. In this case, as shown in the above program, performing Command Readout (version) or Command Write will turn the Command Completed Flag ON.*

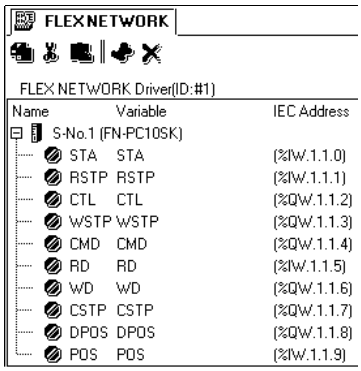
Appendix 2.3 Direct RUN Data Settings Program

■ I/O Configuration

<GLC2000/LT Series>



<GP3000 Series>



In rung 3, data is stored in various arrays. The data required to perform data write is shown in the following table.

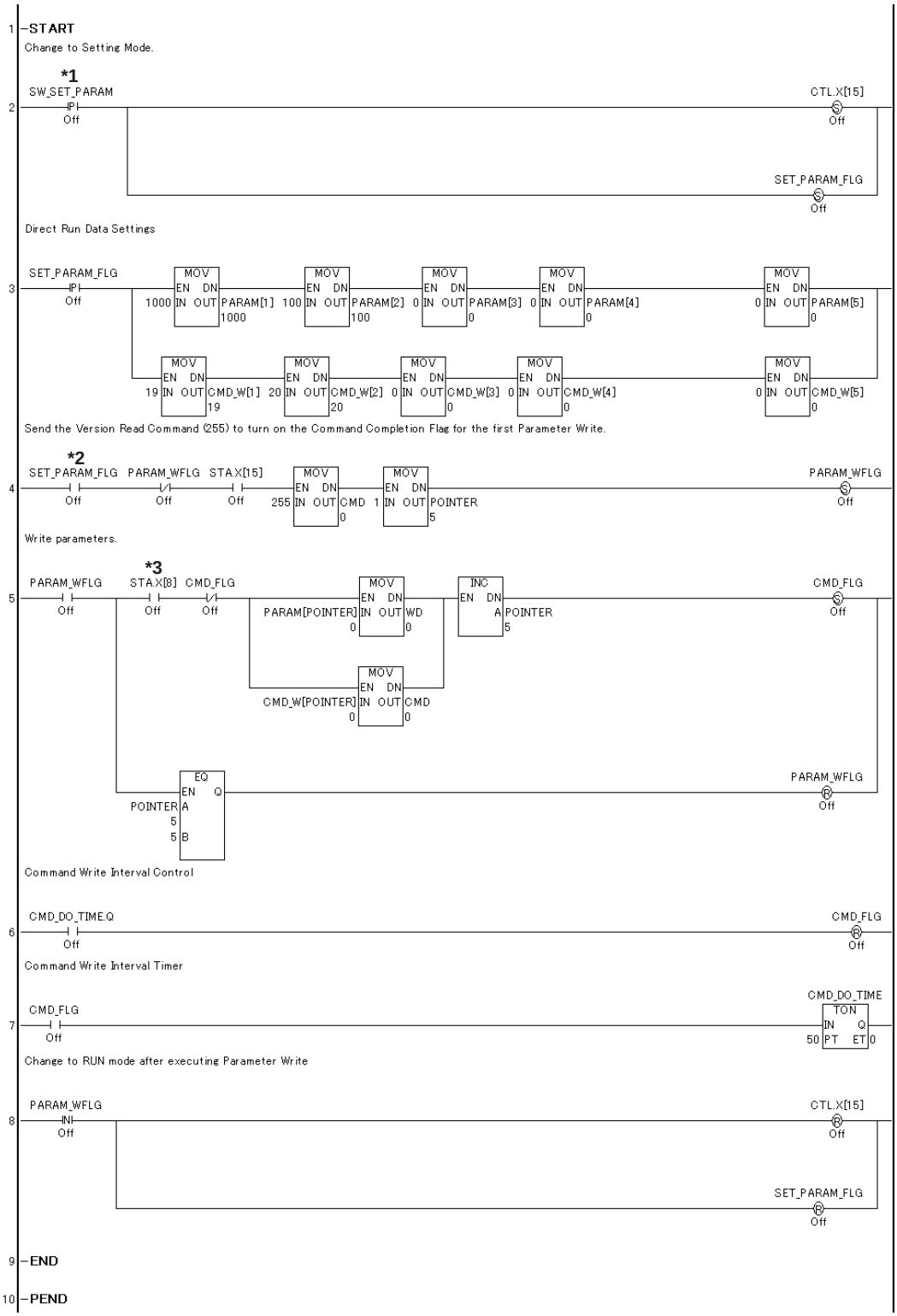
Array No.	Setting Value	Command (No.)
1	1000	19 (Direct RUN Speed data)
2	100	5 (Direct RUN Accel/Decel. Time)

When power is turned ON, changing to Setting Mode will turn the Command Completed Flag (STA bit 8) to OFF. In this case, performing a Command Read, or a Command Write will turn the Command Completed Flag back ON.

After checking that the Command Completed Flag is ON, please turn the Write Start flag ON. This will automatically start data write.

Do not use FOR-NEXT commands. While the FOR-NEXT loop is executing, I/O input/output cannot be performed.

■ Logic Program Example of GLC2000/LT Series

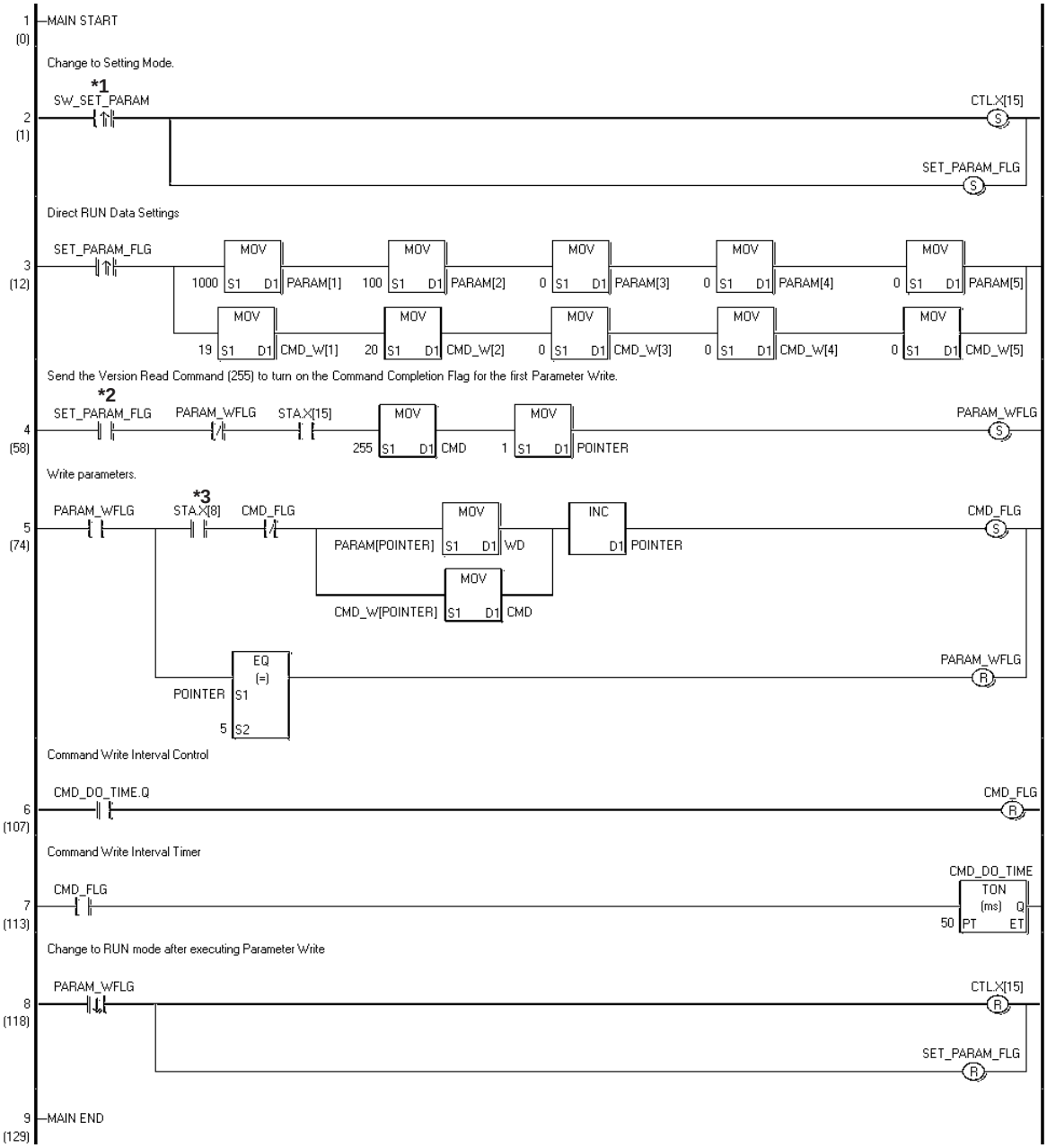


**1 Turn each ON with the switches or the programs on the screen.*

**2 This rung reads out the Flex Network Single Axis Positioning Unit's version number. However, it is not necessary for the correct performance of this feature/ program.*

**3 The Command Completed Flag (Status_Register.X[8]) turns OFF during Power ON and Setting Mode Changeover. In this case, as shown in the above program, performing Command Readout (version) or Command Write will turn the Command Completed Flag ON.*

■Logic Program Example of GP3000 Series



**1 Turn each ON with the switches or the programs on the screen.*

**2 This rung reads out the Flex Network Single Axis Positioning Unit's version number. However, it is not necessary for the correct performance of this feature/ program.*

**3 The Command Completed Flag (Status_Register.X[8]) turns OFF during Power ON and Setting Mode Changeover. In this case, as shown in the above program, performing Command Readout (version) or Command Write will turn the Command Completed Flag ON.*

Appendix 3 RUN Data Settings Sheets

■ Parameter Settings Sheet

Par. No.	MSB			LSB	Initial Value	Data 1	Data 2
	15 to 12	11 to 8	7 to 4	3 to 0			
1	Origin Point Return Method	- O.T.Rev. Rot. - O.T. Logic - S-ALM Logic - COIN Movement	- Accel/Decel Mode - Speed Mode	High Speed Return Count	513 (0201h)		
2	PORG OFF time				10 (Ah)		
3	PORG ON time				10 (Ah)		
4	Upper Limit Speed				10 (Ah)		
5	Manual JOG Speed				10 (Ah)		
6	Manual Speed				10 (Ah)		
7	Auto JOG Speed				10 (Ah)		
8	Origin Point return Speed				10 (Ah)		
9	High Speed Origin Point Return Speed				10 (Ah)		
10	Accel/Decel Speed time				10 (Ah)		
11	Backlash Compensation				0 (0h)		
12	Origin Point Correction				0 (0h)		
13	Upper Position Data				2147483647 (7FFFFFFFh)		
14	Lower Position Data				-2147483647 (80000001h)		
15	JOG Dial Speed Change Rate (only w/Teaching Loader)				20 (14h)		
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

■ Auto RUN Data Settings Sheet

Step No.	RUN Mode	Speed	Accel/Decel Time	Position Data

Memo