



# Flex Network Single-Axis Positioning Unit User Manual



## 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>

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## **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:



Indicates situations where severe bodily injury, death or major machine damage will definitely occur.

Indicates situations where severe bodily injury, death or major machine damage can possibly occur.

Indicates situations where slight bodily injury or machine damage can occur.

## 

- 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.

## 

- 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.

## 

- 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
		FN-X16TS41	1	
		FN-X32TS41	2	
		FN-Y16SK41	1	
		FN-Y16SC41	1	
	I/O Unit	FN-XY08TS41 1 DIO Unit User	DIO Unit User Manual	
		FN-XY16SK41	1	
		FN-XY16SC41	1	
		FN-XY32SKS41	4	
Flex Network		FN-Y08RL41	1	
	Apolog Unit	FN-AD02AH41	1	2-Cannel Analog Unit
		FN-DA02AH41	1	User Manual
		FN-AD04AH11	4	Analog Unit User Manual
		FN-DA04AH11	4	Analog Onit Oser Manual
	Single-Avis Positioning Unit	FN-PC10SK41	4	2-Cannel Analog Unit User Manual Analog Unit User Manual This Manual
		FN-PC10LD41	-	i nis manual
	High Speed Counter Unit	FN-HC10SK41	Q	High-Speed Counter Unit
	riigii-Speed Counter Onit		U	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.
		GLC2300 Series	GLC2300T	GLC2300-TC41-24V
			GLC2300L	GLC2300-LG41-24V
		GLC2400 Series	GLC2400T	GLC2400-TC41-24V
GLC	GLC2000 Series	GLC2500 Series	GLC2500T	GLC2500-TC41-24V
		OEC2300 SCHC3	02023001	GLC2500-TC41-200V
		GLC2600 Series	GLC2600T	GLC2600-TC41-24V
		OLC2000 JUNUS	GLC20001	GLC2600-TC41-200V
	LT Series		LT TypeB	GLC150-BG41-FLEX-24V
IТ			LT Type B+	GLC150-BG41-XY32KF-24V
LI			LTC Type B+	GLC150-SC41-XY32KF-24V
			LT Type C	GLC150-BG41-RSFL-24V
		GP-3300 Sprips	AGP-3300L	AGP3300-L1-D24-FN1M
	GP3000 Series	01 3300 30103	AGP-3300T	AGP3300-T1-D24-FN1M
GP		GP-3400 Series	AGP-3400T	AGP3400-T1-D24-FN1M
		GP-3500 Series	AGP-3500T	AGP3500-T1-D24-FN1M
				AGP3500-T1-AF-FN1M
		CP 3600 Series		AGP3600-T1-D24-FN1M
	GF-3000 Selles			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)



The Flex Network Single-Axis Positioning Unit User Manual is sold separately. Installation Guide

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<sup>\*1</sup>. 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.

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

1. System Design

2. Accessories

## 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 Network 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 Two (2) Channels **Flex Network Unit** 000<u>40404040</u> GLC Flex Network I/F 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 Single-Axis **Positioning Unit** to Stepping Driver **16 Input Points** PWB.C 10002 FBI-X16TS11 AND MAR 20\_40\_40\_40\_90\_90\_90 to next unit \*1 Sensors, DC24V DC24V Operation **Switches** Single-Axis 8 points Input/ **Positioning Unit** PWB.0 OSTA RUNO OEBR 8 points Output GLC to Servo Driver No. **ÖÖÖÖÖ**OOOOOOO DC24V Valve Actua-DC24V tor Lamp Sensors, to next unit \*1 Operation **Switches** 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

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- \*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

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

#### ■ Maintenance Items

ltem	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



## **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 10M $_{\Omega}$ or higher (combined I/O power and FG terminals)		

#### 2.1.2 Environmental

Ambient			
Operating	0°C to 55°C		
Temperature			
Storage Temp.	-25°C to +70°C		
Ambient Humidity	30%RH to 95%RH (no condensation)		
Air Purity (Dust)	0.1mg/m <sup>3</sup> or less (non-conductive levels)		
Corrosive Gasses	Free of corrosive gasses		
Atmospheric Pressure	800 hPa to 1114 hPa (2,000 meters or lower)		
	IEC61131-2 (JIS B 3501) compliant		
Shock Resistance	147m/s <sup>2</sup> (in X,Y, Z directions - 2 times each)		
	IEC61131-2 (JIS B 3501) compliant		
	When vibration IS NOT continuous:		
Vibration	10Hz to 57Hz 0.075mm, 57Hz to 150 Hz 9.8m/s <sup>2</sup>		
Resistance	When vibration IS continuous:		
	10Hz to 57Hz 0.035mm, 57Hz to 150 Hz 4.9m/s <sup>2</sup>		
	X,Y, Z directions for 10 times (80 min.)		
Noise Immunity	Noise Voltage: 1000Vp-p		
(via noise	Pulse Width: 1 <sub>u</sub> s		
simulator)	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	1		
Axis			
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	1.5625pps to 62.5kpps/6.25pps to 250kpps/12.5pps to 500kpps/		
Frequencies <sup>*1</sup>	50pps to 2Mpps (set via parameters)		
Max. Pulse	+/-2,147,483,647 pulses		
Output			
Accelerate/Dece	Tranezoidal and Sinusoidal curves		
Ilerate Method			
Position	Abcoluto/Incromontal		
Settings	ADSOIUTE/IIICTEITTEITTAI		
Backlash	n ta 65 525 nuleas		
Correction	0 10 00,030 puises		
Control Mode	Manual, Automatic, Direct		
Origin Point	4 Types (option, low-speed, 2 types of high speed)		
Return			
Origin Point	-32,767 to 32,767 pulses		
Correction			

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

	GLC2000/LT Series	GP3000 Series		
Communication Configuration	1:N			
Connection Method	Multi-Drop Connection			
Maximum	200m/channel at 6 Mbps			
Distance	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			
		63 stations max.,		
		Bit variable input: 256 points,		
Number of	63 (max.), 1008 I/O points	Bit variable output: 256 points,		
Connectable Nodes	(depending on type of units used.)	Integer variable input: 64 points,		
Nouco		Integer variable output: 64 points		
		(depending on type of units used.)		
Number of Occupied Nodes	4			

#### 2.2.2 Data Transfer Settings

Rated Input Voltage	
	DC24V
Maximum Allowable Input Voltage	DC26.4V
No. of Input Points 5 po	pints (1 common)
Control Input Input ON Voltage D	C19V or higher
Input OFF Voltage	DC5V or less
Input Impedance	3.9k <u>Ω</u>
Input Delay OFF-ON	1.5ms or less
ON-OFF	1.5ms or less
Rated Input Voltage	DC5V
Maximum Allowable Input Voltage	DC5.5V
No. of Input Points	1
Input ON Voltage	330Ω
Input OFF Voltage	OC4V or higher
Input Impedance [	DC1V or lower
Input Dolay OFF-ON	1.5ms or less
ON-OFF	1.5ms or less
Rated Output Voltage	DC24V
Maximum Allowable Output Voltage D	0C24V(+/-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 OFF-ON	1ms or less
Time ON-OFF	1ms or less
Rated Output Voltage	DC5V
Maximum Allowable Output Voltage DC	4.5V to DC5.5V
No. of Output Points 2 p	oints (CW/CCW)
Pulse Maximum Load Current	50mA or less
	None
Output Output Hold Feature	
Output         Output Hold Feature           Voltage Drop (ON Voltage)         E	DC0.8V or less
Output         Output Hold Feature           Voltage Drop (ON Voltage)         E           Line Driver         Differential Output         Equivaler	DC0.8V or less nt to TI Corp. SN75158

#### 2.2.3 Input/Output Specifications

### 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.	Туре	Description
1	241/	Input	
3	24 V	Voltage	
4	NC		
5	COIN	Control	Positioning completed input signal from Motor Driver
6	-O.T	Input	CCW direction overtravel signal (a contact/b contact)
7	PORG <sup>*1</sup>		Origin point switch (a contact)
8	END	Control Output	Positioning completed output
9	+CW	Pulse	CW direction pulse output (Line Driver)
10	-CW	Output	
11 12	+5V	Output Voltage	Pulse output voltage (for Open collector)
13	CW	Pulse Output	CW direction pulse output (non-logical Open Collector)
14	NC		
15		Input	
16	24G	Voltage	Controller Input Voltage DC0V
17			
18	+0.T	Control	CW direction overtravel signal
- 10	0.41.14	Input	(a contact, b contact)
19	S-ALM	7 Dhasa	Motor Driver Alarm Input
20	-Z (URG)	Z Phase	Encoder origin point signal
21	+2 (URG)	Dulaa	
22	-CCW	Output	CCW direction pulse output (Line Driver)
24	50	Output	Pulse output voltage
25	5G	Voltage	(for Open collector)
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.>

1	4	1	6	1	8	2	0	2	2	2	4	2	6
	1	5	1	7	1	9	2	1	2	3	2	5	
1		3	3	Ę	5	1	r	ę	9	1	1	1	3
	2	2	4	4	6	3	8	3	1	0	1	2	

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) Single Axis Positioning Unit

\*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)



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### 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**

E: Station No. Switch

FN-PC unit's S-No.

**F:** Terminator

ON or OFF.

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

Designates the second (hex) digit of the

Turns the termination resistance feature

#### 0 ∾ 6 0 ∾ - 0 - -

Π

# A B C OFFICIENTS



#### **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.



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.





indicates the

#### S-No. Setting Example

S-No. (Sta	ation No.)	Dip S	witch	S-No. (Station No.)	
Base 10	Base 16	3	4	Switch	
1	01h	OFF	OFF	1	
		-6 1 2 -12	- 		This station number is set to 1.
16	10h	OFF	ON	0	
		-6 1 2 -12			This station number is set to 16.
60	3Ch	ON	ON	С	
		-6 1 2 -12			This station number is set to 63.



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.





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.



Dip Switch 2

6Mbps ← ▶12Mbps



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

#### A FN-PC10LD41 1-AXIS B STOP MODE START C D

#### 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



Flex Network Single Axis Positioning Unit User Manual

## Memo



### 3.1 Installation

## 

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

## 

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	FN-CABLE2010-31-MS	10m		
Corporation	FN-CABLE2050-31-MS	50m		
Corporation	FN-CABLE2200-31-MS	200m		

The cable should be made as shown below:





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.]





Crimp terminals should be either taped or covered with a plastic tube.

• Be sure to tighten all unused terminal screws.



- 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





Positioning unit.

Flex Network Terminal/ **Communication Block** 



3-3



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.





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.



Operation Mode
 Functions

## 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.





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

<ol> <li>RUN Data Write</li> <li>Origin Point return</li> <li>Manual RUN</li> <li>Automatic RUN</li> <li>Direct RUN Command</li> </ol>	No.	Function Name
<ol> <li>2 Origin Point return</li> <li>3 Manual RUN</li> <li>4 Automatic RUN</li> <li>5 Direct RUN Command</li> </ol>	1	RUN Data Write
<ul> <li>3 Manual RUN</li> <li>4 Automatic RUN</li> <li>5 Direct RUN Command</li> </ul>	2	Origin Point return
4 Automatic RUN 5 Direct RUN Command	3	Manual RUN
5 Direct RUN Command	4	Automatic RUN
	5	Direct RUN Command
6 Current Position Read	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

1. RUN Data

# 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.

	CN	ЛD					WD/RD		
Par. No.	Write CMD	Read CMD	MSB	11 0	7 4	LSB	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)	Ze	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)			1	MIN STROKE LIMIT	-2147483647 - 0 (80000001-0h)	-2147483647 (80000001h)

#### ■ Parameter Summary (Command Summary)

\*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	
Dor	Write	Road	MSB			LSB	Teaching		Initial
No.	CMD	CMD	15 - 12	11 - 8	7 - 4	3 - 0	Loader Display	Setting Range	Value
15	15 (0Fh)	143 (8Fh)	- RUN Enable/Disable - Cycle Continuous/Stop - Control Mode - Position Settings		Refer to Bit Allocation		32768 (8000h)		
16	16 (10h)	144 (90h)	Speed Data <sup>*1</sup> (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 <sup>*2</sup> (Unit: Pulse)			POS	-2147483647 to H102147483647 (80000001 - 7FFFFFFh)	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.

	CN	/ID			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.

h	Origin Point	Single-Axis Teaching Loader		
D <sub>15</sub>	Return Method	Display		
<u>0</u>	CCW DIR		CCW	
1	CW DIR		CW	

#### **Origin Point Return Method**

Sets the Origin point return method.

b <sub>13</sub>	b <sub>12</sub>	Zero Origin Return Method	Single-Axis E	Teaching Loader Display
<u>0</u>	<u>0</u>	Optional Origin Point Return	PTN	OPTIONAL
0	1	Low Speed Return		LOW SPEED
1	0	High Speed Return 1	VV A I	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.

h	Over Travel	Single-Axis Teaching Loader		
D <sub>11</sub>	Reverse	Display		
<u>0</u>	Reverse Disable		OFF	
<u>1</u>	Reverse Enable	0.TREVERSE	ON	

#### O.T. Logic

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

b <sub>10</sub>	O.T. Logic	Single-Axis Tea Displ	iching Loader ay
<u>0</u>	a Contact		A CONTACT
1	b Contact	0.1 20010	B CONTACT

#### Servo Alarm Logic

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

b <sub>9</sub>	Servo Alarm Logic	Single-Axis Tea Displ	ching Loader ay
0	a Contact		A CONTACT
<u>1</u>	b Contact		B CONTACT

#### **COIN Logic**

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

b <sub>8</sub>	COIN Operation	Single-Axis Tea Displ	ching Loader ay
<u>0</u>	a Contact		A CONTACT
1	b Contact		B CONTACT

#### (c) Acceleration/Deceleration Mode

b <sub>7</sub>	b <sub>6</sub>	Accel/Decel Single-Axis Method D		Teaching Loader Display	
<u>0</u>	<u>0</u>	Trapezoidal Accel/Decel	SLOPE	TRAPEZOID	
0	1	S-Curve Accel/Decel 1	MODE	S1	(1)
1	0	S-Curve Accel/Decel 2	WODL	S2	(2)
1	1	S-Curve Accel/Decel 3		S3	(3)

Sets the Acelleration/Decelleration mode.

Sinusoidal Curves - Acceleration/Deceleration Comparison

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



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



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



#### **Speed Mode**

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

b <sub>5</sub>	b <sub>4</sub>	Speed Range	Speed Modulus	Teaching Lo	oader Display
<u>0</u>	<u>0</u>	1.5625pps - 62.5Kpps	1.5625pps		1.56 -> 62.5k
0	1	6.25pps - 250Kpps	6.25pps	SPEED	6.25 ->250k
1	0	12.5pps - 500Kpps	12.5pps	MODE	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 <sub>3 -&gt;</sub> b <sub>0</sub> (Base 16)	Count	Single-Axis Te Dis	eaching Loader olay
0	0		0
:	:	COUNT	:
F	15		15

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



■ 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

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

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

3) KV=12.5pps

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

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



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**

Flex Network Single Axis Positioning Unit User Manual

• Origin Point Correction Amount: -100(FFFFF9Bh)



**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 7FFFFFFh).

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 0000000h).

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

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

Data No. 1



(a) RUN Enable/Disable

b <sub>15</sub>	RUN Enable/Disable	Single-Ax Loade	kis Teaching er Display
0	RUN Disable (To not operate the unit)	RUN	OFF
<u>1</u>	RUN Enable (To operate the unit)	NON	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.

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

#### (b) Cycle Continuous/Stop

b <sub>14</sub>	Cycle Continuous/Stop	Single-Axis [	Teaching Loader Display
0	Cycle Continuous		CONTINUE
1	Cycle Stop	END	

• In automatic mode 2 and 3, operation is continuous from the first step to the b<sub>14</sub>=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 <sub>11</sub>	b <sub>10</sub>	Control Mode	Single-Axis	s Teaching Loader Display
0	0	Position Control Mode		POS
0	1	Speed + Position Control Mode	CNTRL	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<sub>8</sub> and b<sub>9</sub>, 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 <sub>9</sub>	b <sub>8</sub>	Position Setting	Single-Axis Te Dis	eaching Loader play
<u>0</u>	0	Absolute		ABS
0	1	Incremental	INC INC	

Absolute/Incremental  $(b_8 \text{ and } b_0)$ 

- 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**

	CN	ЛD			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

	CN	/ID			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		

1. Flex Network Driver Settings

2. Data Settings

# 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>

833	EI I		DWODK	
Jaar	FL			
	8		+ X -	
			-	
FLE	: A IN	EIWU	RK Driver(ID	:#1)
Nam	e		Variable	IEC Address
₽ [	S-	No.1 (F	N-PC10SK)	
	Ø	STA	STA	(%IW.1.1.0)
}	Ø	RSTP	RSTP	(%IW.1.1.1)
	Ø	CTL	CTL	(%QW.1.1.2)
}	Ø	WSTP	WSTP	(%QW.1.1.3)
	Ø	CMD	CMD	(%QW.1.1.4)
	Ø	RD	RD	(%IW.1.1.5)
	Ø	WD	WD	(%QW.1.1.6)
}	Ø	CSTP	CSTP	(%QW.1.1.7)
	0	DPOS	DPOS	(%QW.1.1.8)
L	Ø	POS	POS	(%IW.1.1.9)

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	
1	0: 1 Step, 1:Continuous Step 2: 1 Cycle, 3: Direct RUN	Allows checking of RUN mode.
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 <sup>*1</sup>	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	Allows checking of RUN mode.
1	2: 1 Cycle, 3: Direct RUN command	je i se i
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 <i>5.1.2 Auto RUN Position Data</i>
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 <sup>*2</sup>	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





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





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





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

- 1. Operation Mode Summary
- 2. Mode Selection
- 3. POS (Current Position Display) 7. PAR (Parameter Input)
- 4. PROG (Program Input)
- 5. AUTO (Auto RUN)
- 6. MAN (Manual RUN)
- 8. CHECK (Check Feature)

# Chapter

7

# **Single-Axis Teaching Loader**

#### 7.1 **Operation Mode Summary**

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

The FN-PC unit has the following operation modes.

## 7.2 Mode Selection

Use the following steps to select the operation mode.







# 7.3 Current Position Display (POS)

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

#### CURRENT POSITION DISPLAY SCREEN



#### 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.	1) Rotate the JOG wheel to select STEP.
PROG MODE INITIAL SCREEN	<ul> <li>2) Press the arrow keys (←,→) to designate the digit position. Press the [COM/RTN] key to designate if the</li> </ul>
INPUT	position is shown in base 10 or base 16.
STEP= H 01	<ol> <li>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).</li> </ol>

#### (2) Entering Data/Selections

Use either the JOG wheel or the arrow keys  $(\leftarrow, \rightarrow)$  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.



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#### (3) Data Entry

#### 1. RUN ON/OFF Input



#### 2. Cycle CONTINUE/END Input



- 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.
- 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.

# STEP 01 CNTRL= POS

3. CNTRL Mode Input

### 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

- 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.

After SLOPE input, go to next step (STEP2)

#### 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  $(\leftarrow, \rightarrow)$  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

INPUT

STEP=



This area explains the AUTO Mode selections available. Rotate the JOG wheel or press the arrow keys  $(\leftarrow, \rightarrow)$  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.)



01



#### 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)

Mode Selection. The Teaching Loader unit can be used to Manual Mode Initial Screen perform Manual RUN and Origin Point Return. MANUAL <100%> In this mode, the JOG dial is used to perform POS= 12345 manual operation. Origin Return STOP COM/RTN Check Display (Rotate Right) : CW RTN ORIGIN OK? SET : OK STOP: NO (Rotate Left) : CCW SET **During Origin Return** ORIGIN RETURN NOW ! After Origin **Return Completed** When Origin Point Return is completed, the MANUAL <100%> POS (Current Position) value will be "0". POS data is displayed during Manual RUN. POS= 0 Use the arrow keys  $(\leftarrow, \rightarrow)$  to change the unit's positioning. Each push of these keys < n% > MANUAL equals one click of the JOG dial and changes POS= 0 the output speed one setting. Output Speed = (Manual Speed - Man. Jog START Speed) x n% + Man. Jog Speed MANUAL < n% > Press the [START] key to change from POS=H 0 base10 to base16 (decimal or hex).

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





Use either the JOG wheel, or the arrow keys  $(\leftarrow, \rightarrow)$  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 V alue Input Method

### P1-1 Selection Screen



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.



P6 Input Screen



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  $(\leftarrow, \rightarrow)$  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

-	CHECK	$\rightarrow$
IN1	01111100	

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
								)N=1 )FF=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  $(\leftarrow, \rightarrow)$  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.

<ol> <li>Auto Run Data</li> </ol>	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



(5) FN-PC10SK41 Version No. Display Screen

FN-PC10SK41 Ver. 1.0 This screen displays the FN-PC unit's version information number. Press the [MODE] key to return to the Check Feature menu.



- 2. Manual RUN Operation
- 3. Auto RUN
- 4. Direct RUN

# 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

 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.



## • Origin Point Return with (PORG) ON

- 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.



## ■ 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.



## 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

- 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.
- 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.





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

- 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.
- 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. CW



## ■ Origin Point Return (PORG) in CW direction

- 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.



## 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**

 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.



## ■ Origin Point (PORG) is ON

- 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.
- 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.



## **CCW Direction Origin Point (PORG) Return**

- 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 fogic to wait one scan or longer before executing. Next, turn the CW (CCW) ON.



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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.



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

#### [Auto RUN Data]

In Single-Step RUN Mode:

Step 1 ->	Step 2 🔶	Step 1 🔶	Step 3 🔶	Step 1	Step 4 -	
<b></b>						Repeat

## 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	RUN	Cycle	Control Mode	Position Setting	Target	Speed	Slope
NO.	Enable/Disable	Contin./Stop		,	Position	Data	
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.



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

#### [Auto RUN Position Data]



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

Reference 5.1.2 Automatic RUN Data

#### **Direct RUN** 8.4

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 param-*Important* eters not related to Origin Point Return cannot be changed.

- 1. Prior to Troubleshooting
- 4. Troubleshooting for GP3000 Series
- 2. Error Code Display
- 3. Troubleshooting for GLC2000/ LT Series

# **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

Chapter

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).



Flex Network Single Axis Positioning Unit User Manual





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	
	Is the operation mode	Set the RUN Mode /Setting Mode switch	
	set to RUN Mode?	(Control bit 15) to ON.	
Connotwrite cot	Does the previous		
	Command value remain in	Re-check the values entered in the Command (CMD) setting,	
value correctly	CMD (has the value not	and enter correct values.	
	been cleared to 0)?		
	Is the Teaching Loader	Stop the Teaching Loader and return to the menu screen.	
	Deing used?		
		Turn the FN-PC unit's power ON.	
	Has the GLC unit's control		
Onenationsia	feature caused an	Release the GLC unit's Immediate stop command.	
Operation via	Immediate stop?	· · · · · · · · · · · · · · · · · · ·	
Teaching	Is the FN-PC unit's wiring	Wro all terminals correctly	
Loader is not	correct?	wie all terminals correctly.	
possible	Is the COIN or Z Phase	Re-enter the COIN or 7 Phase Input values	
F	Input correctly set?		
	Has the unit changed to the		
	mode set in the GLC's	Set the GLC to RUN mode.	
	Control (CTL) area?	Line shielded twisted new wines	
		- Use shielded, wisied-pair wires Donair all incorract wiring	
		- Repair all cut Terminal and Connector wiring	
		- Senarate all AC Circuit and Pulse Signal lines	
	Is there too much noise in	- Place the lines in metal ducts to protect them from peripheral	
	the lines?	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	
		If the wiring is incorrect the EN-PC will rotate only for the final	
Motor operates	Is the alignment of the U, V	pulse amount. Occasionally, depending on the type of incorrect	
but unit	and W lines for the Amp	encoder wiring and the U.V.W. power lines, the FN-PC unit will	
movementic	and the Motor Terminal	rotate, however, confirm that the amp and motor's wiring is	
	numbers the same?	correct.	
not correct	ls ⊥/∩T (Status hits 3	Turn the +/-O.T. (Status bits 3, 4) OFF.	
	4) turned ON?	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	- Check the Z-Phase Input wiring.	
	stop during High Speed	- Check if the Z-Phase signal is occurring during the PORG ON	
	Origin Point Return 2?	period.	
	Has an overnow error occurred?	Clear the overflow error by executing Reset or Preset.	
	Is the value 8/6 in	An error was detected in the FN-PC unit.	
		<b>Reference</b> 9.3.2 – "Error Code List for GLC2000/LT	
		Series"	

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

# 

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.		
042	(Input range: set at 4 - 20mA)		
	FN-HC unit error occurred. For details, use a command to call up the		
843	unit's error code.		
	<b>Reference</b> Flex Network High Speed Counter Unit User Manual		
844	Initial error in the FN-HC Unit		
845	FN-HC unit Write Command error		
	FN-PC unit error. For details, use a command to call up the unit's error		
846	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
Hamo	1	During RUN mode, Start Movement was input.	Cont.
	(0001h) 3 (0003h)	Auto RUN's Control Mode designates an undefined mode.	
	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.
Command	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.
Error	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	
Hardware Error	513 (0201h)	EEPROM parameter area error.	
Servo Error	768 (0300h)	The servo driver has caused an alarm.	
	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.
Data Error	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	
	2050 (0802h)	- (CCW) Direction Overtravel -OT	
Comm. Error	32773 (8006h)	Communication error occurred between the Teaching Loader and the FN-PC unit.	
Operation Error	36865 (9001h)	During operation via the Teaching Loader, the FN-PC unit has received operation commands from the GLC unit.	Stop <sup>*1</sup>
	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).



Flex Network Single Axis Positioning Unit User Manual





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		
	Is the operation mode	Set the RUN Mode /Setting Mode switch		
	set to RUN Mode?	(Control bit 15) to ON.		
C	Does the previous			
Cannot write set	Command value remain in	Re-check the values entered in the Command (CMD) setting,		
value correctly	CMD (has the value not	and enter correct values.		
	been cleared to 0)?			
	Is the Teaching Loader	Stop the Teaching Loader and return to the menu screen.		
	being used?			
	Is the FN-PC unit's power	Turn the FN-PC unit's power ON.		
	UN?			
	Has the GP units control	Delegas the CD unite Immediate star command		
Operation via	reature caused an	Release the GP units immediate stop command.		
Teaching	Immediate stop?			
Loador is not	IS THE FIN-PC UTILS WITHING	Wire all terminals correctly.		
	LUTTELL! Is the COIN or 7 Phase			
possible	Input correctly set?	Re-enter the COIN or Z Phase Input values.		
	Has the unit changed to the			
	mode set in the GP's	Set the GP to RUN mode		
	Control (CTL) area?			
		- Use shielded, twisted-pair wires		
		- Repair all incorrect wiring		
		- Repair all cut Terminal and Connector wiring		
	Is there too much noise in the lines?	- 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		
Motor operates	le the elignment of the LL V	If the wiring is incorrect, the FN-PC will rotate only for the final		
	Is the alignment of the U, V	pulse amount. Occasionally, depending on the type of incorrect		
but unit	and the Motor Terminal	encoder wiring and the U.V.W. power lines, the FN-PC unit will		
movement is	numbers the same?	rotate, however, confirm that the amp and motor's wiring is		
not correct		correct.		
	Is +/-O T (Status hits 3	Turn the +/-O.T. (Status bits 3, 4) OFF.		
	4) turned ON?	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	- Check the Z-Phase Input wiring.		
	stop during High Speed	- Check if the Z-Phase signal is occurring during the PORG ON		
	Origin Point Return 2?	period.		
	Has an overnow error	Clear the overflow error by executing Reset or Preset.		
	UCCUITED?			
		All Chui Was ucleuleu III IIIC FIN-PC UIIII.		
	# L_IUSIalus?	7.4.2 - ETUI CUUE LISLIUI GESUUU SEIIES		

Condition	Check Item	Solution
	Is there a problem with the electrical circuit? - Does the Teaching Loader display operate properly? - Does the FN-PC unit's LED operate	<ul> <li>Is the GP unit using the correct level of power and currect?</li> <li>Is the FN-PC unit using the correct level of power and current?</li> <li>Is the connector loose or disconnected?</li> </ul>
	Are all parameter settings entered correctly?	Correct any incorrect settings.
Motor operation is not normal	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. <b>Reference</b> 9.4.2 Error Code List for GP3000 Series.

# 

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.
		The data type of the symbol variable assigned to the
002	Illegal Parameter.	Flex Network unit is illegal.
		The Flex Network unit setting value is illegal.
002	Dovice offect boyond limit	The address of the symbol variable assigned to the
005	Device offset beyond finnt.	Flex Network unit is out of range.
004		The number of Flex Network unit terminals exceeds
004	r enninal coning overlapped.	the limit.
005	Illogal terminal sequence	The I/O terminal numbers are not specified in
005	lileyal terminal sequence.	ascending order.
004	Incufficient terminals	The number of I/O terminals is not appropriate
000		(insufficient).
007	Units config overlapped.	Flex Network unit S-No. is duplicated and set.
		The maximum number of connected Flex Network
		units (63 units) is exceeded.
000	Units count over limit.	The maximum value of S-No. (S-No. 63) is
008		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	Upmatched In/Out terminal	The input/output settings of the Flex Network unit are
010		not correct.
011	Upmatched bit/word torm	The variable type specified in the Flex Network unit
UTI		is incorrect.
012	Illegal level nunber.	Something is wrong with the I/O driver.
012	Illegal data addr. Cotton	The I/O driver information is incorrect.
013	niegai uala auti. Gullett.	The controller information is incorrect.
014	No drivers/units registed.	The I/O driver or Flex Network unit is not registered.

<b>Runtime</b>	<b>Errors</b>

Error Code	Error Message	Definition
		A communication error has occurred between the
100		main unit and the Flex Network unit.
	Unit communication error.	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
105	Androy unit's whe broken.	2ch. analog unit is cut off.
		An error has occurred in the high-speed counter unit.
10/	Countor unit's orror	For details, use a command to call up the unit's error
104		code. 🔽 Reference 👗 Flex Network High Speed
		Counter Unit User Manual
105	Counter initial error.	Initializing the high-speed counter unit has failed.
		A communication error with the high-speed counter
	Counter communication err.	unit has occurred.
106		The communication cable is cut off. The high-
		speed counter unit is not connected. The editor
		settings have problems.
		An error has occurred in the positioning unit. For
107	Positioning Unit's error	details, use a command to call up the unit's error
107	rusiuuning units enut.	code. 🔽 Reference 🗶 🗖 Single-Axis Positioning
		Unit Errors
		A communication error with the positioning unit has
		occurred.
108	Comm.position error.	The communication cable is cut off. The positioning
		unit is not connected. The editor settings have
		problems.
		A communication error with the 2ch. analog unit has
		occurred.
109	2ch. analog comm. error.	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	SatValua func (INT) NC	Integer-type Terminal data of the Flex Network unit
200	Setvalue lunc.(INT) NG.	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.

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# Single-Axis Positioning Unit Errors

Error Name	Error Code	Description	RUN		
	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.			
	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.			
Command Error	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.			
	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.			
	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	
Hardware Error	513 (0201h)	EEPROM parameter area error.	
Servo Error	768 (0300h)	The servo driver has caused an alarm.	Stop <sup>*1</sup>
	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.
Data Error	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 <sup>*1</sup>
Overrain	2050 (0802h)	- (CCW) Direction Overtravel -OT	Stop <sup>*1</sup>
Comm. Error	32773 (8006h)	Communication error occurred between the Teaching Loader and the FN-PC unit.	
Operation	36865 (9001h)	During operation via the Teaching Loader, the FN-PC unit has received operation commands from the GP unit.	Stop <sup>*1</sup>
Error	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

1. Connection Examples

2. Logic Program Examples

3. RUN Data Setting Sheets

# 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	
Sanvo Electric	Servo Amn PY type	Line Driver	
		Open Collector	
Panasonic	Servo Amp Atype	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)

![](_page_115_Figure_2.jpeg)

# ■ Line Driver Connection Diagram

# Appendix 1.3Sanyo Electric Servo Amp (PY)

![](_page_116_Figure_2.jpeg)

# ■ Line Driver Connection Diagram

![](_page_117_Figure_1.jpeg)

# Open Collector Connection Diagram

# Appendix 1.4 Panasonic Servo Amp (Type A)

![](_page_118_Figure_2.jpeg)

# ■ Line Driver Connection Diagram

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

# ■ Line Driver Connection Diagram

![](_page_119_Figure_3.jpeg)

# 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>

Flex Network Driver (ID:#1) (Sp	eed:6Mbps)	Close		
— 💻 🚦 S-No.1 (FN-PC10SK	)		PLEA NET WORK DIWEI(D.#T)	ICC A Jak
⊨ Ø STA.STA	16384	(%IW1.1.0) Drivers		IEU Addre
BSTP.BSTP	1	[%[W1.1.1]]	E 🗗 S-No.1 (FN-PC1USK)	
	O	(%DW112)	STA STA	(%IW.1.1
	1	(SOUT 1 2) Add	🗁 🐼 RSTP RSTP	(%IW.1.1
	0	(%QW114)	🔤 🧭 CTL CTL	(%QW.1.
	1000	(%QW1.1.4) Bemoxe	🛛 🖉 WSTP WSTP	(%QW.1.
B NURD	1000		🐼 СМД СМД	(%QW.1.
	U		🦕 🙍 RD RD	(%W.1.1
- STP.CSTP	3	[%UW1.1.7]	with with with	(%DW/1
-Ø DPOS.DPOS	0	(%QW1.1.8) <u>∎ ≌⊯παφ</u>		(%DW 1
- Ø POS.POS	0	(%IW1.1.9)		(%Q))/ 1
				(2015), 2 H H

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.

![](_page_121_Picture_10.jpeg)

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

![](_page_122_Figure_1.jpeg)

### ■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.

![](_page_123_Figure_1.jpeg)

#### ■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>

🔆 Configure I/O				FLEX NETWORK	
File Edit View Help				-  €1381 +∂×	
Flex Network Driver (ID:#1) (Sp	eed:6Mbps) I			FLEX NETWORK Driver(ID:#1)	
STA.STA	16384	(%IW1.1.0)	Drivers	Name Variable	IEC Address
-Ø RSTP.RSTP	1	(%IW1.1.1)	Setun	📮 🞚 S-No.1 (FN-PC10SK)	
CTL.CTL	0	(%QW1.1.2)		🔚 🧭 STA STA	(%IW.1.1.0)
WSTP.WSTP	1	(%QW1.1.3)	Add	🔤 🖉 RSTP RSTP	(%IW.1.1.1)
-Ø CMD.CMD	0	(%QW1.1.4)		🖳 🕖 CTL CTL	(%QW.1.1.2)
-Ø RD.RD	100	(%lW1.1.5)	HXEM0X6	🖙 🖉 WSTP WSTP	(%QW.1.1.3)
-Ø WD.WD	50000	(%QW1.1.6)	Miap,	💋 СМД СМД	(%QW.1.1.4)
CSTP.CSTP	1	(%QW1.1.7)		🖉 RD RD	(%IW.1.1.5)
DPOS.DPOS	0	(%QW1.1.8)	Unnap	🖉 WD WD	(%QW.1.1.6)
POS.POS	0	(%lW1.1.9)		🔤 🖉 CSTP CSTP	(%QW.1.1.7)
				🔤 🧭 DPOS DPOS	(%QW.1.1.8)
				🛄 🖉 POS POS	(%IW.1.1.9)
				1	

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

Array	Setting	Step	Command (No.)	Comment	
No.	Value	Number		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.

![](_page_124_Picture_10.jpeg)

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

![](_page_125_Figure_1.jpeg)

#### ■ 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.

![](_page_126_Figure_1.jpeg)

![](_page_126_Figure_2.jpeg)

- \*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>

<b>X Configure 1/0</b> File Edit View Help				FLEXNETWORK	
	ed:6Mbps) 16384 1 0 1 0 100 0 3 0 0 0	(%1W1.1.0) (%1W1.1.1) (%2W1.1.2) (%2W1.1.3) (%2W1.1.4) (%2W1.1.5) (%2W1.1.6) (%2W1.1.6) (%2W1.1.8) (%2W1.1.8) (%1W1.1.9)	Close Drivers Setup Add Rigmoxe Map	Image: Second system Image: Second system   FLEX NETWORK Driver(ID:#   Name Variable   Image: Second system STA   Image: Second system	I) IEC Address (%IW.1.1.0) (%IW.1.1.1) (%QW.1.1.2) (%QW.1.1.3) (%QW.1.1.4) (%IW.1.1.5) (%QW.1.1.5) (%QW.1.1.7) (%QW.1.1.8) (%IW.1.1.9)

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.

![](_page_127_Picture_10.jpeg)

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

![](_page_128_Figure_1.jpeg)

#### ■ 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.

![](_page_129_Figure_1.jpeg)

#### ■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.	MSB			LSB	Initial Value	Data 1	Data 2
No.	15 to 12	11 to 8	7 to 4	3 to 0		Data	Duu L
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 ti	10 (Ah)				
3		PORG ON tir	ne		10 (Ab)		
4	4 Upper Limit Speed				10 (Ab)		
5		Manual JOG S	beed		(All) 10		
6		Manual Spe	ed		(Ah) 10		
7		Auto IOG Spe	ed		(Ah) 10		
, 8		Origin Point return	Sneed		(Ah) 10		
0	Urigin Point return Speed				(Ah) 10		
9	High Speed Origin Point Return Speed				(Ah) 10		
10	Accel/Decel Speed time				(Ah)		
11	Backlash Compensation				(0h)		
12	Origin Point Correction				(0h)		
13	Upper Position Data			2147483647 (7FFFFFFh)			
14	4 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							

Flex Network Single Axis Positioning Unit User Manual

= Muto Kon Data Dettings blee	Auto	RUN	Data	Settings	Sheet
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Step No.	RUN Mode	Speed	Accel/Decel Time	Position Data

# Memo