User's Manual
for
FlexiLogics®

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SERVICE

If service is required then pack the unit in its original packaging container or, if unavailable, any suitable rigid container. If a substitute container is used, surround the unit with shock absorbing material; damage in shipment is not covered by the warranty. Include a letter with the unit describing the difficulty and Hardware Revision and Software Version. Send to the following address:

> Renu Electronics Pvt. Ltd.
> Survey No. 2/6,
> Baner Road,
> Pune-411045

All returns will be tested to verify customer claims of noncompliance with the product warranty. Improper return packaging, which makes verification impossible, will void the warranty. If noncompliance is verified and is not due to customer abuse or the other exceptions described with product warranty, Renu Electronics will, at its option, repair or replace the Product returned to it, freight prepaid, which fail to comply with the foregoing warranty, provided REPL is notified of such noncompliance within the one-year warranty period.

ASSISTANCE

This manual is designed to provide the necessary information for trouble-free installation and operation of your new FlexiLogics® Series. However, if you need assistance, please call Renu Electronics Pvt. Ltd. at 91-20-27292840 or visit our web site at www.renuelectronics.com

MANUAL REVISION

If you contact us in reference to this manual, please include the following document number

Name	:	User Manual For FlexiLogics®
Part Number	:	URML104
Document	:	UMAN\FL\0110
Revision	:	1.02J

Revision History:

Revision Number	Document Number	Date	Description
Rev 1.00	UMAN\FL\0110	21-01-2010	First Release
Rev 1.01	UMAN\FL\0110	10-09-2010	FlexiLogics features revised
Rev 1.02	UMAN\FL\0110	10-09-2010	FlexiLogics manual revised for images & other corrections
Rev 1.02A	UMAN\FL\0110	12-01-2011	Timings of ON/OFF pulse width is corrected on Pg. 85, 86, 88 & 90.
Rev 1.02B	UMAN\FL\0110	27-08-2011	Battery life specifications are corrected and addition of communication baud rates. Product configuration GUI changed. Weights for FL series models are updated.
Rev 1.02C	UMAN\FL\0110	23-09-2011	Force download model, fixed pulse output mode sections are added.
Rev 1.02D	UMAN\FL\0110	18-04-2012	Registration mark added. Mode transition conditions are added in chapter-6.
Rev 1.02E	UMAN\FL\0110	09-07-2012	In section 7.5.3 (Time interrupt Program), the interval range is corrected to 1 to 1000ms.
Rev 1.02F	UMAN\FL\0110	20-09-2012	FLD-HS-0808N product and related information added.
Rev 1.02G	UMAN\FL\0110	17-04-2013	PWM O/P and HSC related context changed.
Rev 1.02H	UMAN\FL\0110	23-05-2013	FL100 and FLD-HS-0808P models are added.
Rev 1.02I	UMAN\FL\0110	14-02-2014	FL005 Series models added.
Rev 1.02J	UMAN\FL\0110	02-02-2015	FL005 Series expandable models added.

Warranty Certificate

For New product: This product is warranted against defects in materials and workmanship for a period of 12 months from the date of shipment to Buyer.

For Rectified Products: Any product that will be replaced will have Warranty for 6 months or upto Original Product Warranty period whichever is greater.

The warranty is limited to repair or replacement of the defective unit at the option of the manufacturer. This warranty is void if the product has been altered, misused, dismantled, or otherwise abused.

ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ARE EXCLUDED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

MAINTENANCE & SERVICE : There are no parts that can be serviced by the user. Service should be performed on a unit substitution basis only. Do not attempt to remove, replace or service any printed circuit board, components or any hardware/software related with display product. If problem within the display product occurs, contact the factory for service information or repair.

NOTE : Renu Electronics Pvt. Ltd. is dedicated to providing complete customer service and customer satisfaction. If you have any comments or criticisms about how to improve the product features/reliability, please make a note of the problem/improvement and notify us. We are always open to new ideas and improvements. So please let us know your ideas and comments.

IMPORTANT

FlexiLogics® Series Products are Programmable Logic Controller modules which actually take control actions. It is assumed that the user is well acquainted with the PLC system being used and Windows based software usage, in general. Never use FlexiLogics® units to perform emergency STOP applications. It is advised that separate switches be used outside the PLC for ANY emergency Stops.

Any Mechanical or Electrical Modification to this Unit will void all Warranties.

Contents

INTRODUCTION

In this chapter. . . .

♦   Purpose of this manual
            FlexiLogics® Basics
            Hardware Configuration

♦   FlexiLogics® Features

♦   FlexiLogics® Overview
            What is FlexiLogics® series unit?
            How FlexiLogics® works?
            FlexiLogics® Specifications

1.1 Purpose of this manual

Thank you for purchasing FlexiLogics® Series Products from Renu Electronics. FlexiLogics® Series Products are versatile high-performance programmable controllers with Microsoft® Windows based configuration Software.

This Manual explains the operation of the FlexiLogics® Series and how to implement available features using the FlexiSoft® Software. This manual will help you to install, configure and operate your FlexiLogics® product.

1.1.1 FlexiLogics® Basics

FlexiLogics® provide much more versatility than traditional programmable controllers. FlexiLogics® unit supports basic relay ladder functions. In addition to this it provides functions such as data operations, arithmatic operations, various functions etc. Furthermore, its high speed counter functions, pulse output functions, and data communication functions allow its application to a wide scope of control systems.

What is a *Project*?

A project is an user created application in FlexiSoft® Software. A project contains information such as FlexiLogics® model, Network Configuration, ladder information, etc.

What is a *Ladder*?

You use Ladder Logic to write your project application. Ladder is based on Boolean principals. Ladder Diagrams are composed of different types of contact, coil and function block elements. These elements are placed in nets.
        In any Ladder Diagram, the contacts represent input conditions. They lead power from the left rail to the right rail. Coils represent output instructions. In order for output coils to be activated, the logical state of the contacts must allow the power to flow through the net to the coil.

1.1.2   Hardware Requirements

The following basic PC hardware configuration is needed to configure and operate your FlexiSoft® Configuration Software.
Minimal PC configuration for Windows2000 / XP:

DEVICE	RECOMMENDATIONS
IBM compatible PC	with 800MHz Pentium Processor or Pentium Processor equivalent processor
Operating System	Windows® 2000 with SP4, Microsoft Windows® XP Professional / Home Edition with SP2
System RAM	256Mb
Hard Disk	800 MB (Including 200Mb for the .NET Framework Redistributable)
Display	1024 x 768 High Color 16-bit
Serial Port	Required
USB Port	Required
Mouse	Microsoft® Mouse or compatible pointing device
Keyboard	Required

Minimal PC configuration for Vista:

DEVICE	RECOMMENDATIONS
Processor	1GHz Pentium processor or equivalent processor
Operating System	Microsoft Windows Vista Home and Vista Business edition with SP1
RAM	1GB
Hard Disk Space	800MB (including 200MB for the .NET Framework Redistributable)
Display	1024 x 768 High Color 16-bit
Mouse/Keyboard	Required
Serial Port	Required
USB Port	Required

These are the minimum system requirements for a computer running the FlexiSoft® Configuration software.

Computer requirement for Windows8:
Hardware requirement:

Processor	1 GHz
RAM	512 MB
Disk Space (Minimum)	
32-bit	850 MB
64-bit	2 GB

Supported client operating systems

Operating System	Supported Editions	Additional Information
Windows 8	32-bit and 64-bit	Includes the .NET Framework 4.5

Recommended hardware specification to install FlexiSoft on windows 8 OS

View basic information about your computer

Windows edition

    Windows 8 Pro

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System

Rating:	**4.3** Windows Experience Index
Processor:	Intel(R) Pentium(R) CPU G630 @ 2.70GHz 2.70 GHz
Installed memory (RAM):	2.00 GB (1.89 GB usable)
System type:	32-bit Operating System, x64-based processor
Pen and Touch:	No Pen or Touch Input is available for this Display

View basic information about your computer

Windows edition

    Windows 8 Pro

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System

Rating:	**4.3** Windows Experience Index
Processor:	Intel(R) Pentium(R) CPU G630 @ 2.70GHz 2.70 GHz
Installed memory (RAM):	2.00 GB (1.90 GB usable)
System type:	64-bit Operating System, x64-based processor
Pen and Touch:	No Pen or Touch Input is available for this Display

1.2   Features

Expansion Models:

The following are the digital expansion models:

-> 16 points DC input

-> 16 points DC output (NPN Type)

-> 16 points DC output (PNP Type)

-> 16 points DC output (Relay Type)

-> 8 DC inputs + 8 DC outputs (NPN type)

-> 8 DC inputs + 8 DC outputs (PNP type)

-> 8 DC inputs + 8 DC outputs (Relay type)

-> 8 DC inputs (within which 4 are HSC) + 8 DC outputs (NPN type) within which 2 are PWM O/P

-> 8 DC inputs (within which 4 are HSC) + 8 DC outputs (PNP type) within which 2 are PWM O/P

The following are the analog expansion models:

-> 4 Universal Analog inputs & 2 analog outputs (V-I Type)

-> 8 Analog inputs (Linear Type)

-> 8 Analog inputs (RTD Type)

-> 4 Analog outputs (V-I Type)

Built-in high speed counter:

Two single-phase or one quadrature (2-phase) pulses can be counted. In single phase mode, up to 50KHz and in quadrature mode, up to 5KHz frequency can be counted.

High speed processing:

Sophisticated machine control applications require high speed data manipulations. The FL® is designed to meet these requirements.

· 1.4 ms per contact · 2.3 ms per coil

· 4.2 ms per 16-bit transfer · 6.5 ms per 16-bit addition

The FlexiLogics® also supports interrupt input function (DC input type only). This allows immediate operation independent of program scan.

High performance software:

The FlexiLogics® offer various basic ladder instructions and other functional instructions. Subroutines, Interrupt functions, Indirect addressing, For/Next loops, Pre-derivative real PID, etc. are standard on the FlexiLogics® unit. These functions allow the unit to be applied to the most demanding control applications.

Pulse output / PWM output:

One point of variable frequency pulses (max. 5 kHz) or variable duty pulses can be output. These functions can be used to drive a stepping motor or to simulate an analog output. (DC input type only)

Removable terminal blocks:

The FlexiLogics® are equipped with removable terminal blocks. This supports the easy maintenance work.

Real-time clock/calendar function:

The FlexiLogics® has the real-time-clock/calendar function (year, month, day, day of the week, hours, minutes, seconds) that can be used for performing scheduled operations, data gathering with time stamps, etc. The real-time-clock/calendar data is backed up by a removable and replacable battery.

RS-485 multi-purpose communication port:

The FlexiLogics® unit has an RS-485 multi-purpose communication port. Using this port, one of the following communication modes can be selected.

Computer link mode: T-series computer link protocol can be used in this mode. Up to 32 FlexiLogics® can be connected to a master computer. By using this mode, MMI/SCADA system can be easily configured.

Data link mode: Two PLCs can be directly linked together. This direct link is inexpensive, easily config-ured and requires no special programming.

Free ASCII mode: User defined ASCII messages can be transmitted and received through this port. A terminal, printer, bar-code reader, or other serial ASCII device can be directly connected.

1.2.1   Webserver Functionality

FlexiSoft now supports powerful and user friendly Webserver functionality. This feature is available for Ethernet models (FL100 PLC).
This feature allows user to monitor and control from remote locations. This feature is password protected that requires sign up.
Configuration:
Follow below said steps to configure web server functionality:
1) Create new application.
2) Go to "Tool -> Web server Configuration" as shown below:

3) Below shown window will open:

4) To use webserver functionalityuser has to choose dialogue box as "Yes" as shown below.
Username and password are compulsory. User has to fill these fields to enable web server functionality.
Header: - User can put header name up to max. 70 characters, it will be shown in white color and blue background color on web screen.

5. Click on "OK" button, flexisoft will open a new web scree. User can create his webpages here.
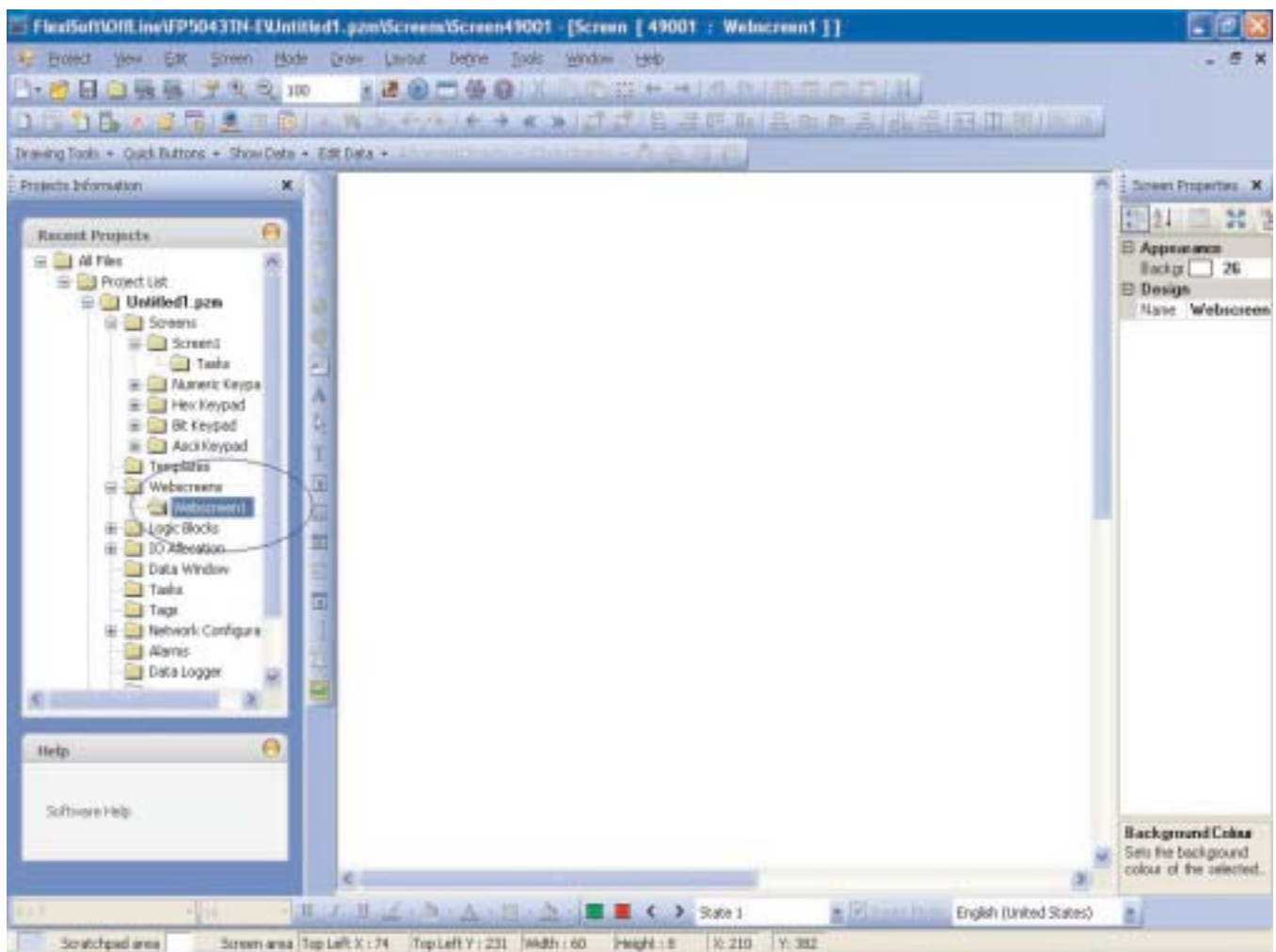
6. To set any web screen as default web screen, right click on desire web screen and click on "set as default screen".

Note:-
1. Only bit data entry, bit data display, data entry, data display , picture objects, multilingual text and go to buttons are supported for web screen design.
2. Currently, PLC Tags and retentive tags are not allowed on web screens.
3. Only 10 users can open simultaneous connection with web server.
4. User can embed maximum 100 tags per web screen.
5. User can design maximum 100 web screens in a project.
6. Data refresh time is one second.
7. If the selected font is not available in browser, then browser can set default font by himself.
8. It is recommended that, user should use Internet Explore version 7 and above and opera version 15 and above.
9. This functionality is tested on Mozila fire fox, google chrome, Opera version 15 , Internet explore version 7, and android phones(with chrome browser), I-Phone (with Chrome and Safari browsers).

1.2.2   Working of Webserver

After finishing with web page design, just download firmware and application in to unit.
To access web page on browser follow below said steps:
1. Open any browser.
2. Enter IP address in the address bar of the browser and press enter.
3. Browser will show a login page as below:
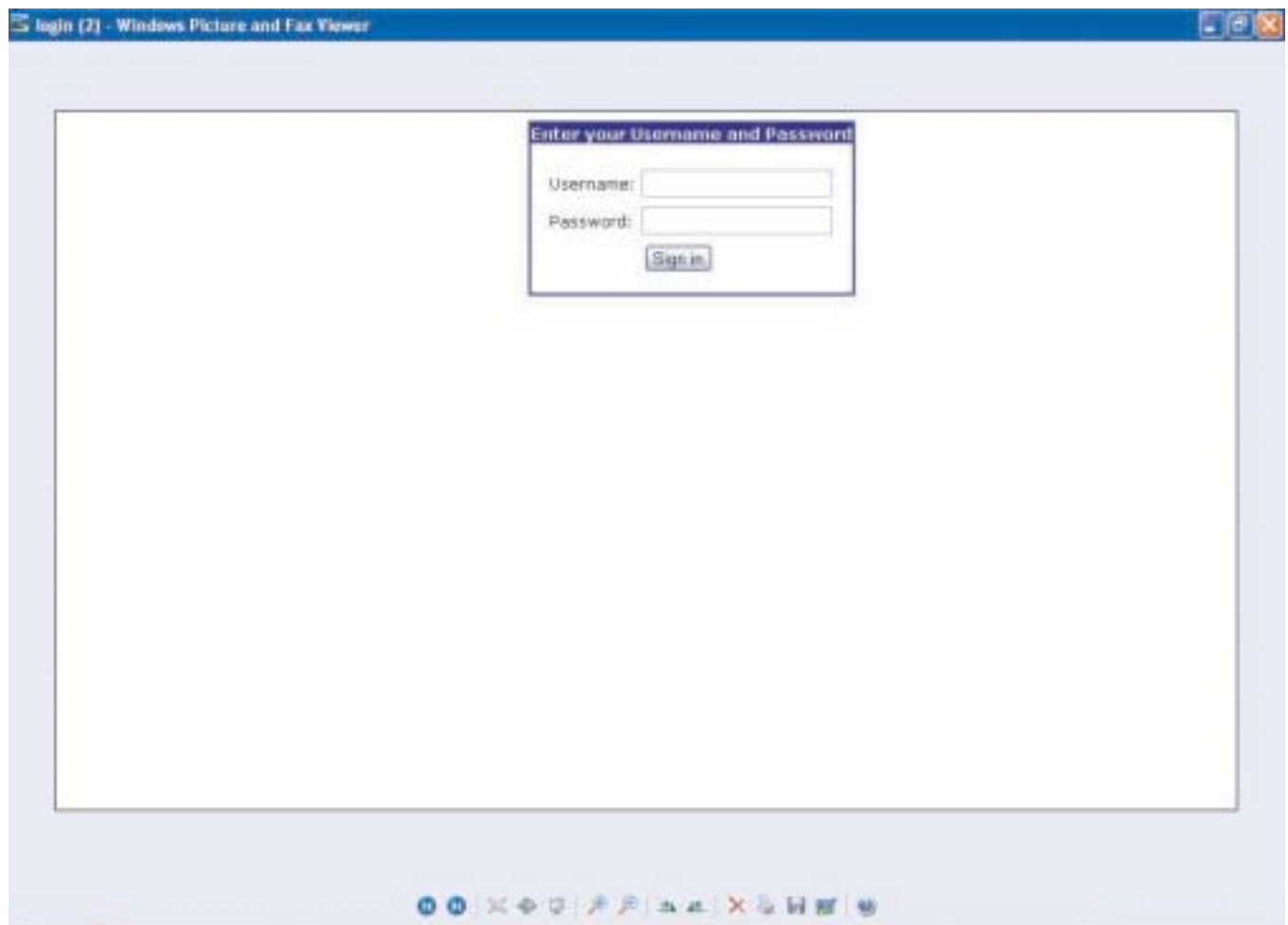
4. Enter User name/Password and click on "Enter" button.

5. After entering correct username and password, browser will show the default web screen.
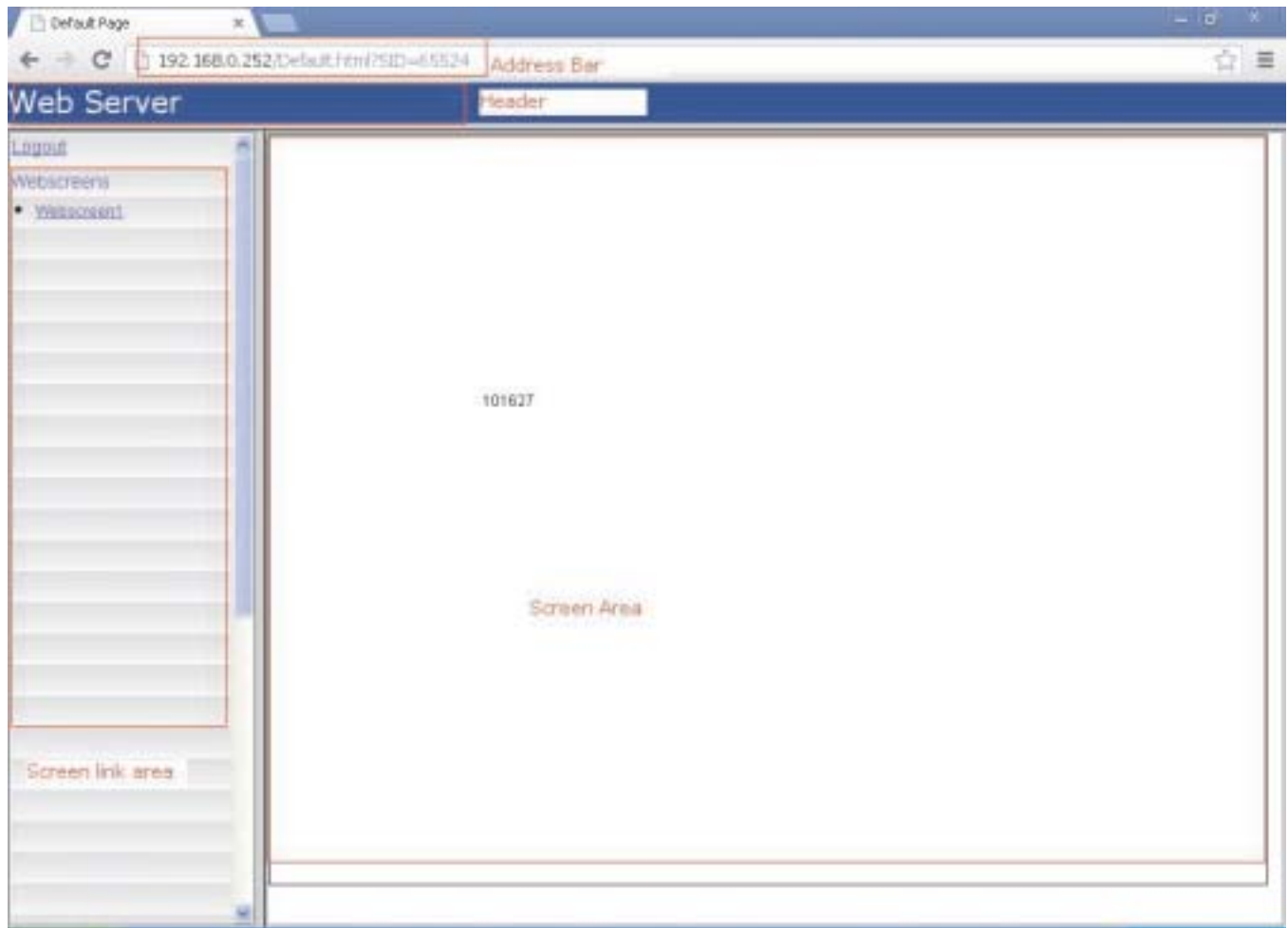
1.3 FlexiLogics® Overview

1.3.1 What is a FlexiLogics® series unit?

FlexiLogics® Series units are compact, easy-handling block style programmable controller. It also has modular expandability.

Configuration of FlexiLogics® unit:

Each FlexiLogics® base unit has to be configured using the FlexiSoft® Software before connecting it to the system.
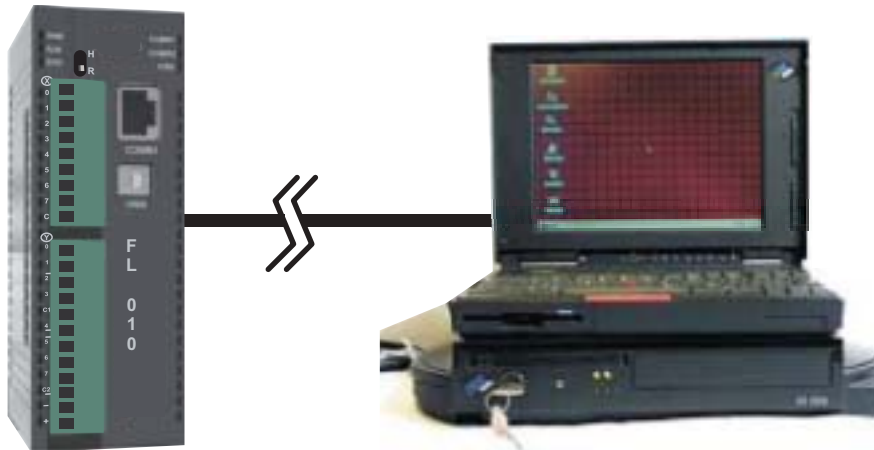
Normal Operation:

The FlexiLogics® family is designed to offer practical PLC features in a compact and expandable design, and at the same time offer a simple-to-use philosophy. An external powered FlexiLogics® series base models by itself can be used as a complete PLC system with optional built-in I/O points, or the system can be expanded with the addition of up to eight I/O modules.
The FlexiLogics® can be mounted in DIN rail plate. The base CPU and I/O modules are connected together via an expansion port on the sides of the modules. A variety of I/O modules are available for flexible and optimal system configuration.

FIG-1: FlexiLogics® Base with eight expansions

Application Examples1:

HMI   FlexiLogics® PLC   base unit   PLC

As shown above, FlexiLogics® base unit can be connected to another PLC as well as to HMI. Thus can be worked with two different protocols at a time.

Application Examples2:

SCADA   FlexiLogics® PLC base unit   HMI

As shown above, FlexiLogics® base unit can be connected to SCADA as well as HMI.

1.3.2   How FlexiLogics® Works?

The FlexiLogics® follows a specific sequence and the sequence is as shown below:

```
                    ┌──────────────────┐
                    │      START       │
                    └────────┬─────────┘
                             │
                    ┌────────▼─────────┐
                    │    Initialize    │
                    │    Watchdog      │
                    └────────┬─────────┘
                             │
                          ◇ Check for        No      ┌──────────────────┐
                            Valid          ──────────▶│ Initialize serial and│
                            Firmware                  │    USB ports     │
                          ◇                           └────────┬─────────┘
                             Yes                               │
                                               ┌───────────────▼──────────┐
                                               │ Wait till Firmware       │
                                               │ Download. Flash          │
                                               │ Error and RUN led        │
                                               │ at 1 sec interval        │
                                               └───────────────┬──────────┘
                                                               │
                                               ┌───────────────▼──────────┐
                                               │ Soft restart             │
                                               └──────────────────────────┘

                          ◇ Check for        No      ┌──────────────────┐
                            valid          ──────────▶│ Initialize serial and│
                            Ladder                    │    USB ports     │
                          ◇                           └────────┬─────────┘
                             Yes                               │
                                               ┌───────────────▼──────────┐
                                               │ Wait till Ladder         │
                                               │ Download.                │
                                               │ Flash Error led at 1     │
                                               │ sec interval.            │
                                               └───────────────┬──────────┘
                                                               │
                                               ┌───────────────▼──────────┐
                                               │ Soft restart             │
                                               └──────────────────────────┘

                          ◇ Check for        No      ┌──────────────────┐
                            valid          ──────────▶│ Initialize serial and│
                            Application              │    USB ports     │
                          ◇                           └────────┬─────────┘
                             Yes                               │
                                               ┌───────────────▼──────────┐
                                               │ Wait till Application    │
                                               │ Download.                │
                                               │ Flash Error led at 1     │
                                               │ sec interval.            │
                                               └───────────────┬──────────┘
                                                               │
                                               ┌───────────────▼──────────┐
                                               │ Soft restart             │
                                               └──────────────────────────┘
                           (  A  )
```

```
                              ┌─────┐
                              │  A  │
                              └──┬──┘
                                 │
                                 ▼
CPU Watch-                    ╱ Check  ╲              Soft restart
dog reset          ◄─────────╱  for     ╲──────────►
                             ╲  type of ╱
                             ╲ restart ╱
                                 │
                          Power On Reset
                                 ▼
                    ┌────────────────────────┐      ┌────────────────────────┐
                    │  Clear All PLC registers│      │  Clear All PLC registers│
                    │  expansion module       │      │  except keep memory,    │
                    │  information and event   │      │                         │
                    │  history                 │      └────────────────────────┘
                    └────────────┬───────────┘
                                 ▼
                    ┌────────────────────────┐
                    │  Restore Keep memory data,│
                    │  Event History          │
                    └────────────┬───────────┘
                                 ▼
                    ┌────────────────────────┐
                    │  Initialize USB         │
                    └────────────┬───────────┘
```

Set internal configuration according to application. (Base Timer, (100uSec) Timer 1, IO configuration and other system parameter read)

Configure communication channel and detect slave serial devices.(if master)

Detect the expansion modules and update Expansion module information (Only at Power on)

Read the ladder address information.

Power Up Self Diagnosis

Set Power On system bit to '1'

Main Loop Start

Main Loop Start

C

Start counting Main Loop Scan Time

Self Diagnosis → Error Down → ERROR MODE

OK

Read RUN/STOP Switch → STOP Position → HALT MODE

RUN Position

Update PLC mode from software

Hold Mode

HOLD ← Mode check → Halt Mode → HALT MODE

RUN Mode or Switch position change from Stop to RUN

If power On System bit is '1' → No → D

Yes

Scan Local and expansion inputs

Turn On RUN Led
Clear non retentive PLC registers.
Execute Power-On Tasks.
Execute Power-Up ladder.
Enable User Timer Interrupt.
Initialize digital filter constant to default 10 mSec.
Reset Power On system bit to '0'

B

```
        ( B )
          │
          ▼
┌──────────────────────┐
│ Update local,        │
│ expansion.           │
└──────────────────────┘
          │◄──────────────────  ( D )
          ▼
┌──────────────────────┐
│ Scan Local and       │
│ expansion inputs     │
└──────────────────────┘
          │
          ▼
┌──────────────────────┐
│ Execute Global Tasks │
└──────────────────────┘
          │
          ▼
┌──────────────────────┐
│ Feed the CPU watch-dog│
└──────────────────────┘
          │
          ▼
┌──────────────────────────────┐
│ Start counting ladder scan time│
└──────────────────────────────┘
          │
          ▼
┌──────────────────────────────┐
│ Execute main Ladder          │
└──────────────────────────────┘
          │
          ▼
┌──────────────────────────────┐
│ Stop counting ladder scan time│
└──────────────────────────────┘
          │
          ▼
┌──────────────────────────────┐
│  Execute First Scan operations│
│ (1. Initialize special inputs and│
│ outputs. 2. Load Digital filter│
│ constant.)                    │
└──────────────────────────────┘
          │
          ▼
┌──────────────────────┐
│ Update High speed    │
│ counter registers    │
└──────────────────────┘
          │
          ▼
┌──────────────────────┐
│ Update local,        │
│ expansion and PWM    │
│ outputs              │
└──────────────────────┘
          │
          ▼
┌──────────────────────┐
│ Feed watch-dog       │
└──────────────────────┘
          │
          ▼
┌──────────────────────┐
│ Respond to the       │
│ monitor query (if any)│
│ on USB.              │
└──────────────────────┘
          │
          ▼
┌──────────────────────┐
│ Stop counting main loop│
│ scan time            │
└──────────────────────┘
          │
( C )◄────┘
```

```
            ┌─────────────────┐
            │    HALT MODE    │
            └─────────────────┘
                     │
                     ▼
            ┌─────────────────┐
            │  Feed Watch-dog │
            └─────────────────┘
                     │
                     ▼
         ┌───────────────────────┐
         │ Turn OFF all Outputs  │
         │      and RUN Led      │
         └───────────────────────┘
                     │
                     ▼
         ┌───────────────────────┐
         │  Respond to the       │
         │  monitor query        │
         │  (if any) on USB.     │
         └───────────────────────┘
                     │
                     ▼
         ┌───────────────────────┐
         │ Stop counting main    │
         │     loop scan time    │
         └───────────────────────┘
                     │
                     ▼
      ┌──────────────────────────────┐
      │ Set Power On system bit to '1'│
      └──────────────────────────────┘
                     │
                     ▼
            ┌─────────────────┐
            │ Main Loop Start │
            └─────────────────┘
```

```
            ┌─────────────────┐
            │   ERROR MODE    │
            └─────────────────┘
                     │
                     ▼
            ┌─────────────────┐
            │  Feed Watch-dog │
            └─────────────────┘
                     │
                     ▼
      ┌──────────────────────────────┐
      │ Set the state of output as   │
      │ per 'ERROR STATE OUTPUT      │
      │ CONDITION' (Local, expansion │
      │ and PWM)                     │
      └──────────────────────────────┘
                     │
                     ▼
      ┌──────────────────────────────┐
      │ Turn ON ERROR Led.           │
      │ Turn OFF RUN Led.            │
      └──────────────────────────────┘
                     │
                     ▼
         ┌───────────────────────┐
         │  Respond to the       │
         │  monitor query        │
         │  (if any) on USB.     │
         └───────────────────────┘
                     │
                     ▼
         ┌───────────────────────┐
         │ Stop counting main    │
         │     loop scan time    │
         └───────────────────────┘
                     │
                     ▼
            ┌─────────────────┐
            │ Main Loop Start │
            └─────────────────┘
```

HOLD MODE

Read Local and Expansion Inputs

Update Local, Expansion
and PWM outputs

Respond to the monitor
query (if any) on USB.

Stop counting main loop
scan time

Main Loop Start

```
                        ┌─────────────────┐
                        │  Power-Up Self   │
                        │    Diagnosis     │
                        └────────┬─────────┘
                                 │
                                 ▼
                            ◇ if
                            1.  IO Mismatch          Yes
                            2. CPU Watchdog reset  ─────────►  ┌──────────────┐
                                 │                              │ Log event in │
                                 │ No                           │ Event History│
                                 ▼                              └──────┬───────┘
                            ◇ if                                       ▼
                            1.  RTC error                      ┌──────────────┐
         Yes                2. Retentive data loss             │ Set Error down│
   ┌──────────────┐              │                             │  mode flag   │
   │ Log event in │              │ No                          └──────┬───────┘
   │ Event History│              ▼                                    ▼
   └──────┬───────┘        ┌──────────┐                        ┌──────────┐
          ▼                │  Return  │                        │  Return  │
   ┌──────────┐            └──────────┘                        └──────────┘
   │  Return  │
   └──────────┘
```

Power-Up Self Diagnosis

if
1.   IO Mismatch
2. CPU Watchdog reset

Yes

Log event in Event History

Set Error down mode flag

Return

No

if
1.   RTC error
2. Retentive data loss

Yes

No

Log event in Event History

Return

Return

Self Diagnosis

if
1. IO BCC error

Yes

No

Log event in
Event History

Set Error down
mode flag

Return

if
1. User watchdog error
2. Scan time over error

Yes

No

Log event in
Event History

Return

Return

1.4 Specifications of FlexiLogics® Series

The FlexiLogics® series models possess powerful programmable logic features. User can implement logic, specific to application using standard Ladder programming.

FlexiLogics® models need +24VDC power from an external supply.

Models included in the FlexiLogics® Series are as follows:

Basic Models:

FL010	PLC Base model with 8 digital I/Ps and 8 Digital O/Ps
FL011	PLC card with 16 digital I/Ps and 16 Digital O/Ps
FL050	PLC Base model with ethernet
FL051	PLC card with ethernet and 16 digital I/Ps and 16 Digital O/Ps
FL100	PLC Base model with ethernet, USB host, USB device
FL005	PLC Base model (Slim case) with fixed I/Os in various combinations
FL005	PLC Base model (Big case) with expandable I/Os in various combinations

Expansion models:

FLD1600	16 Input Digital Module
FLD0016P	16 PNP type transistor output digital module
FLD0016N	16 NPN type transistor output digital module
FLD0016R	16 Relay type output digital module
FLD0808P	8 Digital input, 8 PNP type transistor output digital module
FLD0808N	8 Digital input, 8 NPN type transistor output digital module
FLD-HS-0808N	8 Inputs Bi-directional Type (Within which 4 are high speed), 8 NPN type transistor output
FLD-HS-0808P	8 Inputs Bi-directional Type (Within which 4 are high speed), 8 PNP type transistor output
FLD0808R	8 Digital input, 8 Relay type output digital module
FLA0800L	0-10 VDC or 4-20 mA (16 Bit), 8 channels input.
FLA0004	4 channel 0-10 VDC or 4-20 mA (16 Bit) Output.
FLA0402U	4 channel Universal Analog Inputs (RTD PT100, TC, 4-20 mA, 0-20mA, 0-50mV, 0 - 100mV, 0-10VDC), 16 Bit 2 channel 0-10 VDC or 4-20 mA (16 Bit) Output

1.4.1 Comparison between basic models of FlexiLogics Series

Models	FL010	FL050	FL100	FL005 Series Fixed I/Os	FL005 Series Expandable I/Os
Speed	1.03ms per contact	1.03ms per contact	20.0ns per contact	60.0ns per contact	60.0ns per contact
Program size	8K steps	8K steps	5120K steps	33K steps	30K steps
Total user Memory	65KB	65KB	52MB	288KB + 2.8KB retentive	270KB + 2.8KB retentive
High-speed counter	1 Phase 50KHz x 2 Bi-Phase 5KHz x 2	NA NA	NA NA	1 Phase 200KHz x 2 Bi-phase 200KHz x 4	1 Phase 200KHz x 2 Bi-phase 200KHz x 4
Pulse outputs	5KHz x 1	NA	NA	100KHz x 2	200KHz x 2
Sensor Inputs	NA	NA	NA	2 x (0 to 10 VDC & 0 to 5VDC) 2 x (0 to 20mA & 4 to 20mA)	4 x (0 to 10 VDC & 0 to 5VDC) 4 x (0 to 50mV & 0 to 100mV) 4 x (0 to 20mA & 4 to 20mA) 4 RTD (PT100 / PT1000) 4 Thermocouple (JKRST)
Analog outputs	NA	NA	NA	1 x current output (4 to 20mA)	2 x current output (4 to 20mA) 2 x voltage output (0 to 10VDC)
Communication ports	1 x RS232 / RS485 port 1 x 2 Wire RS485 port 1 x USB Device [B Type] NA	1 x RS232 RS485 port 1 x 2 Wire RS485 port 1 x USB Device [B Type] 1 x Ethernet	1 x RS232 RS485 port 1 x 2 Wire RS485 port 1 x USB Device [B Type Mini] 1 x Ethernet	1 x RS232 (built-in 5V/300mA power source) 1 x 2 Wire RS485 port 1 x USB Device [B Type Micro] NA	1 x RS232 (built-in 5V/300mA power source) 1 x 2 Wire RS485 port 1 x USB Device [B Type Micro] NA
Webserver Functionality	NA	NA	Yes	NA	NA
Expansion connectivity	Yes	Yes	Yes	No	Yes
RTC	Yes	Yes	Yes	Yes	Yes
Local IO Point Sizes	8DI ,8DO	NA	NA	6DI, 5DO 8DI, 8DO 8DI, 8DO, 2AI,1AO	16DI, 16DO 16DI, 16DO, 2AI,1AO 8DI, 8DO, 4AI,2AO
Dimensions	100mm x 35mm x 70mm	100mm x 35mm x 70mm	100mm x 35mm x 70mm	100mm x 26mm x 70mm	100mm x 52mm x 70mm
Certification	CE & UL Class1 Div 2	CE & UL Class1 Div 2	CE & UL Class1 Div 2	CE & UL Class1 Div 2	CE & UL Class1 Div 2

1.4.2 Specification for Basic Models
FL010

Power Supply	24VDC, 330mA
Input per channel	24 VDC, 5mA & 20mA (for CH0 & CH1)
Output per channel	230V / 2A or 24VDC / 2A for Relay, 0.5A at 24VDC for transistor

Approvals	CE, UL

Memory	
Total Program Memory	8K Steps

User Data	
Input Registers	400 Words / 6400 pts. (Max.*)
Outout Registers	400 Words / 6400 pts. (Max.*)
Data Registers	4096 words
Retentive Registers	1400 words (EEPROM)
System Registers	256 words
Timer Registers	256 words
Counter Register	256 words
Timer Devices	256 points
System Devices	100 points
Counter Devices	256 points
Configuration Register	1600 Words / 25600 pts. (Max.*)

Communication Ports	
2 COM Ports:	COM1: RS232 and RS485 COM2: 2-wire RS485
1 USB:	For programming

IO Specifications:	
Expansion IO capacity	8 expansion modules
Expansion Bus	SPI (1 MHz)
Local IOs	16 (8 IN / 8 OUT)
Digital Inputs	8 Bidirectional Digital inputs (2 High Speed inputs of upto 50KHz). 8 points per common.
Rated Input voltage	24VDC
Rated Input Current	Upto 5mA. (20mA for High Speed I/Ps)
Input Impedance	5.4Kohm (1.2Kohm for High Speed i/ps)
Minimum ON voltage	9.6 VDC
Maximum OFF voltage	3.6 VDC
Turn ON time	10 msec
Turn OFF time	10 msec
Isolation	Optically isolated from internal circuit
Digital outputs	6 Relay (Form A) outputs. 3 points per common. 2 Transistor Output
Output Capacity	2A per o/p for Relay (6A per common), 0.5 A for transistor
Rated load	230V / 2A, 30VDC / 2A for Relay, 0.5 A at 24VDC for transistor

Special Input Function	
HS Counter	2HS Counter inputs, single phase (50 KHZ), 32 Bit Dual Phase 1X, 2X, 4X (5KHz)
Interrupt Input	2 Points
PWM Output	CW / CCW OR PLS / DIR

Connection method	Removable terminals (3.81mm pitch)

| General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	Frequency 10Hz to 150hz Displacement +/- 0.35mm Crossover frequency 59Hz Acceleration: 2g Sweep rate : 1 octave per min Duration : 20 Sweeps / Axis app (2Hr 30min) Axis , X,Y, Z
Shock Test	25 g acceleration with 11 ms 3 Shocks each **AXIS** (a total of 18 Shocks)
Mechanical Dimension	100mm X 35mm X 70mm
Weight	Approx. 180 gm.

Note:
* : Depends upon I/O allocation.

Wiring Diagram for Digital I/Ps and O/Ps of model FL010:
1. Wiring diagram for testing digital inputs:
Note: X0 and X1 are high speed input

Closing Swx will turn on respective inputs
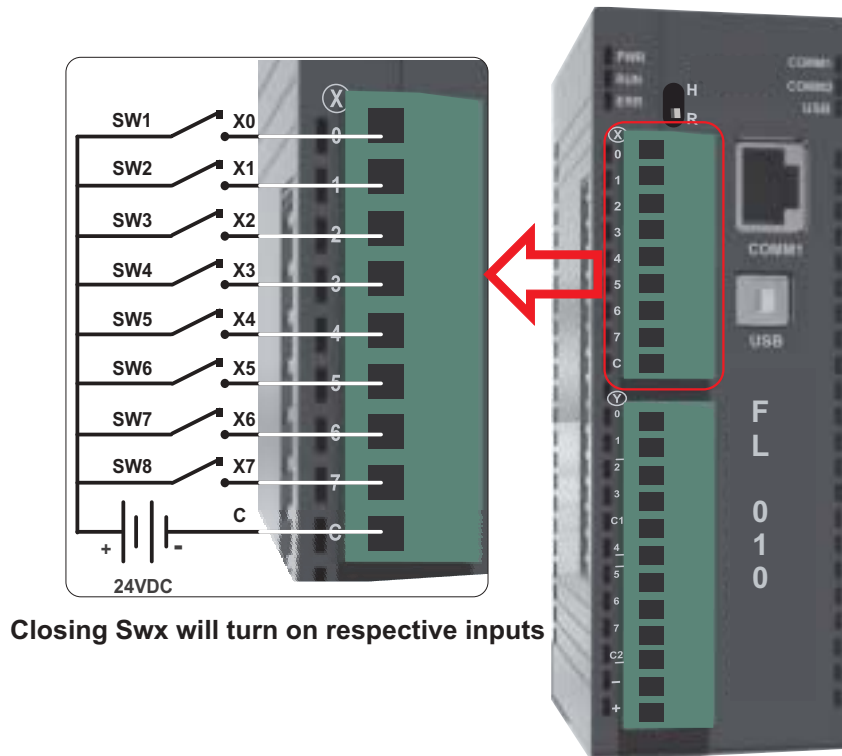
Wiring for transistor type outputs:
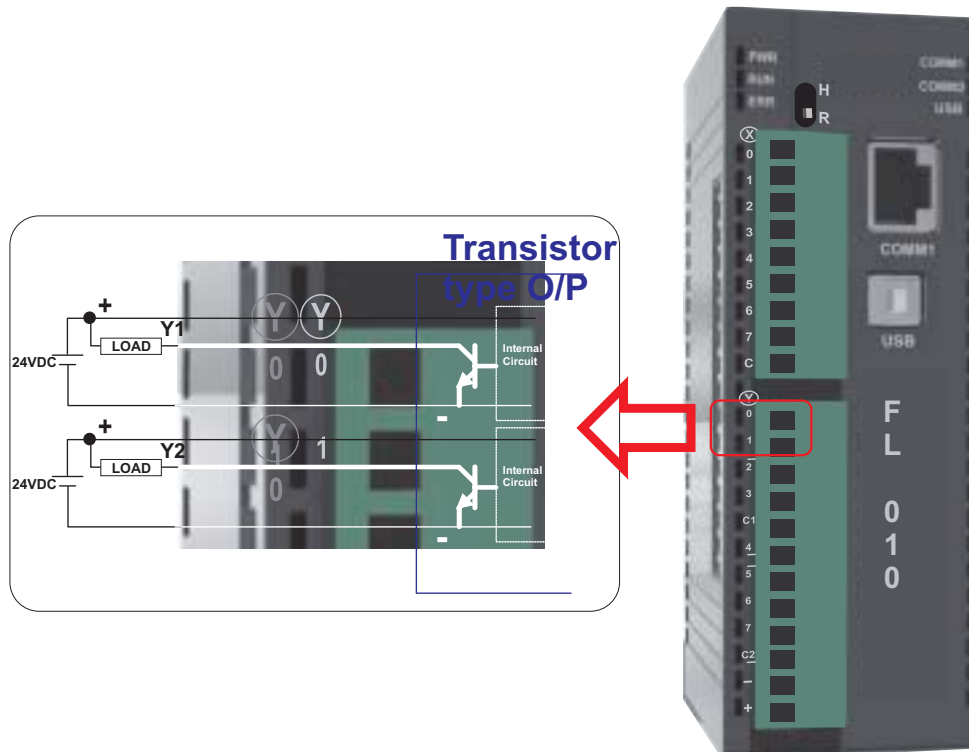
Wiring for output connections:

*L1 to L6 are A.C. Load.
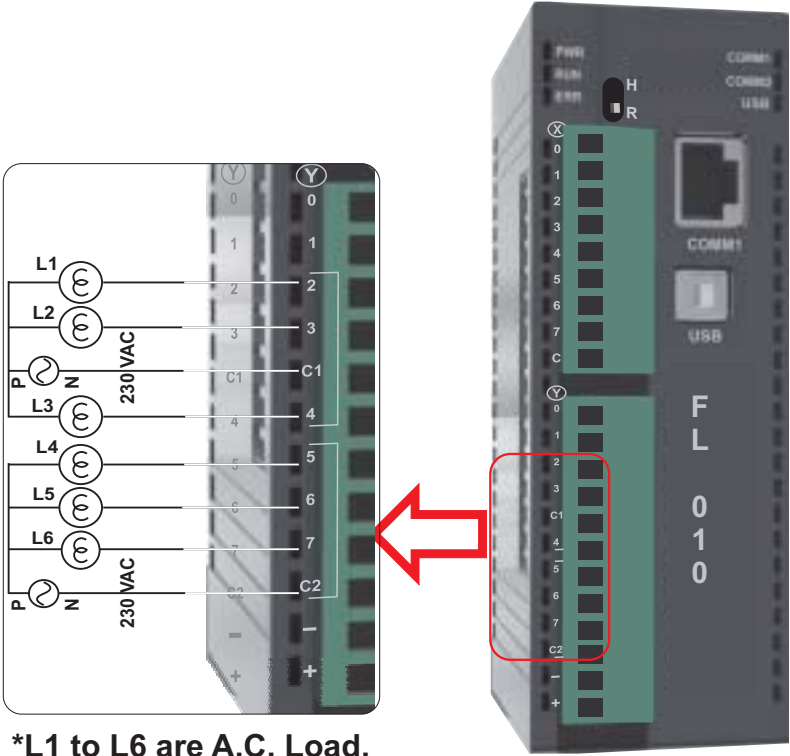
FL011

Power Supply	24VDC, 330mA
Input per channel	24 VDC, 5mA & 20mA for High Speed inputs (CH1 & CH2)
Output per channel	24VDC; 0.5A
Approvals	CE, UL
Memory	
Total Program Memory	8K Steps
User Data	
Input Registers	400 Words / 6400 pts. (Max.*)
Outout Registers	400 Words / 6400 pts. (Max.*)
Data Registers	4096 words
Retentive Registers	1400 words (EEPROM)
System Registers	256 words
Timer Registers	256 words
Counter Register	256 words
Timer Devices	256 points
System Devices	100 points
Counter Devices	256 points
Configuration Register	1600 Words / 25600 pts. (Max.*)
Communication Ports	
2 COM Ports:	COM1: RS232 COM2: 2-wire RS485
1 USB:	For programming
IO Specifications:	
Expansion IO capacity	None
Expansion Bus	SPI (1 MHz)
Local IOs	32 (16 IN / 16 OUT)
Digital Inputs	16 Bidirectional Digital inputs (2 High Speed inputs of upto 50KHz). 16 points per common.
Rated Input voltage	24VDC
Rated Input Current	Upto 5mA. (20mA for High Speed I/Ps)
Input Impedance	5.4Kohm (1.2Kohm for High Speed i/ps)
Minimum ON voltage	9.6 VDC
Maximum OFF voltage	3.6 VDC
Turn ON time	10 msec
Turn OFF time	10 msec
Isolation	Optically isolated from internal circuit
Digital outputs	16 PNP transistor outputs.
Output Capacity	0.5 A for transistor
Rated load	0.5 A at 24VDC for transistor

Special Input Function	
HS Counter	2HS Counter inputs, single phase (50 KHZ), 32 Bit Dual Phase 1X, 2X, 4X (5KHz)
Interrupt Input	2 Points
Connection method	FRC Type connector
General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	Frequency 10Hz to 150hz Displacement +/- 0.35mm Crossover frequency 59Hz Acceleration: 2g Sweep rate : 1 octave per min Duration : 20 Sweeps / Axis app (2Hr 30min) Axis , X,Y, Z
Shock Test	25 g acceleration with 11 ms 3 Shocks each **AXIS** (a total of 18 Shocks)
Mechanical Dimension	155mm X 102mm
Weight	180 gm

Note:
* : Depends upon I/O allocation.

Wiring diagram for connecting digital inputs:
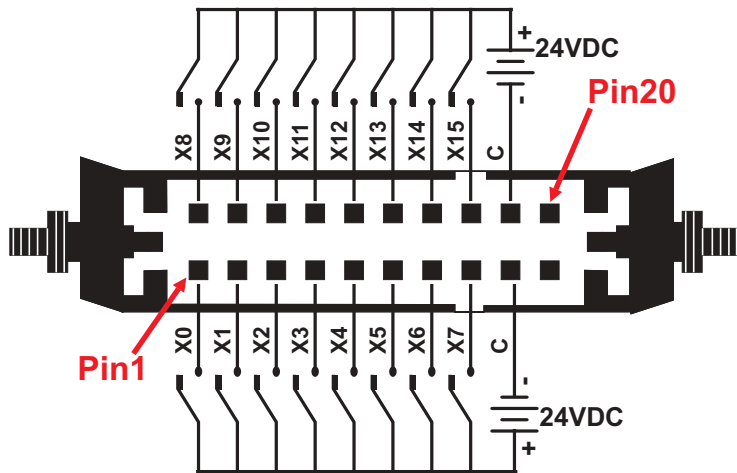
Wiring diagram for connecting digital outputs:
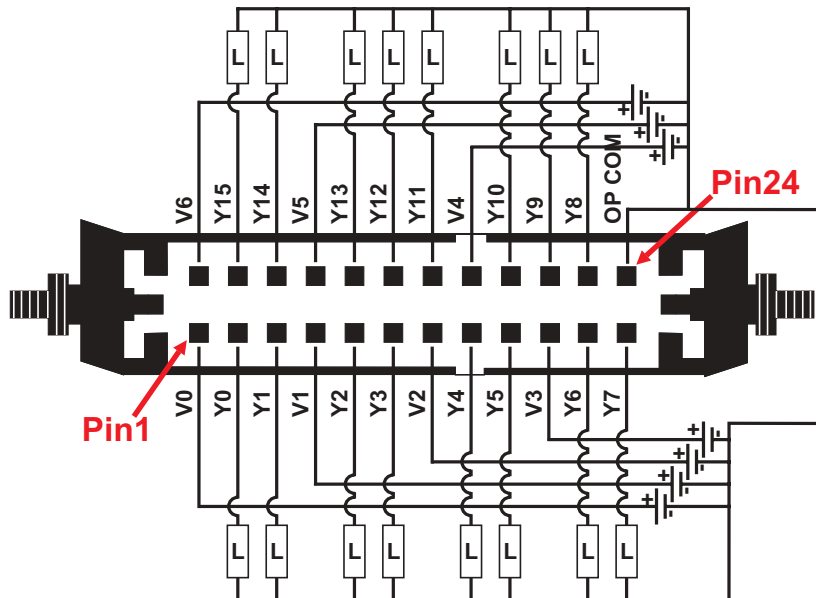
Note:
For these two connectors 20 pin and 24 pin, to make connections, below given cables are available:

Part#	Description
SC-FRC-20P-0.305	FRC female connector at both the ends, Cable length 1Feet
SC-FRC-24P-0.305	FRC female connector at both the ends, Cable length 1Feet

FRC female connector present on these cables are:
20 Pin FRC Connector: Manufacturer: Wurth Electronik; Mfg. Part No.# 612 020 230 21
24 Pin FRC Connector: Manufacturer: Wurth Electronik; Mfg. Part No.# 612 024 230 21
User may use any alternative connector which is compatible to this part#.

FL050

Power Supply	24VDC, 150mA
Input per channel	NA
Output per channel	NA
Standards	CE, UL
Memory	
Total Program Memory	8K Steps
User Data	
Input Registers	400 Words / 6400 pts. (Max.*)
Outout Registers	400 Words / 6400 pts. (Max.*)
Data Registers	4096 words
Retentive Registers	1400 words (EEPROM)
System Registers	256 words
Timer Registers	256 words
Counter Register	256 words
Timer Devices	256 points
System Devices	100 points
Counter Devices	256 points
Configuration Register	1600 Words / 25600 pts. (Max.*)
Communication Ports	
2 COM Ports:	COM1: RS232/RS485 COM2: 2-wire RS485
1 USB:	For programming
1 Ethernet:	10/100 MBBS For PLC communication and Configuration
IO Specifications:	
Expansion IO capacity	8 expansion modules
Expansion Bus	SPI (1 MHz)
Local I/Os	None
General	
Mechanical Dimension	100mm X 35mm X 70mm
Weight	Approx. 125 gm.

Note:
* : Depends upon I/O allocation.
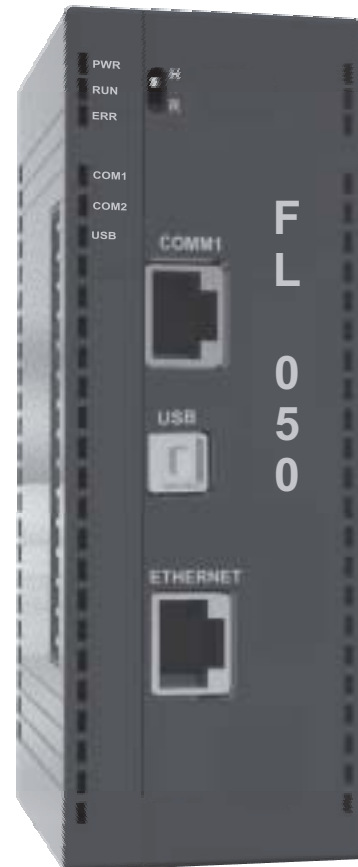
FL051

Power Supply	24VDC, 150mA
Input per channel	24 VDC, 5mA & 20mA for high speed inputs (CH1 & CH2)
Output per channel	24VDC; 0.5A

Standards	CE, UL
Memory	
Total Program Memory	8K Steps
User Data	
Input Registers	400 Words / 6400 pts. (Max.*)
Outout Registers	400 Words / 6400 pts. (Max.*)
Data Registers	4096 words
Retentive Registers	1400 words (EEPROM)
System Registers	256 words
Timer Registers	256 words
Counter Register	256 words
Timer Devices	256 points
System Devices	100 points
Counter Devices	256 points
Configuration Register	1600 Words / 25600 pts. (Max.*)

Communication Ports	
2 COM Ports:	COM1: RS232 and RS485 COM2: 2-wire RS485
1 USB:	For programming
1 Ethernet:	10/100 MBBS For PLC communication and Configuration
IO Specifications:	
Expansion IO capacity	None
Expansion Bus	SPI (1 MHz)
Local IOs	32 (16 IN / 16 OUT)
Digital Inputs	16 Bidirectional Digital inputs (2 High Speed inputs of upto 50KHz). 16 points per common.
Rated Input voltage	24VDC
Rated Input Current	Upto 5mA. (20mA for High Speed I/Ps)
Input Impedance	5.4Kohm (1.2Kohm for High Speed i/ps)
Minimum ON voltage	9.6 VDC
Maximum OFF voltage	3.6 VDC
Turn ON time	10 msec
Turn OFF time	10 msec
Isolation	Optically isolated from internal circuit
Digital outputs	16 PNP Transistor Output
Output Capacity	0.5 A for transistor
Rated load	0.5 A at 24VDC for transistor

Special Input Function	
HS Counter	2HS Counter inputs, single phase (50 KHZ), 32 Bit Dual Phase 1X, 2X, 4X (5KHz)
Interrupt Input	2 Points

Connection method	FRC Type connector
General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	Frequency 10Hz to 150hz Displacement +/- 0.35mm Crossover frequency 59Hz Acceleration: 2g Sweep rate : 1 octave per min Duration : 20 Sweeps / Axis app (2Hr 30min) Axis , X,Y, Z
Shock Test	25 g acceleration with 11 ms 3 Shocks each **AXIS** (a total of 18 Shocks)
Mechanical Dimension	155mm X 102mm
Weight	Approx. 180 gm

Note:
* : Depends upon I/O allocation.

FL100

Power Supply	24VDC, 150mA (+/- 15%)
Input per channel	NA
Output per channel	NA
Standards	CE, UL (Class 1, Div 2)
Memory	
Total Program Memory	5120K Steps
User Data	
Input Registers	400 Words / 6400 pts. (Max.*)
Outout Registers	400 Words / 6400 pts. (Max.*)
Data Registers	4096 words
Retentive Registers	1400 words (EEPROM)
System Registers	256 words
Timer Registers	256 words
Counter Register	256 words
Timer Devices	256 points
System Devices	100 points
Counter Devices	256 points
Configuration Register	1600 Words / 25600 pts. (Max.*)

Communication Ports	
2 COM Ports: COM1 (RJ45 Type):	RS232 / 2Wire RS485/4Wire RS485 [RS232: For upload/download/programming/communication RS485 (2Wire/4Wire): Communication]
COM2 (Open terminals):	2-wire RS485 for communication
1 USB Host	For programming
1 USB Slave	For programming & monitoring
1 Ethernet:	10/100 Mbps For PLC communication, Configuration & monitoring

IO Specifications:	
Expansion IO capacity	16 expansion modules
Local I/Os	None

General	
Mechanical Dimension	100mm X 35mm X 70mm
Weight	200 gm. approx.

General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 60 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	As per IEC60068-2-6
Shock Test	As per IEC60068-2-27

Note:
* : Depends upon I/O allocation.

LED status for FL100

LED	Status
Run mode	ON: Unit is in RUN mode
	OFF:Unit is not in RUN mode (unit may be in HALT, HOLD, ERROR, etc)
Error Mode	ON: Unit is in ERROR mode.
	OFF:Unit is not in ERROR mode.
COM 1	ON/OFF (Blinking): Com 1 data transfer is in progress
	OFF: No data transfer on serial port 1
COM 2	ON/OFF (Blinking): Com 2 data transfer is in progress
	OFF: No data transfer on serial port 2
USB Device Connect indication	ON/OFF (Blinking): USB data transfer is in progress
	OFF: No data transfer on USB port
Ethernet link indication	GREEN LED on: Valid Link present
	GREEN LED off: Valid Link not present
Ethernet Data tran/receive indications	ORANGE LED on: Ethernet Data tran/receive is in progress
	ORANGE LED off: No data is tran/receive on Ethernet port
IP Conflict indications	ON: Unit has IP Conflict
	OFF: No IP Conflict.

FL005-0808RP0201L

Power Supply	24VDC, 300mA (+20%; -15%)
Input per channel	24VDC, 5mA
Output per channel	230V / 2A or 24VDC / 2A for Relay, 0.25A at 24VDC for transistor

Standards	CE, UL (Class 1, Div 2)

Memory	
Total Program Memory	288 KB (Application + Ladder)

User Data	
Input Registers	400 Words / 6400 pts. (Max.*)
Outout Registers	400 Words / 6400 pts. (Max.*)
Data Registers	4096 words
Retentive Registers	1400 words (***EEPROM)
System Registers	256 words
Timer Registers	256 words
Counter Register	256 words
Timer Devices	256 points
System Devices	100 points
Counter Devices	256 points
Configuration Register	1600 Words / 25600 pts. (Max.*)

Communication Ports	
2 COM Ports: COM1 (RJ45 Type):	RS232 [RS232: For upload/download/ monitoring/communication] 5VDC, 200mA Power Source
COM2 (Open terminals):	2-wire RS485 for communication
1 USB Device	For upload / download / monitoring

IO Specifications:	
Expansion IO capacity	NA
Local I/Os	Yes (8 DC IN, 8 DC OUT & 2 ANALOG IN, 1 ANALOG OUT)

General	
Mechanical Dimension	100mm X 26mm X 70mm
Weight	150 gm. max.

General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	As per IEC60068-2-6
Shock Test	As per IEC60068-2-27

Note:
* : Depends upon I/O allocation.

*** Maximum 30000 EEPROM write cycles are allowed. Above this performance may degrade.*

These details are also applicable to models: FL005-0808RP except analog section.

Local IO's Specifications:

24V DC Digital Inputs	
Number of Inputs	8 Inputs Bi-directional Type (Within which 4 are high speed)
Input Design	According to EN 61131-2 Type 1
Minimum ON Voltage	15 VDC
Maximum ON Voltage	30 VDC
Maximum OFF Voltage	5 VDC
Minimum OFF voltage	-3 VDC
Nominal input voltage	24 VDC
Nominal input current	5mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage(BV= 3.7KV)
Input Impedance	3K ohm
Turn OFF time	10msec
Turn ON time	10msec

High Speed Inputs	
Number of HS Inputs	2
High Speed Channels	X0, X1, X2, X3
Max. input frequency	200KHz per channel
Max. input count	4294967295 (32 Bit)

24V DC Digital Outputs Relay and PNP Transistor type	
Number of Outputs	8 includes 6 relay type and 2 PNP transistor type
Min. ON Output Voltage	22V DC (Voltage across load)
Max. ON Voltage	30V DC (Voltage across load)
Max. OFF Voltage	1V
Minimum OFF Voltage	0.2V
Nominal Output voltage	30 V DC
Nominal Output current per channel	250mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage (BV = 3.7 KV)
Short Circuit protection	Yes
Nominal load Relay o/p :	a) DC load: 12 ohms / 48W(resistive) @24VDC 48VA(inductive ,unity power factor) b) AC load: 115 ohms/ 460W(resistive) @ 230VAC 460VA(inductive, unity power factor)
Transistor o/p:	96ohms/6W (resistive) @ 24VDC 6VA (inductive, unity power factor)

Analog Inputs		Analog outputs	
	2 Input Channels Voltage Input: 0 - 10 V, 0 - 5 V; Current Input: 0-20mA, 4-20mA		1 Output channels Current 4 - 20 mA (Max load 500 ohm)
Resolution	16-Bit	Resolution	12-Bit
Acuuracy	0.2% of full scale@ 25 DegC	Acuuracy	0.2% of full scale@ 25 DegC

High Speed Counter Features

Up / Down Counter Single Phase	Number of channels	2 (X0, X2)
	Physical reset input	2 (X4, X5)
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)

Quadrature Counter	Number of channels	2 (X0 and X1, X2 and X3)
	Physical reset input channels	X4, X5
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
	Quadrature mode	4x

PWM Output

Number of channels	2 (Y0 and Y1)
PWM frequency (per channel)	200KHz
Frequency step	1Hz
PWM duty cycle (variable)	0 to 100%
Duty cycle step	1%

Pulse/DIR mode	Number of pulse channels	1
	Output Channels used	Y0 (Pulse), Y1 (Direction)
	Pulse frequency	100KHz Max(50% duty cycle)
	Frequency step	1Hz

CW/CCW mode	Number of pulse channels	2
	Output Channels used	Y0 (CW), Y1 (CCW)
	Pulse frequency	100KHz Max(50% duty cycle)
	Frequency step	1Hz

Fixed pulse mode (Continuous)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Pulse frequency (variable)	100KHz Max(50% duty cycle)
	Frequency step	1Hz

Fixed pulse mode (Trapezoidal) (Soft start)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Minimum frequency	1Hz to 100KHz
	Maximum frequency (must be>min. freq.)	1Hz to 100KHz
	Accaleration time	0 to 65535 (x10mSec base)
	Deceleration time	0 to 65535 (x10mSec base)
	Pulse count	1 to 4294967296
	Frequency step	1Hz

LED status for FL005

LED	Status
Run mode	ON: Unit is in RUN mode
	OFF:Unit is not in RUN mode (unit may be in HALT, HOLD, ERROR, etc)
Error Mode	ON: Unit is in ERROR mode.
	OFF:Unit is not in ERROR mode.

Wiring Diagram for Digital I/Ps and O/Ps of model FL005:

1. Wiring diagram for digital inputs:

Note: X0, X1, X2 and X3 are high speed input: Wiring for Single Phase up counter:

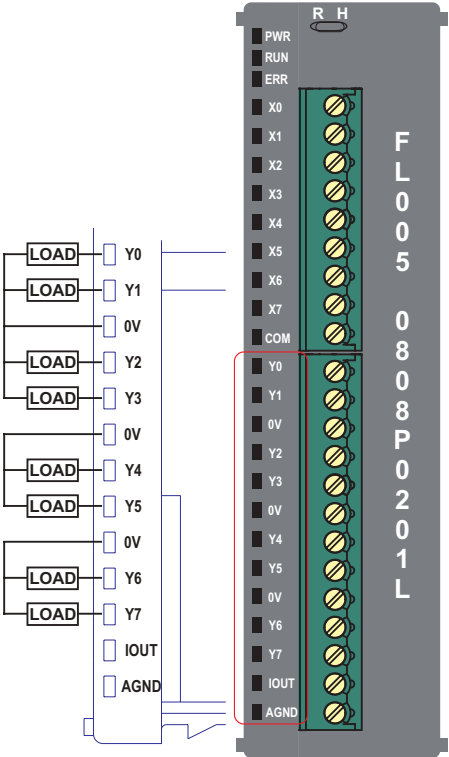**Closing SWx will turn on respective inputs**
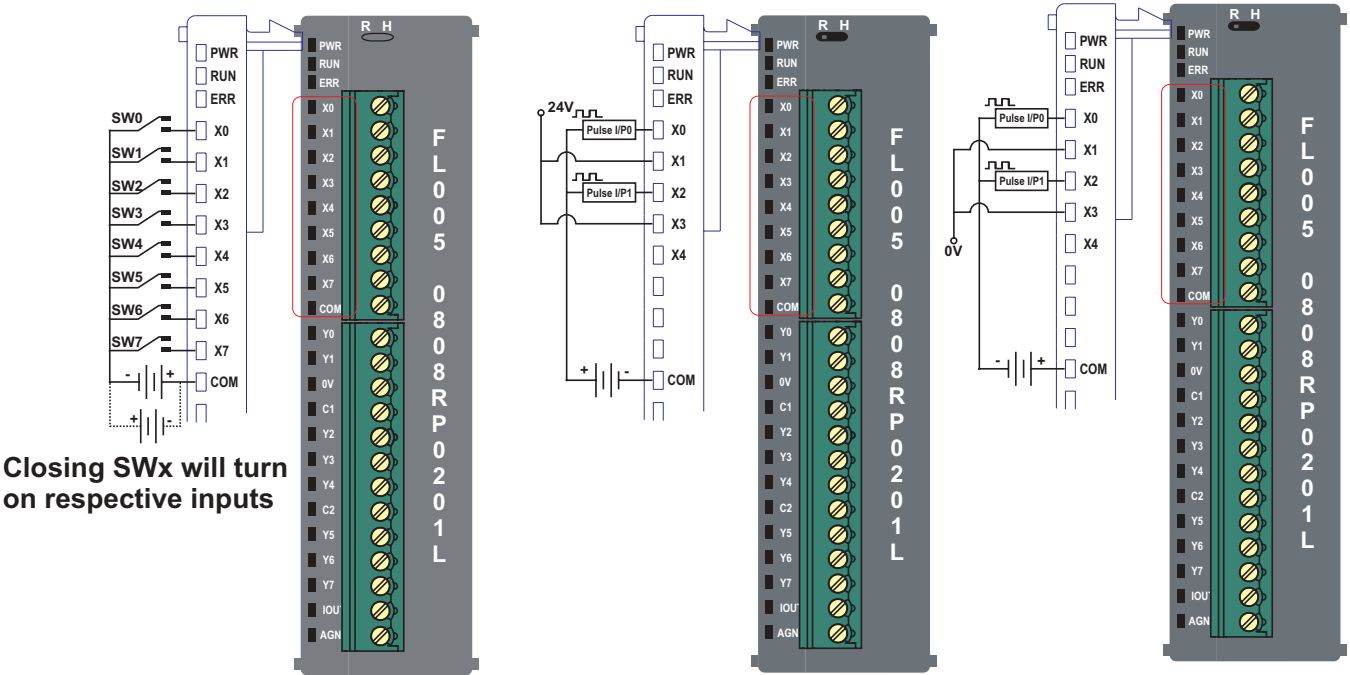
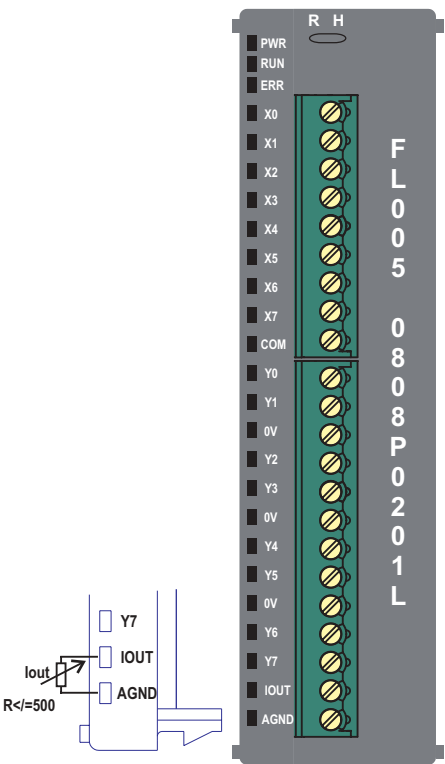Single phase downcounter   Wiring for quadrature mode HSC:
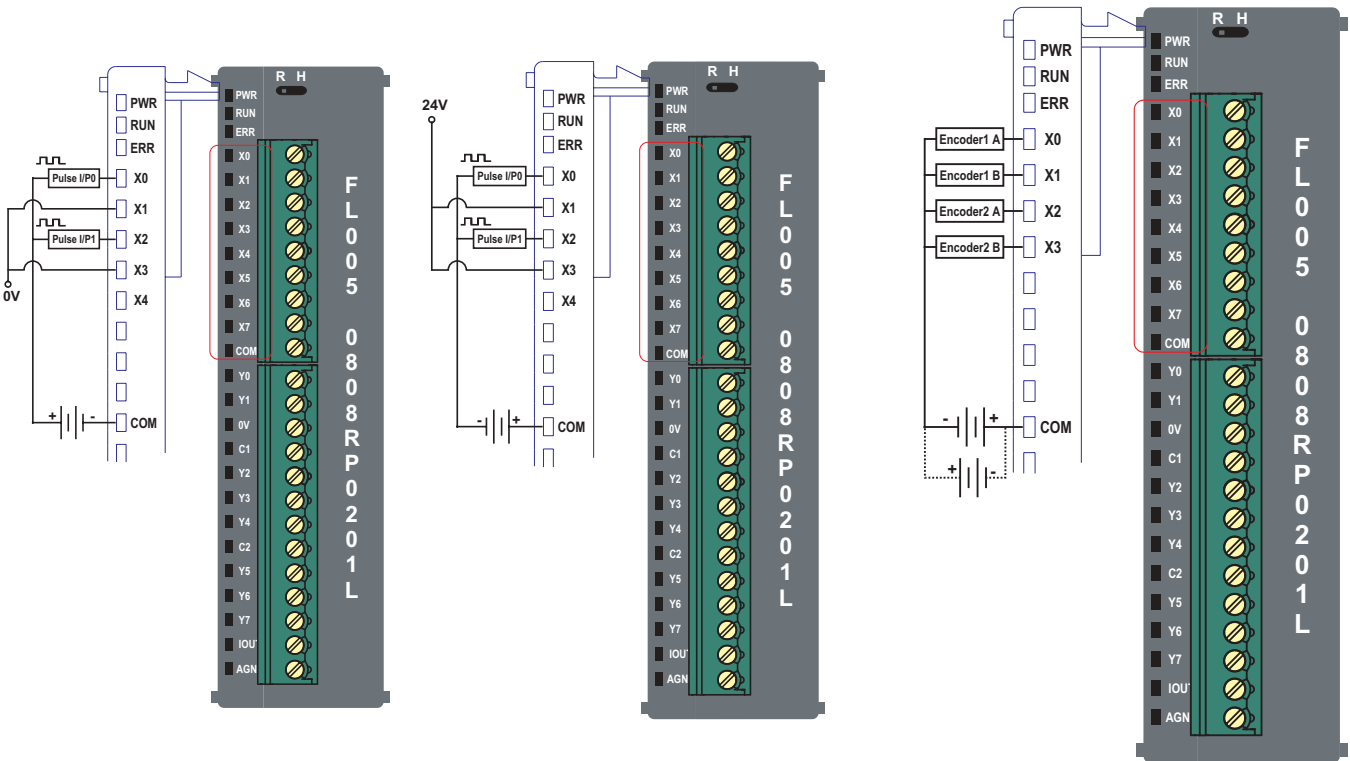
Digital Output Wiring:
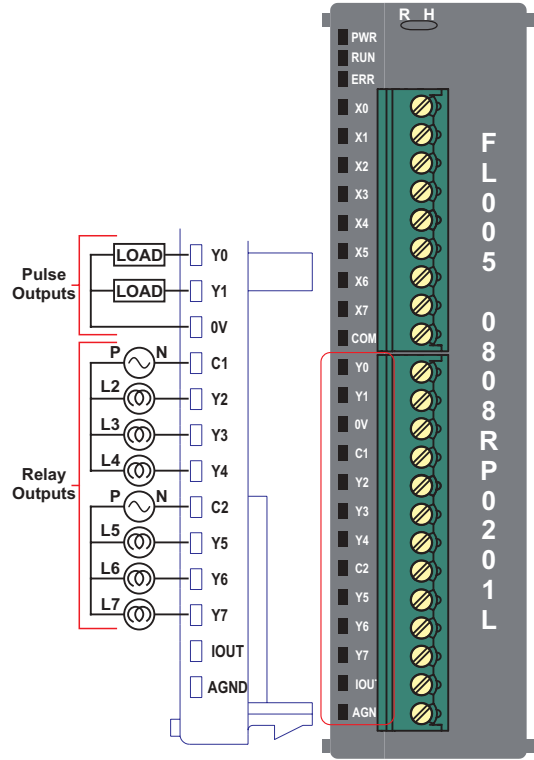
Analog Output Wiring:
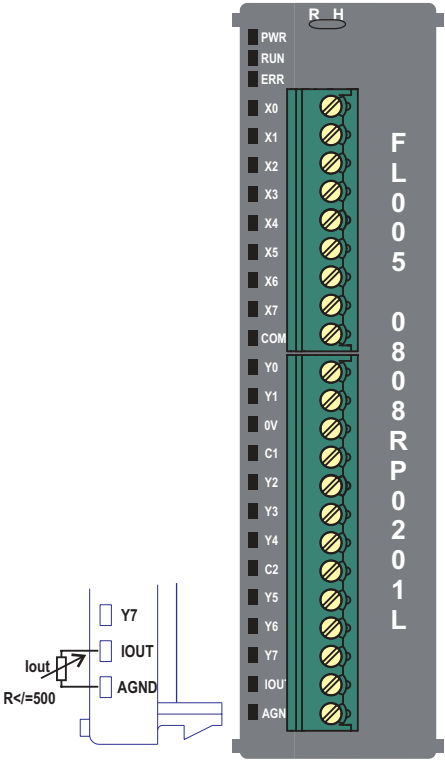
Analog Input Wiring:
For Current:
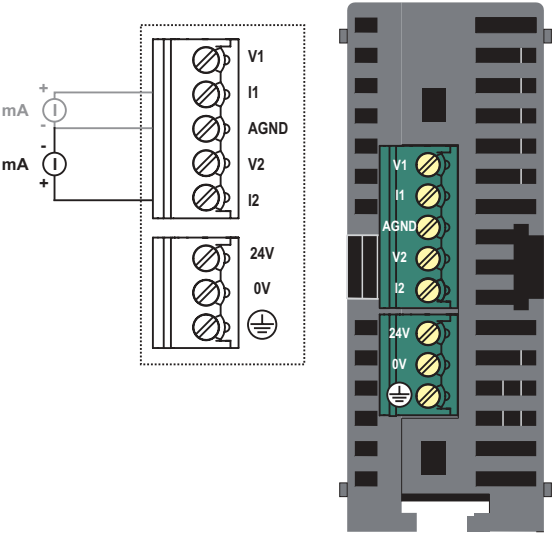
For Voltage:
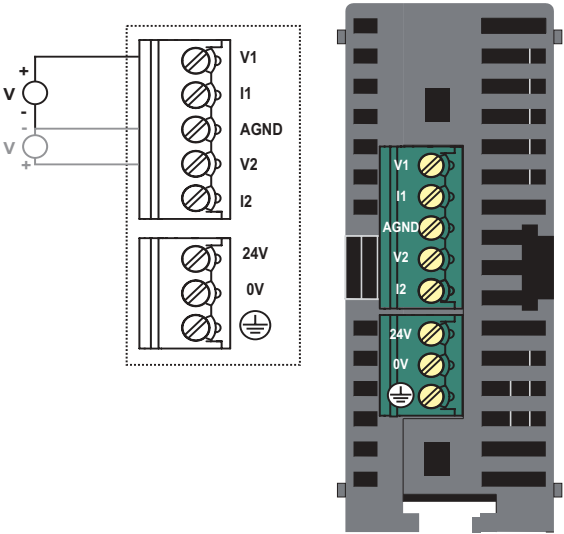
FL005-0808P0201L

Power Supply	24VDC, 300mA (+20%; -15%)
Input per channel	24VDC, 5mA
Output per channel	0.25A at 24VDC
Standards	CE, UL (Class 1, Div 2)
Memory	
Total Program Memory	288 KB (Application + Ladder)
User Data	
Input Registers	400 Words / 6400 pts. (Max.*)
Outout Registers	400 Words / 6400 pts. (Max.*)
Data Registers	4096 words
Retentive Registers	1400 words (EEPROM)
System Registers	256 words
Timer Registers	256 words
Counter Register	256 words
Timer Devices	256 points
System Devices	100 points
Counter Devices	256 points
Configuration Register	1600 Words / 25600 pts. (Max.*)

Communication Ports	
2 COM Ports:	
COM1 (RJ45 Type):	RS232 [RS232: For upload/download/ monitoring/communication] 5VDC, 200mA Power Source
COM2 (Open terminals):	2-wire RS485 for communication
1 USB Device	For upload / download / monitoring
IO Specifications:	
Expansion IO capacity	NA
Local I/Os	Yes (8 DC IN, 8 DC OUT & 2 ANALOG IN, 1 ANALOG OUT)
General	
Mechanical Dimension	100mm X 26mm X 70mm
Weight	150 gm. max.

General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	As per IEC60068-2-6
Shock Test	As per IEC60068-2-27

Note:
* : Depends upon I/O allocation.

***Maximum 30000 EEPROM write cycles are allowed. Above this performance may degrade.

Local IO's Specifications:

24V DC Digital Inputs	
Number of Inputs	8 Inputs Bi-directional Type (Within which 4 are high speed)
Input Design	According to EN 61131-2 Type 1
Minimum ON Voltage	15 VDC
Maximum ON Voltage	30 VDC
Maximum OFF Voltage	5 VDC
Minimum OFF voltage	-3 VDC
Nominal input voltage	24 VDC
Nominal input current	5mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage(BV= 3.7KV)
Input Impedance	3K ohm
Turn OFF time	10msec
Turn ON time	10msec

High Speed Inputs	
Number of HS Inputs	2
High Speed Channels	X0, X1, X2, X3
Max. input frequency	200KHz per channel
Max. input count	4294967295 (32 Bit)

24V DC PNP Transistor type Digital Outputs:	
Number of Outputs	8 includes 8PNP type within which 2 are PWM
Min. ON Output Voltage	22V DC (Voltage across load)
Max. ON Voltage	30V DC (Voltage across load)
Max. OFF Voltage	1V
Minimum OFF Voltage	0.2V
Nominal Output voltage	30 V DC
Nominal Output current per channel	250mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage (BV = 3.7 KV)
Short Circuit protection	Yes.
Nominal load	96ohms/6W (resistive) @ 24VDC 6VA (inductive, unity power factor)

Analog Inputs		Analog outputs	
	2 Input Channels Voltage Input: 0 - 10 V, 0 - 5 V; Current Input: 0-20mA, 4-20mA		1 Output channels Current 4 - 20 mA (Max load 500 ohm)
Resolution	16-Bit	Resolution	12-Bit
Acuuracy	0.2% of full scale @ 25 DegC	Acuuracy	0.2% of full scale @ 25 DegC

High Speed Counter Features

Up / Down Counter Single Phase	Number of channels	2 (X0, X2)
	Physical reset input	2 (X4, X5)
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)

Quadrature Counter	Number of channels	2 (X0 and X1, X2 and X3)
	Physical reset input channels	X4, X5
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
	Quadrature mode	4x

PWM Output

Number of channels	2 (Y0 and Y1)
PWM frequency (per channel)	200KHz
Frequency step	1Hz
PWM duty cycle (variable)	**0 to 100%
Duty cycle step	1%

Pulse/DIR mode	Number of pulse channels	1
	Output Channels used	Y0 (Pulse), Y1 (Direction)
	Pulse frequency	100KHz Max(50% duty cycle)
	Frequency step	1Hz

CW/CCW mode	Number of pulse channels	2
	Output Channels used	Y0 (CW), Y1 (CCW)
	Pulse frequency	100KHz Max(50% duty cycle)
	Frequency step	1Hz

Fixed pulse mode (Continuous)	Number of pulse channels	1
	Output Channels used	Y0 (always continuous pulse)
	Pulse frequency (variable)	100KHz Max(50% duty cycle)
	Frequency step	1Hz

Fixed pulse mode (Trapezoidal) (Soft start)	Number of pulse channels	1
	Output Channels used	Y0
	Minimum frequency	1Hz to 100KHz
	Maximum frequency (must be>min. freq.)	1Hz to 100KHz
	Accelaration time	0 to 65535 (x10mSec base)
	Deceleration time	0 to 65535 (x10mSec base)
	Pulse count	1 to 4294967296
	Frequency step	1Hz

Wiring Diagram for Digital I/Ps and O/Ps of model FL005-0808P0201L:

1. Wiring diagram for digital inputs:

Note: X0, X1, X2 and X4 are high speed input:

Wiring for Single Phase up counter:

Closing SWx will turn on respective inputs

Single phase down counter

Wiring for quadrature mode HSC:

Digital Output Wiring:

Analog Output Wiring:

Analog Input Wiring:
For Current:

For Voltage:

FL005-0808RP

Refer model FL005-0808RP0201L for all specifications except analog section.

Wiring Diagram for Digital I/Ps and O/Ps of model FL005-0808RP:
1. Wiring diagram for digital inputs:
Note: X0, X1, X2 and X3 are high speed input: Single Phase up counter:

Closing SWx will turn on respective inputs
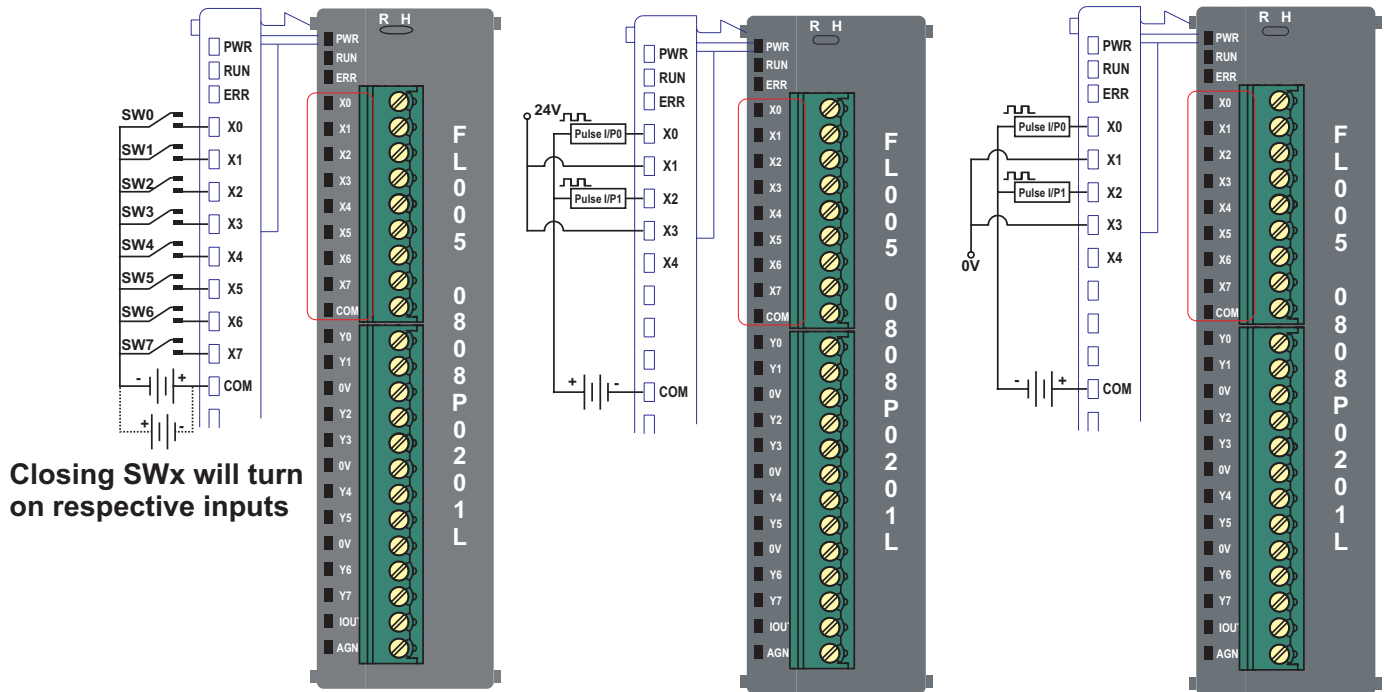
Single phase down counter   Wiring for quadrature mode HSC:
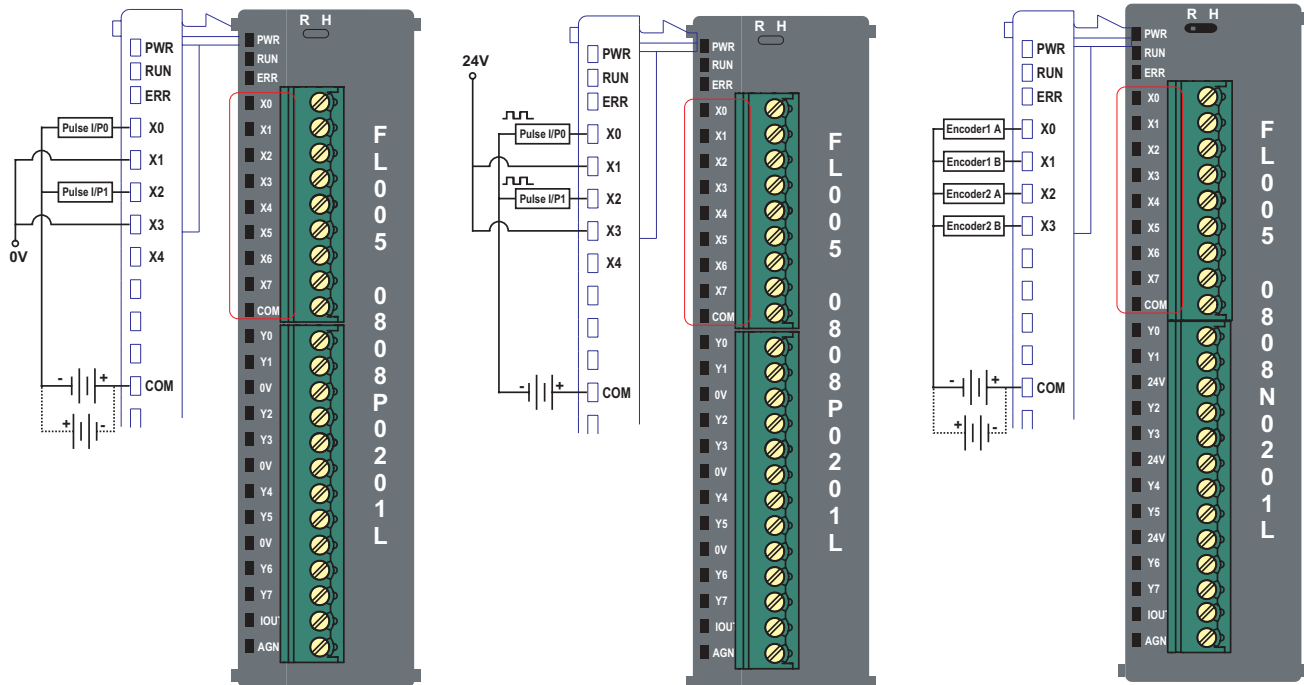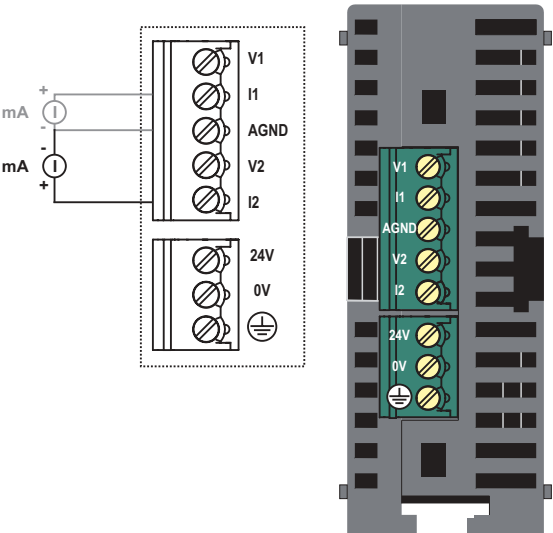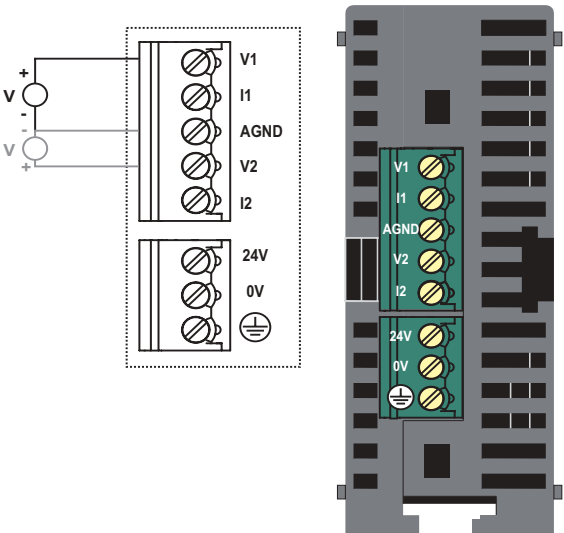
Digital Output Wiring:
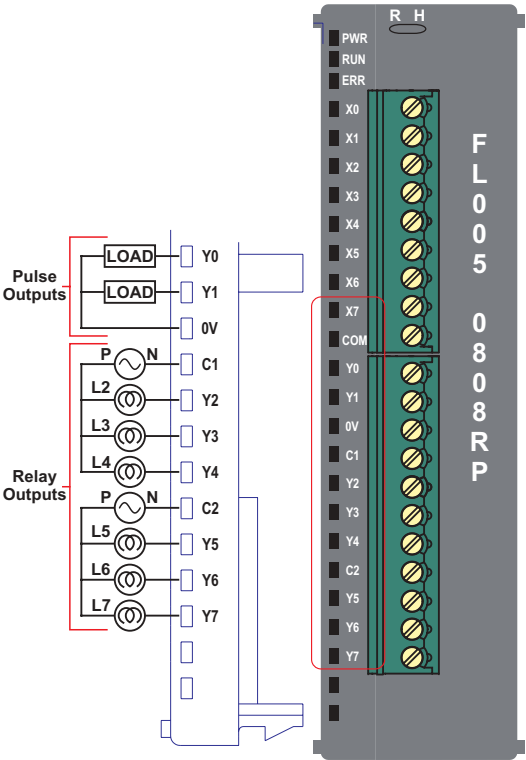
FL005-0808P

Refer model FL005-0808P0201L for all specifications except analog section.

Wiring Diagram for Digital I/Ps and O/Ps of model FL005-0808P:
1. Wiring diagram for digital inputs:
Note: X0, X1, X2 and X3 are high speed input: Single Phase up counter:

Closing SWx will turn on respective inputs
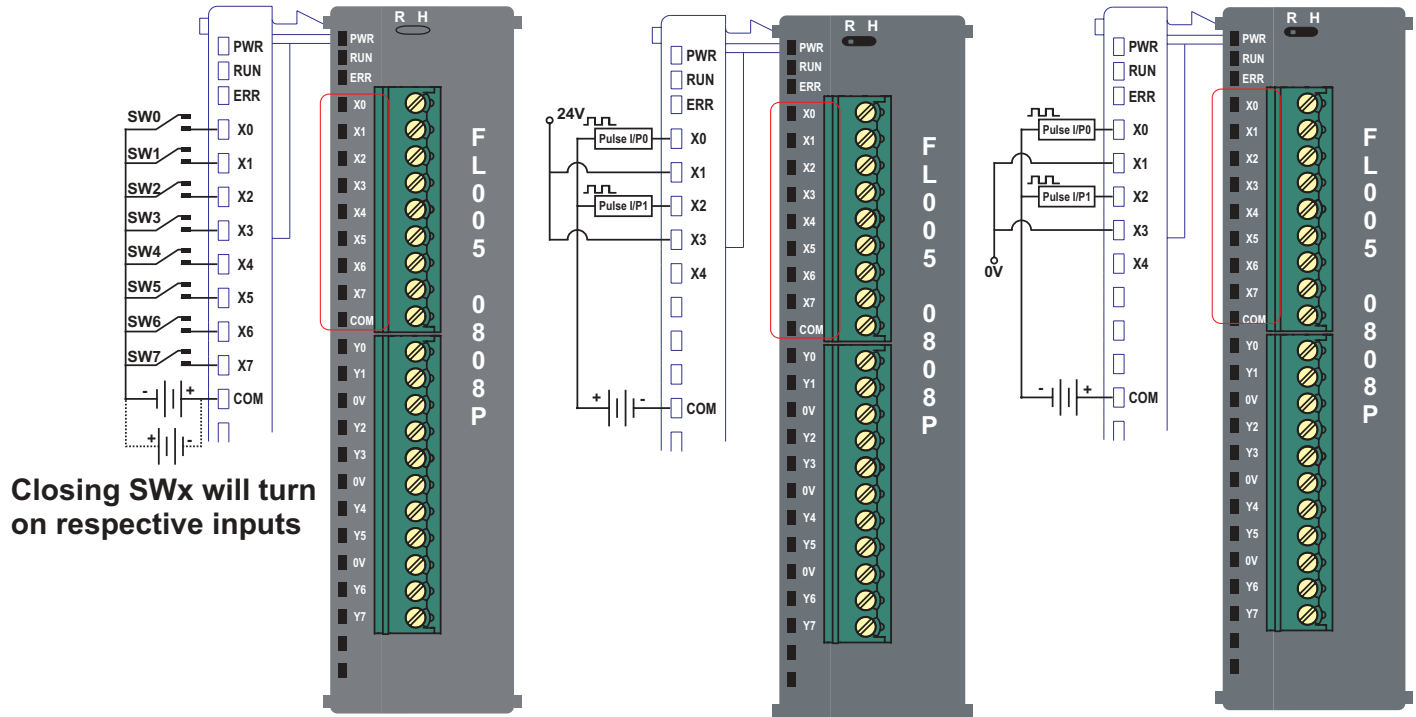
Single phase down counter

Wiring for quadrature mode HSC:
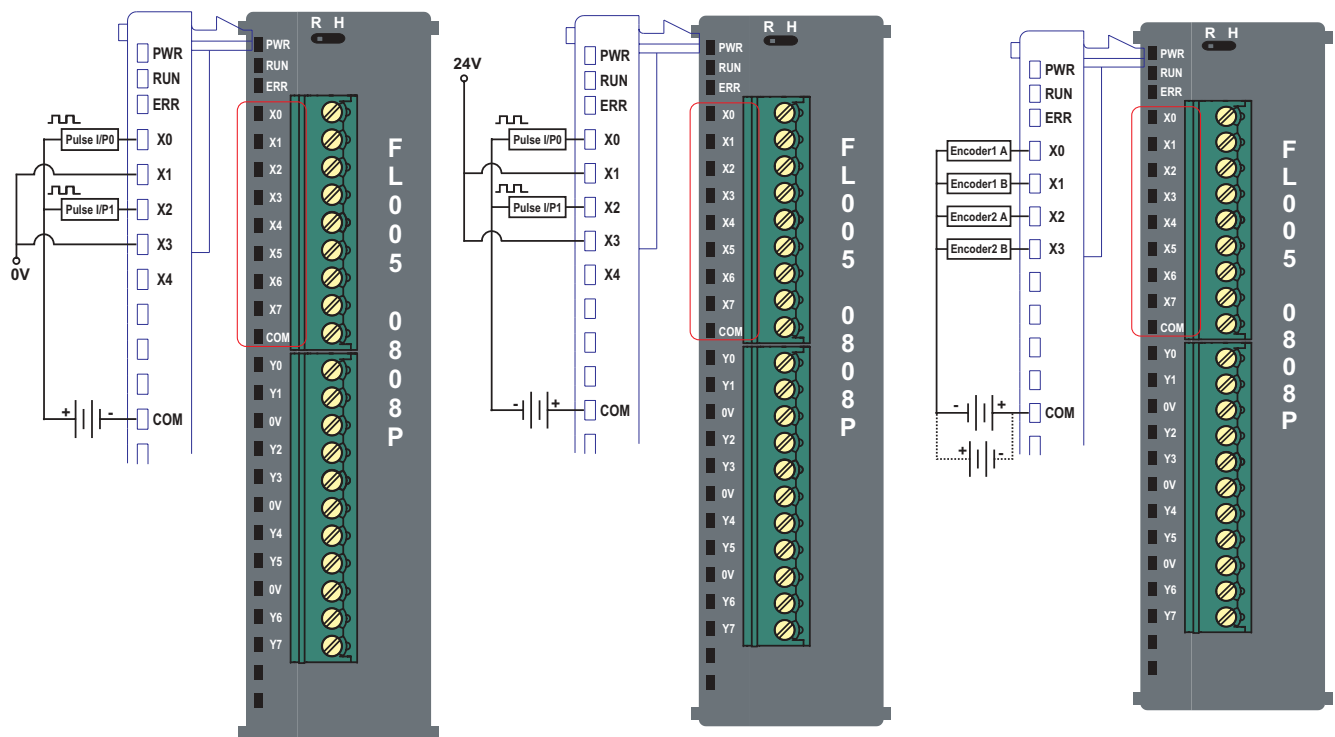
Digital Output Wiring:
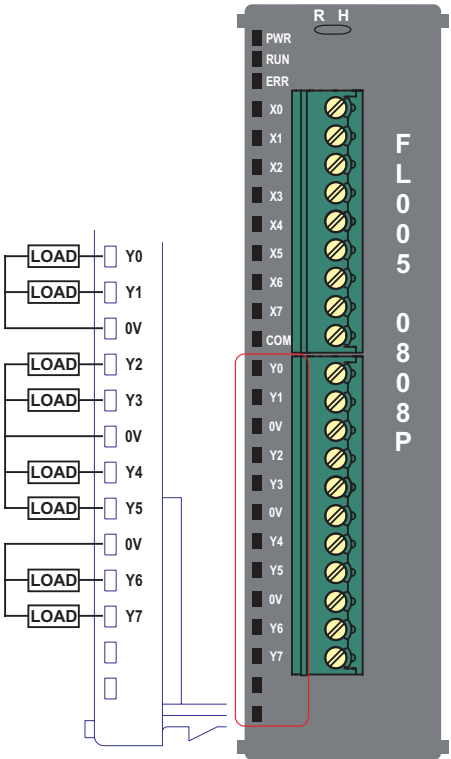
PWM Output Wiring diagram:
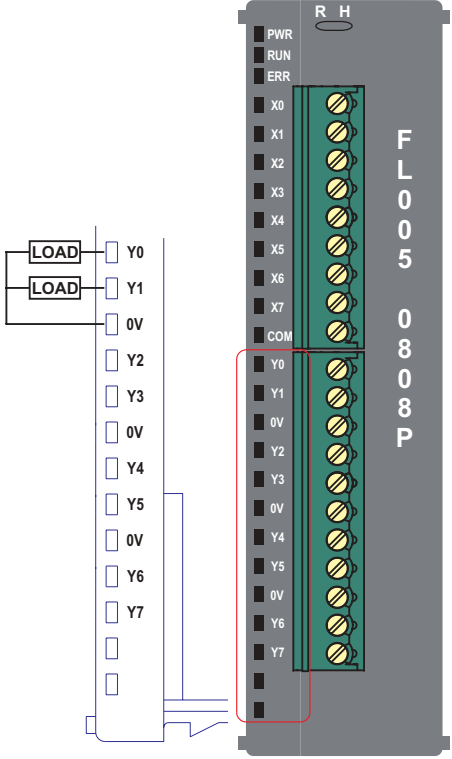
FL005-0604P

Refer model FL005-0808P0201L for all specifications except analog section. Also it has 6 (six) digital outputs and 5 (five) PNP type digital outputs

Wiring Diagram for Digital I/Ps and O/Ps of model FL005-0604P:
1. Wiring diagram for digital inputs:
Note: X0, X1, X2 and X3 are high speed input:

Single Phase up counter:

Closing SWx will turn on respective inputs
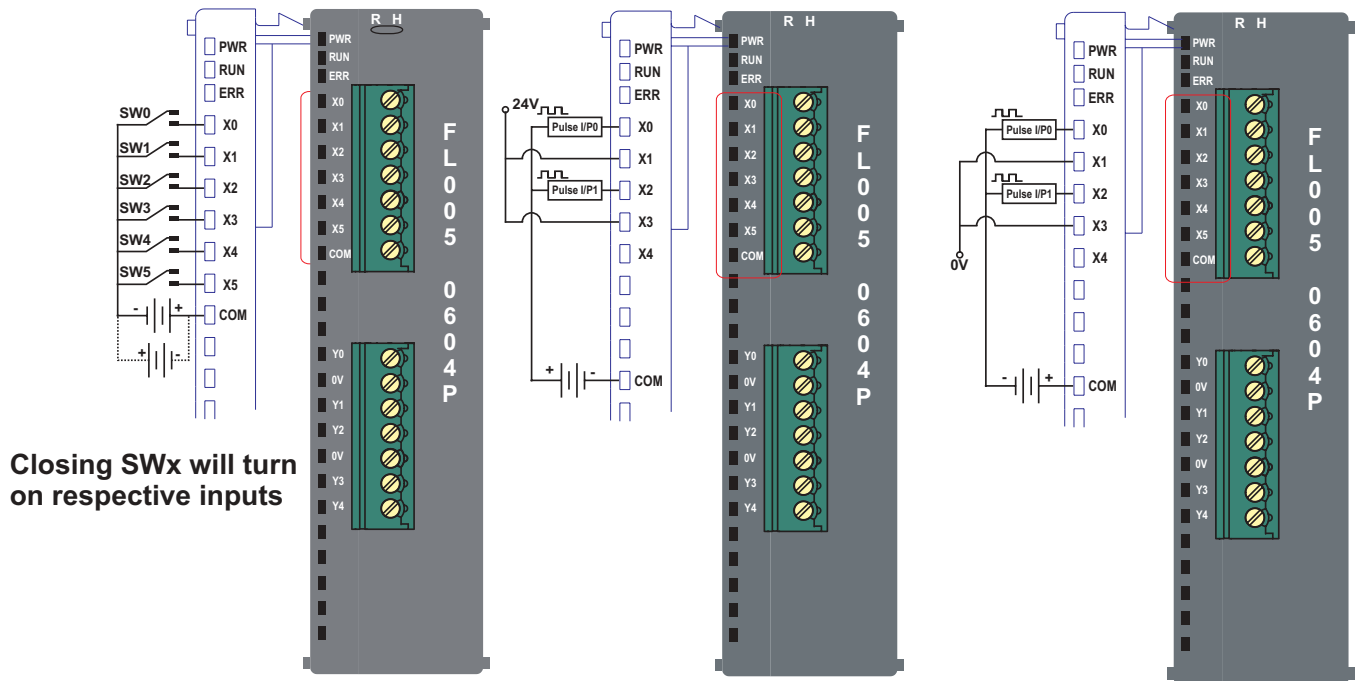
Single phase down counter:

Wiring for quadrature mode HSC:
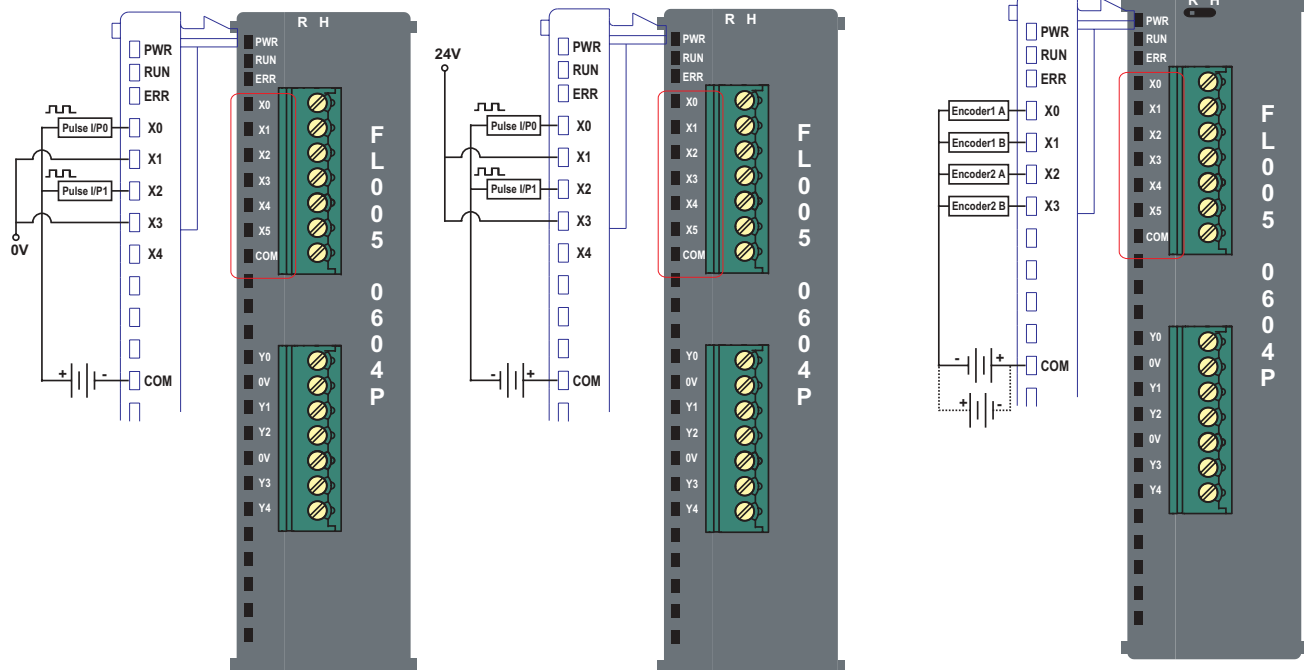
Digital Output Wiring:
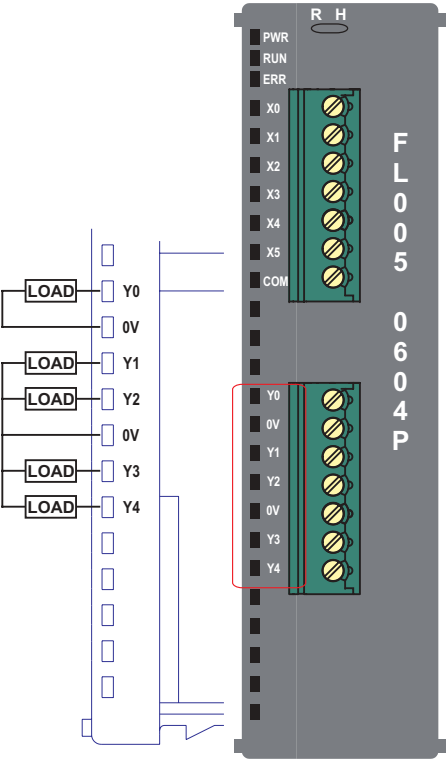
PWM Output wiring diagram:
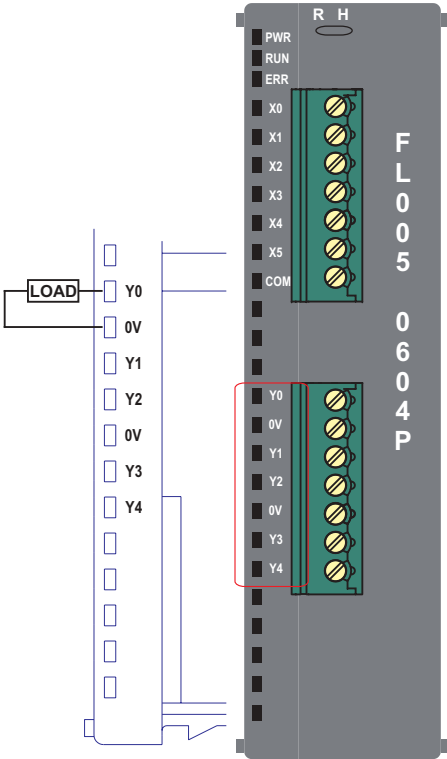
FL005-0808N0201L

Power Supply	24VDC, 300mA (+20%; -15%)
Input per channel	24VDC, 5mA
Output per channel	0.3A at 24VDC
Standards	CE, UL (Class 1, Div 2)
Memory	
Total Program Memory	288 KB (Application + Ladder)
User Data	
Input Registers	400 Words / 6400 pts. (Max.*)
Outout Registers	400 Words / 6400 pts. (Max.*)
Data Registers	4096 words
Retentive Registers	1400 words (***EEPROM)
System Registers	256 words
Timer Registers	256 words
Counter Register	256 words
Timer Devices	256 points
System Devices	100 points
Counter Devices	256 points
Configuration Register	1600 Words / 25600 pts. (Max.*)

Communication Ports	
2 COM Ports:	
COM1 (RJ45 Type):	RS232 [RS232: For upload/download/ monitoring/communication] 5VDC, 200mA Power Source
COM2 (Open terminals):	2-wire RS485 for communication
1 USB Device	For upload / download / monitoring
IO Specifications:	
Expansion IO capacity	NA
Local I/Os	Yes (8 DC IN, 8 DC OUT & 2 ANALOG IN, 1 ANALOG OUT)
General	
Mechanical Dimension	100mm X 26mm X 70mm
Weight	150 gm. max.

General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	As per IEC60068-2-6
Shock Test	As per IEC60068-2-27

Note:
* : Depends upon I/O allocation.

***Maximum 30000 EEPROM write cycles are allowed. Above this performance may degrade.

Local IO's Specifications:

24V DC Digital Inputs	
Number of Inputs	8 Inputs Bi-directional Type (Within which 4 are high speed)
Input Design	According to EN 61131-2 Type 1
Minimum ON Voltage	15 VDC
Maximum ON Voltage	30 VDC
Maximum OFF Voltage	5 VDC
Minimum OFF voltage	-3 VDC
Nominal input voltage	24 VDC
Nominal input current	5mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage(BV= 3.7KV)
Input Impedance	3K ohm
Turn OFF time	10msec
Turn ON time	10msec

High Speed Inputs	
Number of HS Inputs	2
High Speed Channels	X0, X1, X2, X3
Max. input frequency	200KHz per channel
Max. input count	4294967295 (32 Bit)

24V DC NPN Transistor type Digital Outputs:	
Number of Outputs	8 includes 8NPN type within which 2 are PWM
Min. ON Output Voltage	22V DC (Voltage across load)
Max. ON Voltage	30V DC (Voltage across load)
Max. OFF Voltage	1V
Minimum OFF Voltage	0.2V
Nominal Output voltage	30 V DC
Nominal Output current per channel	300mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage (BV = 3.7 KV)
Short Circuit protection	Yes.
Nominal load	80ohms/7.2W (resistive) @ 24VDC 7.2VA (inductive, unity power factor)

Analog Inputs	2 Input Channels Voltage Input: 0 - 10 V, 0 - 5 V; Current Input: 0-20mA, 4-20mA	Analog outputs	1 Output channels Current 4 - 20 mA (Max load 500 ohm)
Resolution	16-Bit	Resolution	12-Bit
Acuuracy	0.2% of full scale @ 25 DegC	Acuuracy	0.2% of full scale @ 25 DegC

High Speed Counter Features

Up / Down Counter Single Phase	Number of channels	2 (X0, X2)
	Physical reset input	2 (X4, X5)
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
Quadrature Counter	Number of channels	2 (X0 and X1, X2 and X3)
	Physical reset input channels	X4, X5
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
	Quadrature mode	4x

PWM Output

Number of channels	2 (Y0 and Y1)
PWM frequency (per channel)	200KHz
Frequency step	1Hz
PWM duty cycle (variable)	**0 to 100%
Duty cycle step	1%

Pulse/DIR mode	Number of pulse channels	1
	Output Channels used	Y0 (Pulse), Y1 (Direction)
	Pulse frequency	100KHz Max(50% duty cycle)
	Frequency step	1Hz
CW/CCW mode	Number of pulse channels	2
	Output Channels used	Y0 (CW), Y1 (CCW)
	Pulse frequency	100KHz Max(50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Continuous)	Number of pulse channels	1
	Output Channels used	Y0 (always continuous pulse)
	Pulse frequency (variable)	100KHz Max(50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Trapezoidal) (Soft start)	Number of pulse channels	1
	Output Channels used	Y0
	Minimum frequency	1Hz to 100KHz
	Maximum frequency (must be>min. freq.)	1Hz to 100KHz
	Accelaration time	0 to 65535 (x10mSec base)
	Deceleration time	0 to 65535 (x10mSec base)
	Pulse count	1 to 4294967296
	Frequency step	1Hz

Wiring Diagram for Digital I/Ps and O/Ps of model FL005-0808N0201L:

1. Wiring diagram for digital inputs:

Note: X0, X1, X2 and X4 are high speed input:

Single Phase up counter:

Closing SWx will turn on respective inputs

Single phase down counter
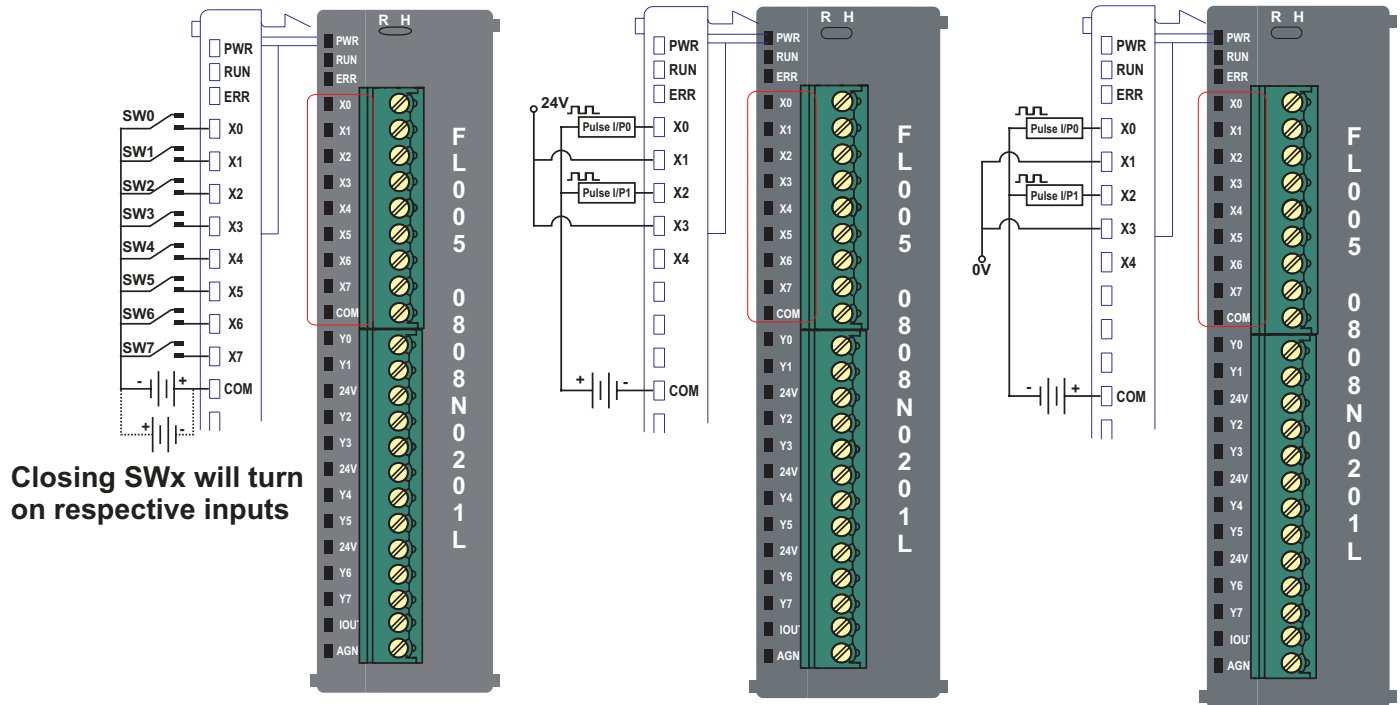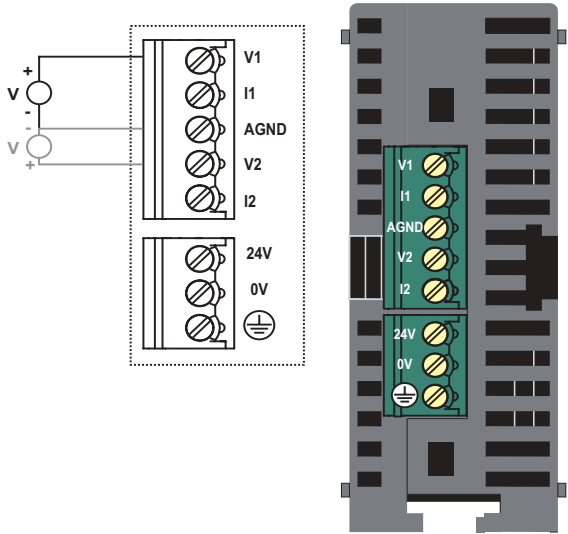
Wiring for quadrature mode HSC:
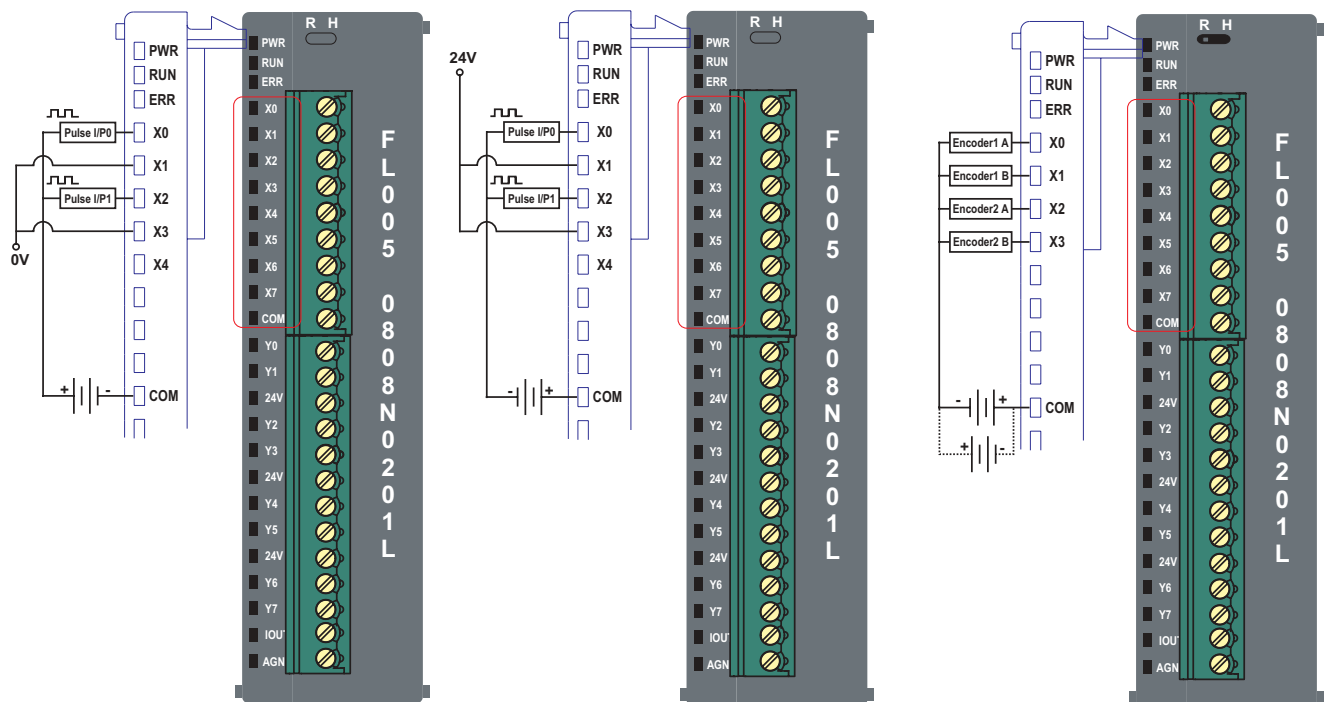
Digital Output Wiring:
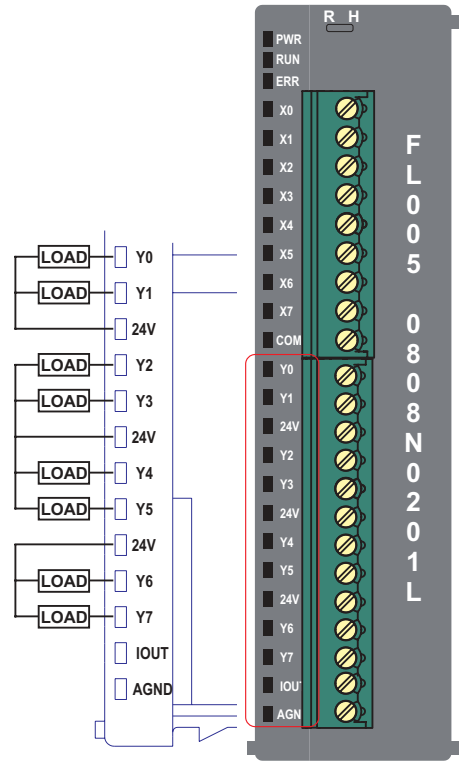
Analog Output Wiring:
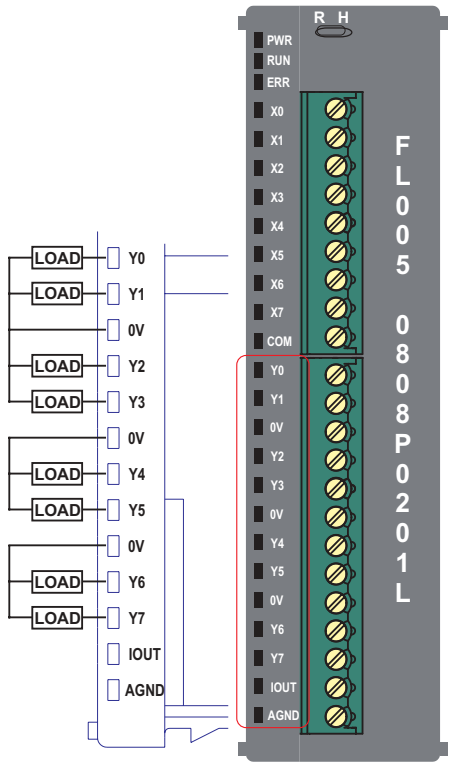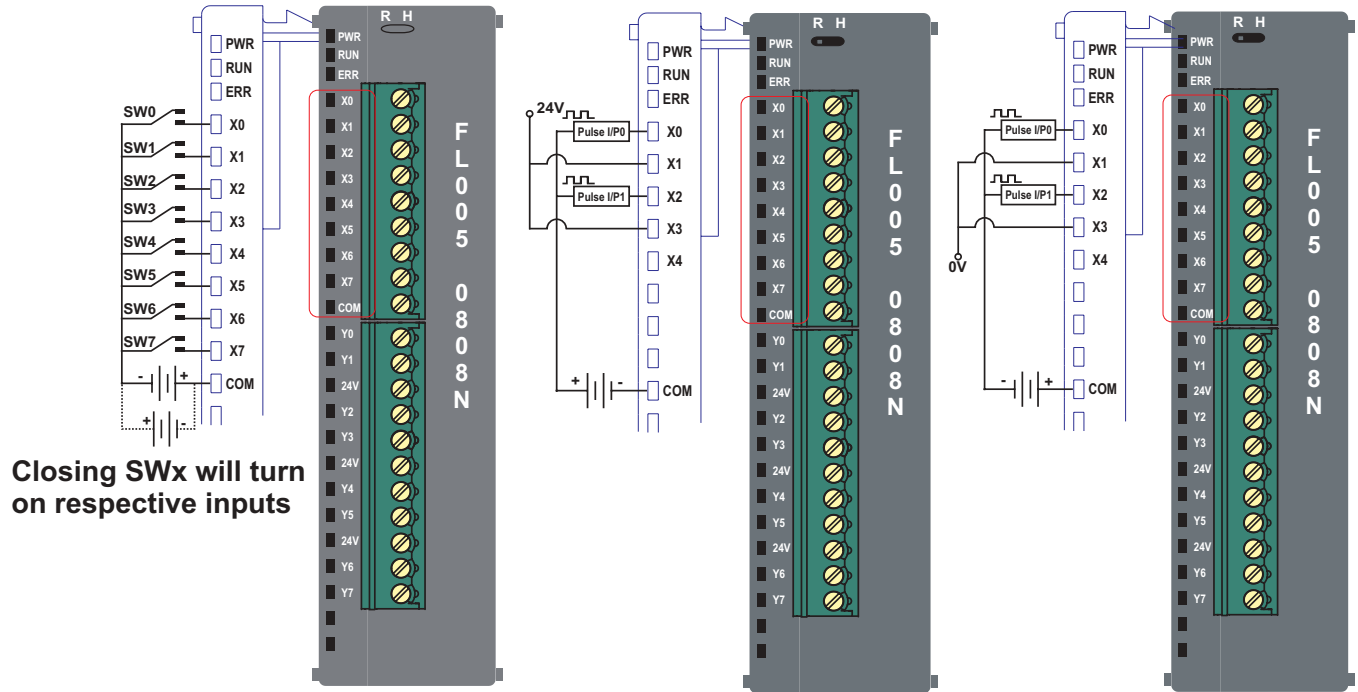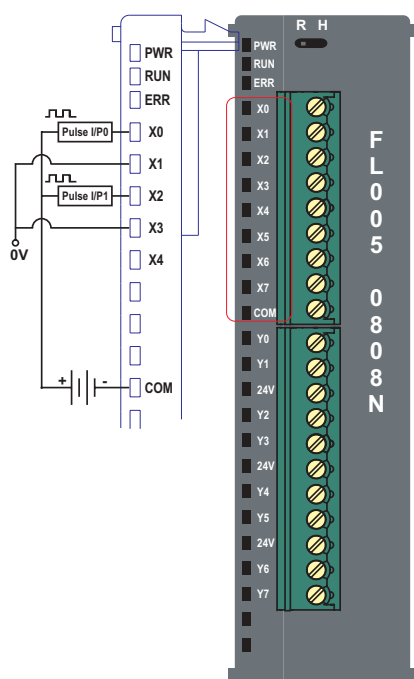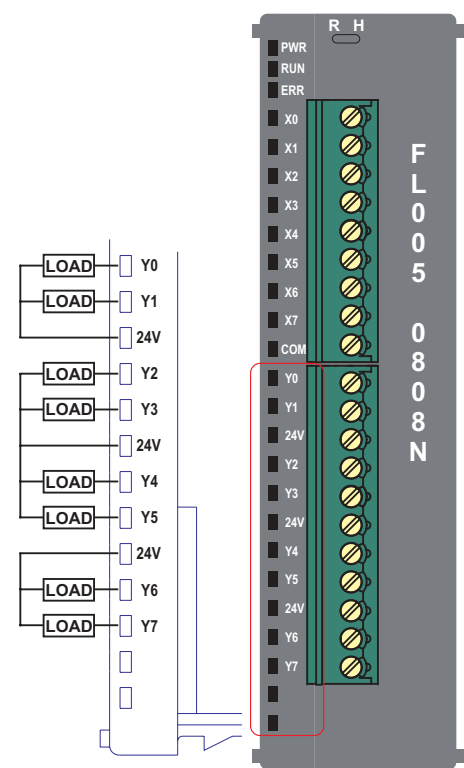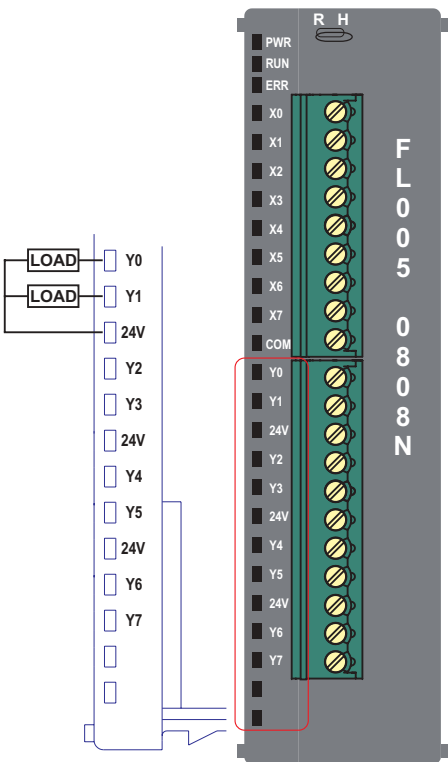

Analog Input Wiring:
For Current:
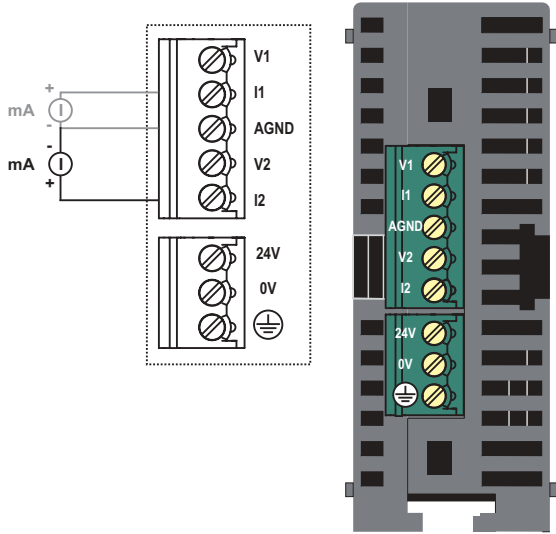
For Voltage:

FL005-0808N

Refer model FL005-0808N0201L for all specifications except analog section.

Wiring Diagram for Digital I/Ps and O/Ps of model FL005-0808N:
1. Wiring diagram for digital inputs:
Note: X0, X1, X2 and X3 are high speed input: Single Phase up counter:


**Closing SWx will turn on respective inputs**

Single phase down counter

Wiring for quadrature mode HSC:
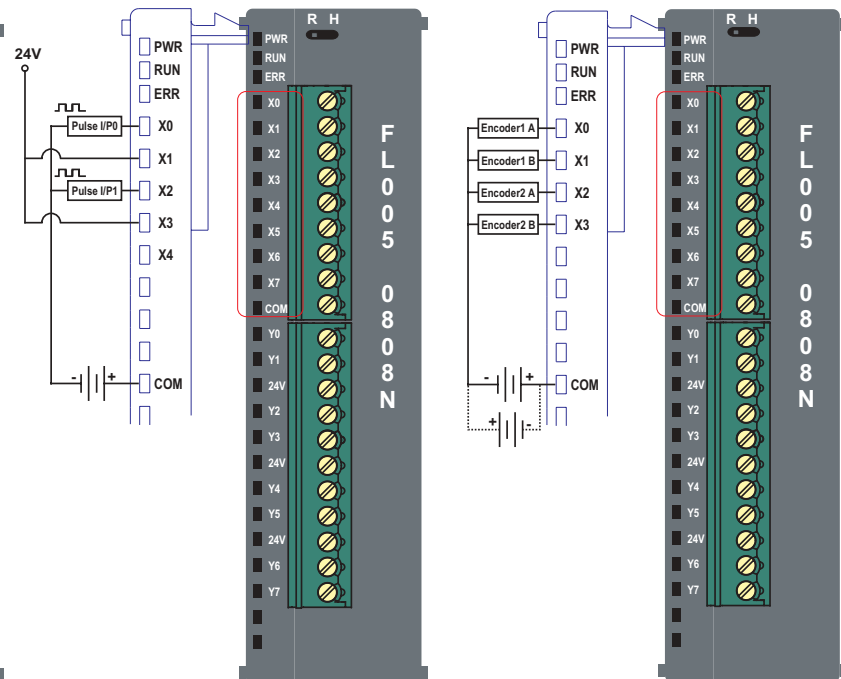
Digital Output Wiring:

PWM wiring diagram:

FL005-0604N

Refer model FL005-0808N0201L for all specifications except analog section. Also it has 6 (six) digital outputs and 5 (five) PNP type digital outputs

Wiring Diagram for Digital I/Ps and O/Ps of model FL005-0604N:
1. Wiring diagram for digital inputs:
Note: X0, X1, X2 and X3 are high speed input:

Single Phase up counter:

Closing SWx will turn on respective inputs
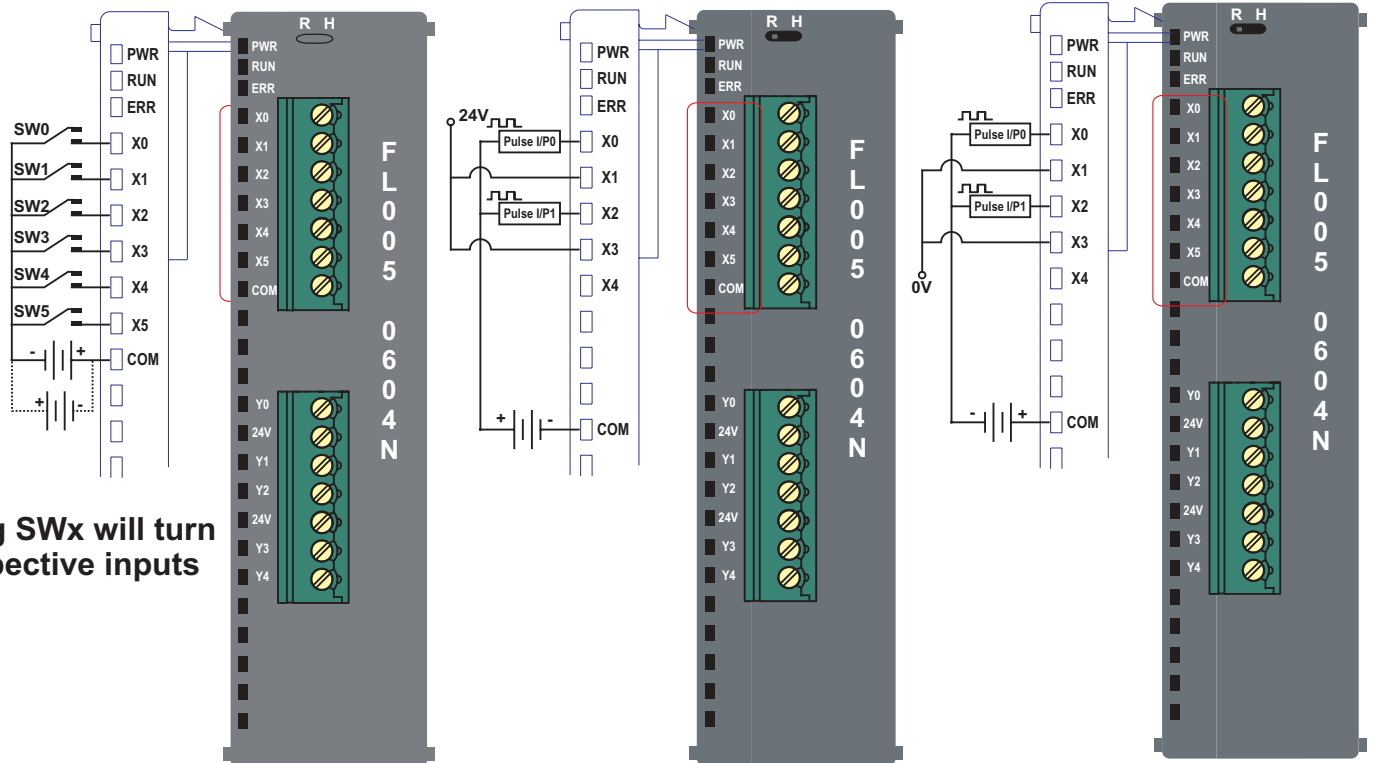
Single phase down counter

Wiring for quadrature mode HSC:
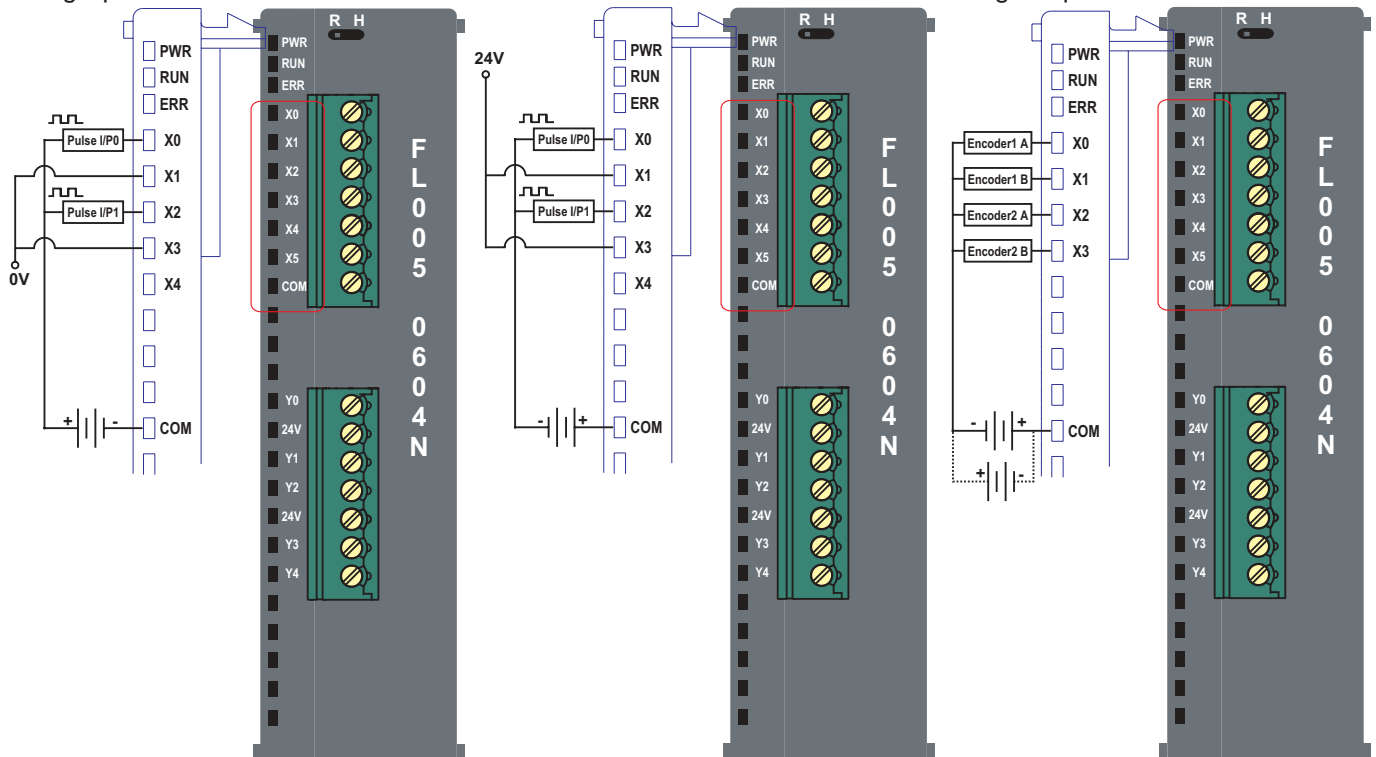
Digital Output Wiring:
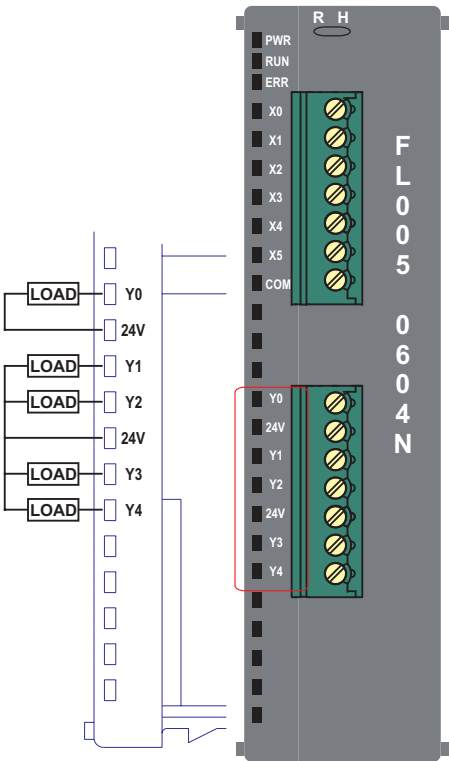
PWM Wiring Diagram:
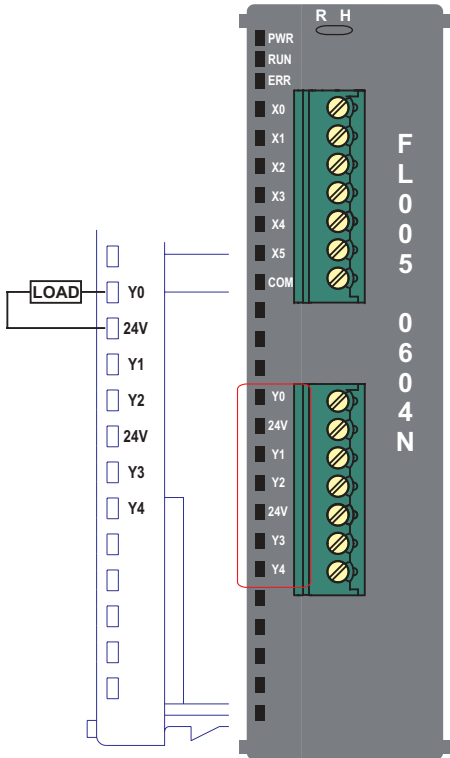
FL005-0808RP0402U

Power Supply	24VDC, 700mA (+20%; -15%)
Input per channel	24VDC, 5mA
Output per channel	230V / 2A or 24VDC / 2A for Relay, 0.25A at 24VDC for transistor (P Type)
Standards	CE, UL (Class 1, Div 2)
Memory	
Total Program Memory	Ladder memory : 178KB (30K Steps) Application memory : 92KB
User Data	
Input Registers	6400 points / 400 Words (*max) (X/XW)
Outout Registers	6400 points / 400 Words (*max) (Y/YW)
Auxillary Registers	4096 points / 256 words (B / BW)
Data Registers	4096 words (D)
Retentive Registers	1400 words (***EEPROM)
System Registers	4096 points / 256 words (S / SW)
Timers	256 points / 256 words (T. / T)
Counters	256 points / 256 words (C. / C)
System Devices	100 points
Configuration Register	25600 points / 1600 Words (Max.*)
Index Registers	3 Words (I, J, K)
Communication Ports	
2 COM Ports: COM1 (RJ45 Type):	RS232 [RS232: For upload/download/ monitoring/communication] 5VDC, 300mA Power Source
COM2 (Open terminals):	2-wire RS485 for communication
USB Device	1, For upload / download / Monitoring
IO Specifications:	
Expansion IO capacity	16 Expansion modules
Local I/Os	Yes (8 DC IN, 8 DC OUT & 4 ANALOG IN, 2 ANALOG OUT)
General	
Mechanical Dimension	100mm X 70mm X 52mm (HxDxW in mm)
Weight	250 gm. max.

General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	As per IEC60068-2-6
Shock Test	As per IEC60068-2-27

Note:
* : Depends upon I/O allocation.
 ***Maximum 30000 EEPROM write cycles are
allowed. Above this performance may degrade.

Local IO's Specifications:

24V DC Digital Inputs	
Number of Inputs	8 Inputs Bi-directional Type (Within which 4 are high speed)
Input Design	According to EN 61131-2 Type 1
Minimum ON Voltage	15 VDC
Maximum ON Voltage	30 VDC
Maximum OFF Voltage	5 VDC
Minimum OFF voltage	-3 VDC
Nominal input voltage	24 VDC
Nominal input current	5mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage(BV= 3.7KV)
Input Impedance	3K ohm
Turn OFF time	10msec
Turn ON time	10msec

High Speed Inputs	
Number of HS Inputs	2
High Speed Channels	X0, X1, X2, X3
Max. input frequency	200KHz per channel
Max. input count	4294967295 (32 Bit)
Nominal inputs current	12 mA

24V DC Digital Outputs	Relay and PNP Transistor type
Number of Outputs	8 includes 6 relay type and 2 PNP transistor type
Min. ON Output Voltage	22V DC (Voltage across load)
Max. ON Voltage	30V DC (Voltage across load)
Max. OFF Voltage	1V
Minimum OFF Voltage	0.2V
Nominal Output voltage	30 V DC
Nominal Output current per channel	250mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage (BV = 3.7 KV)
Short Circuit protection	Yes
Nominal load Relay o/p :	a) DC load: 12 ohms / 48W(resistive) @24VDC 48VA(inductive ,unity power factor) b) AC load: 115 ohms/ 460W(resistive) @ 230VAC 460VA(inductive, unity power factor)
Transistor o/p:	96ohms/6W (resistive) @ 24VDC 6VA (inductive, unity power factor)

Analog Inputs	4Input Channels Voltage Input: 0 - 10 VDC, 0 - 5 VDC; mV Input: 0 - 50mV, 0 - 100mV Current Input: 0-20mA, 4-20mA RTD: PT100 PT100: -200 to 850 Deg.C Thermocouple: J & K *J: -200 to 1200 deg.C *K: -200 to 1373 Deg.C
Resolution	16-Bit
Acuuracy for voltage current & RTD	0.2% of full scale @ 25 DegC
Acuuracy for thermo-couple	0.5% of full scale @ 25 DegC
Acuuracy for millivoltage	0.5% of full scale @ 25 DegC

Analog outputs	1 Output channels Current 4 - 20 mA (Max load 500 ohm) Voltage 0 - 10 VDC (Max load 1000 ohm)
Resolution	12-Bit
Acuuracy	0.2% of full scale @ 25 DegC

* Thermocouple J and K ranges applicable to models with H/W Rev A1 and onwards.
For product with H/W rev A0 had thermocouple range as 0 to 1200 Deg. C and 0 to 1373 Deg. C respectively.

High Speed Counter Features

Up / down Counter Single Phase	Number of channels	2 (X0, X2)
	Physical reset input	2 (X4, X5)
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
Quadrature Counter	Number of channels	2 (X0 and X1, X2 and X3)
	Physical reset input channels	X4, X5
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
	Quadrature mode	4x

PWM Output

Number of channels	2 (Y0 and Y1)
PWM frequency (per channel)	200KHz
Frequency step	1Hz
PWM duty cycle (variable)	0 to 100%
Duty cycle step	1%

Pulse/DIR mode	Number of pulse channels	1
	Output Channels used	Y0 (Pulse), Y1 (Direction)
	Pulse frequency	200KHz Max(50% duty cycle)
	Frequency step	1Hz
CW/CCW mode	Number of pulse channels	2
	Output Channels used	Y0 (CW), Y1 (CCW)
	Pulse frequency	200KHz Max(50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Continuous)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Pulse frequency (variable)	200KHz Max(50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Trapezoidal) (Soft start)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Minimum frequency	1Hz to 200KHz
	Maximum frequency (must be>min. freq.)	1Hz to 200KHz
	Accalaration time	0 to 65535 (x10mSec base)
	Deceleration time	0 to 65535 (x10mSec base)
	Pulse count	1 to 4294967296
	Frequency step	1Hz

LED status for FL005

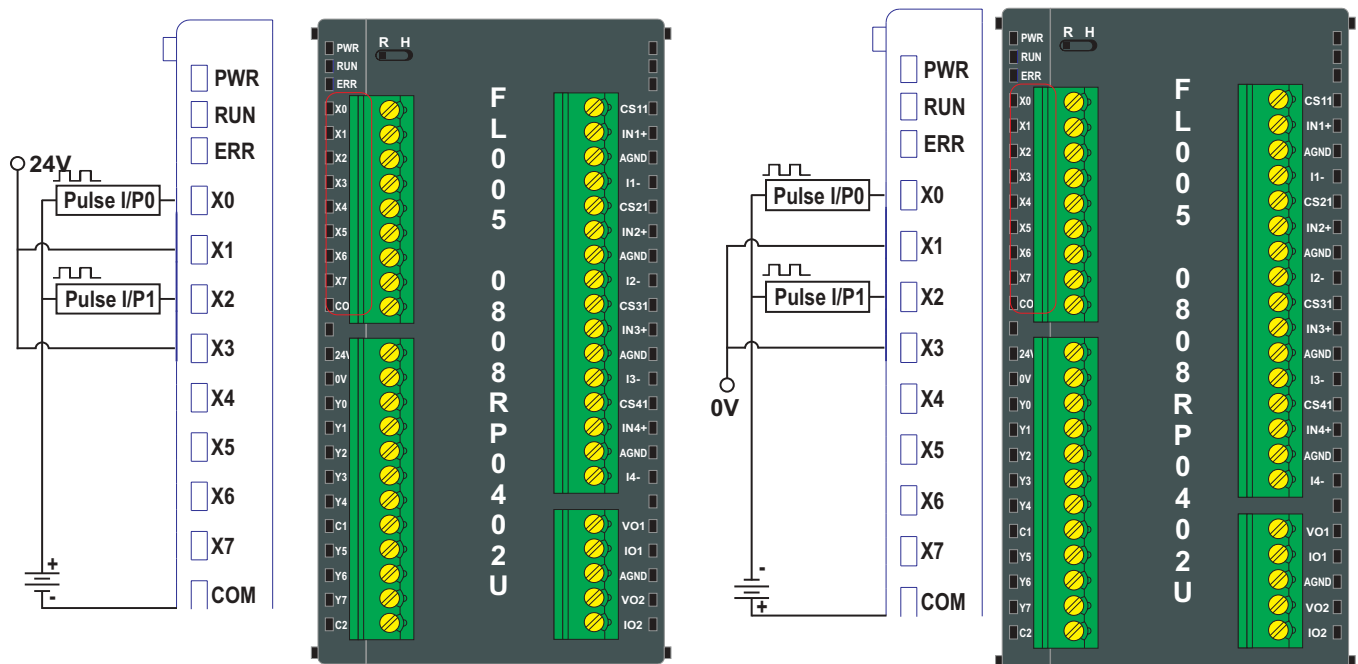| LED	Status
Run mode	ON: Unit is in RUN mode
	OFF:Unit is not in RUN mode (unit may be in HALT, HOLD, ERROR, etc)
Error Mode	ON: Unit is in ERROR mode.
	OFF:Unit is not in ERROR mode.

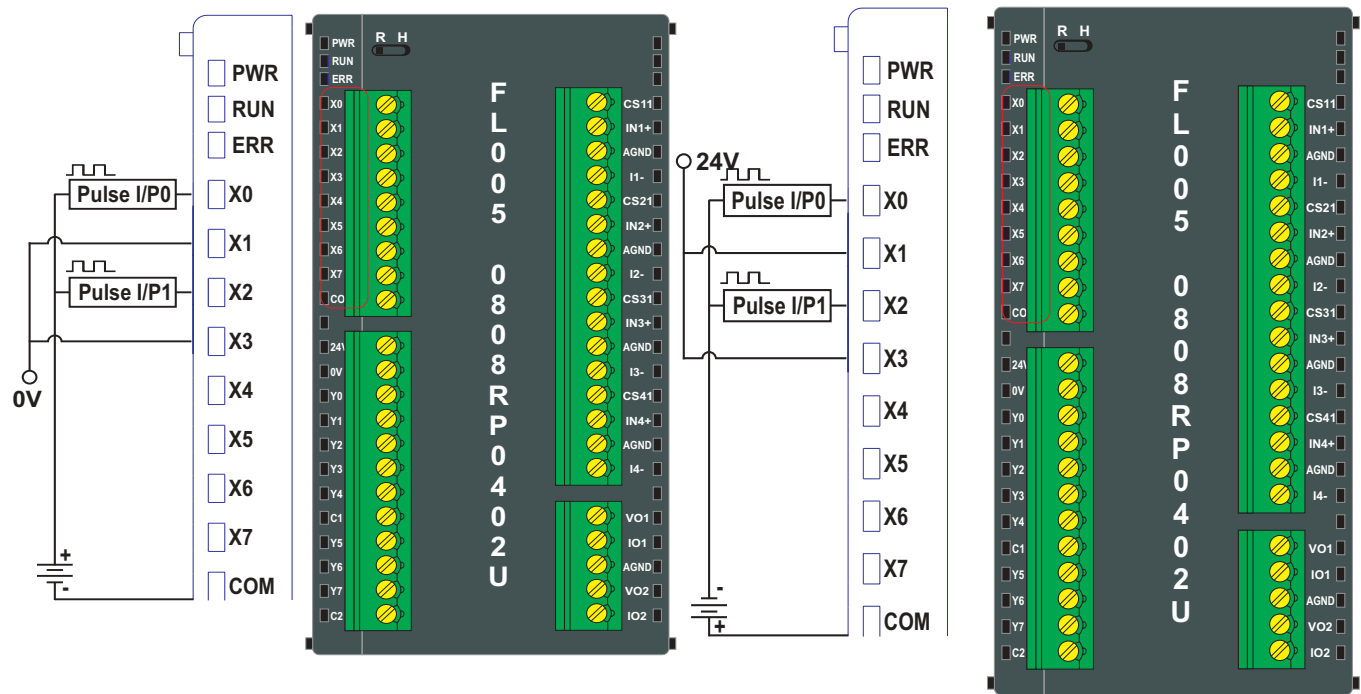Wiring Diagrams:

1. Wiring diagram for digital inputs:

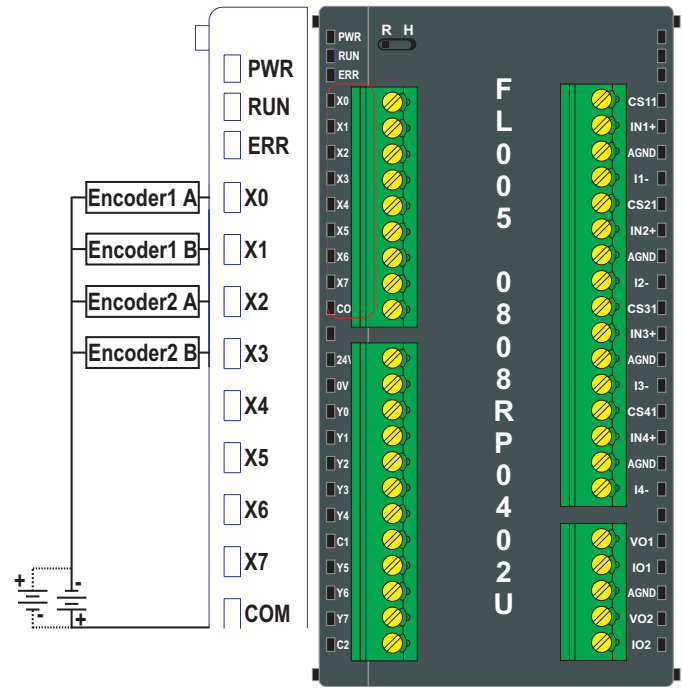Note: X0, X1, X2 and X3 are high speed input:

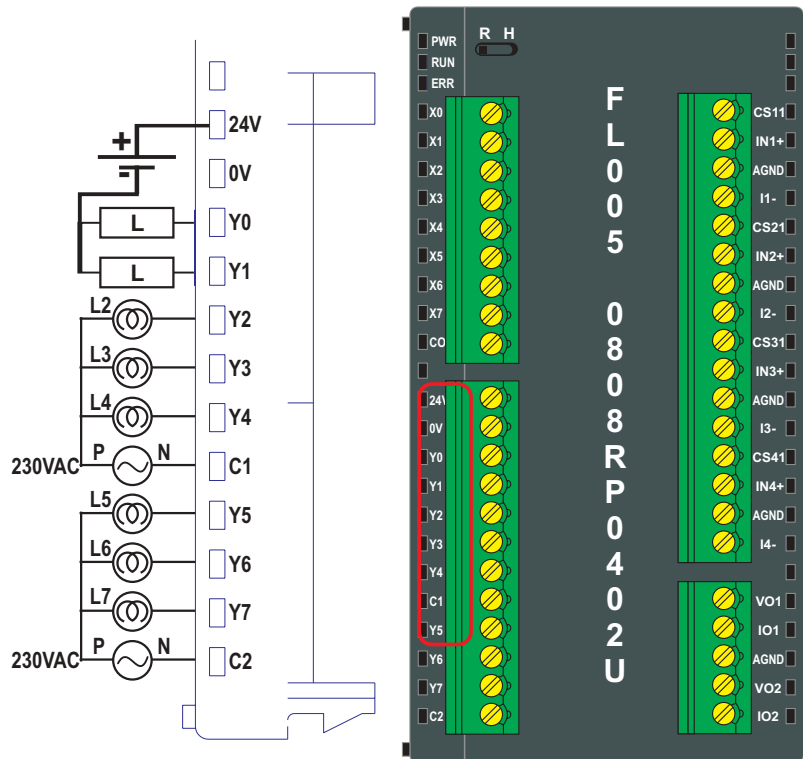Wiring for Single Phase up counter:

Wiring for Single Phase down counter
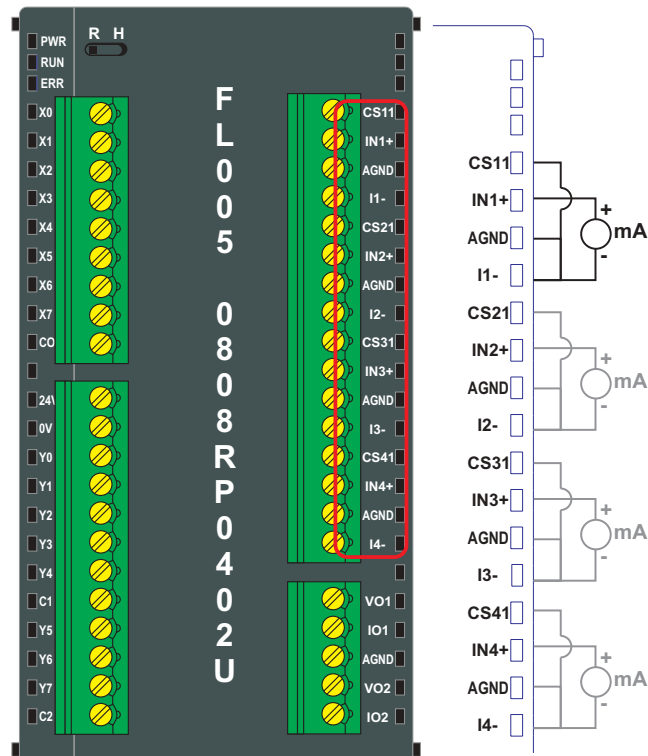

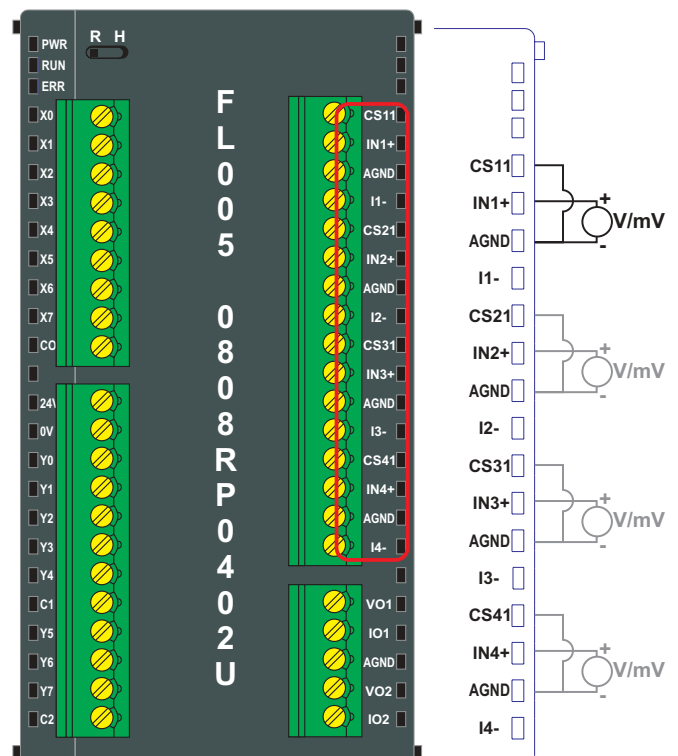Wiring for quadrature mode HSC:

2. Wiring diagram for digital outputs:

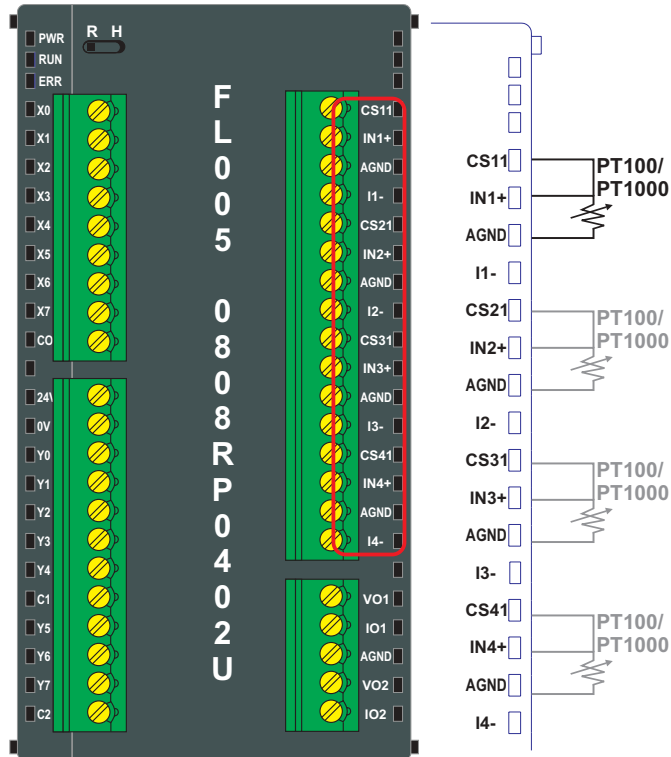
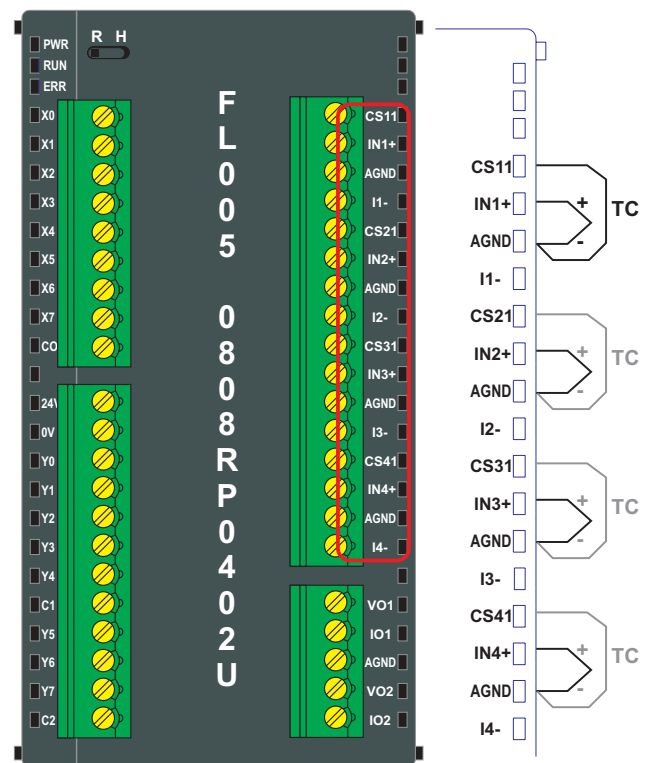3. Wiring for Analog input types:
For Current

For Voltage:

Wiring for Analog input types:
For RTD

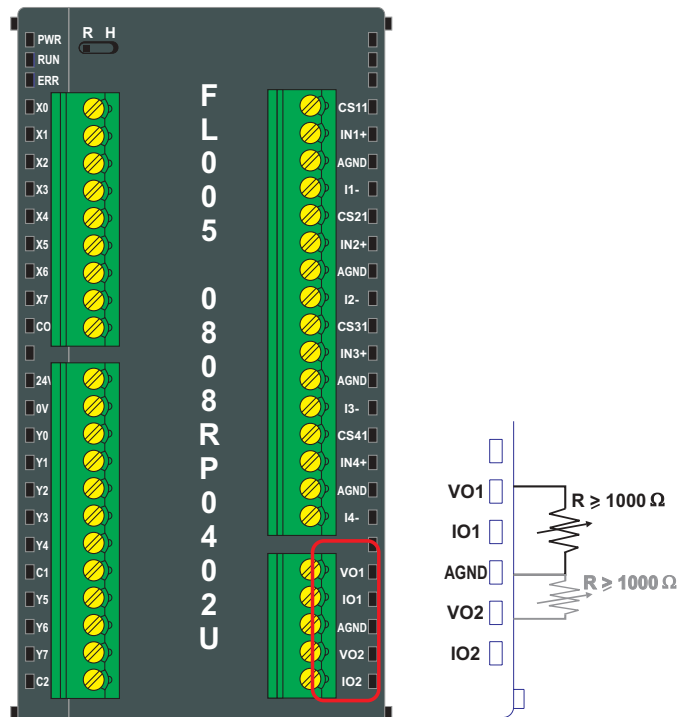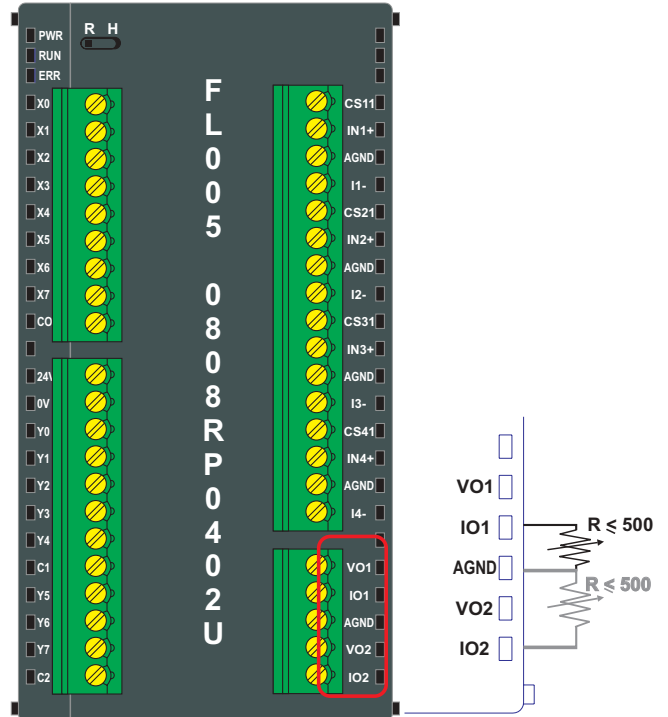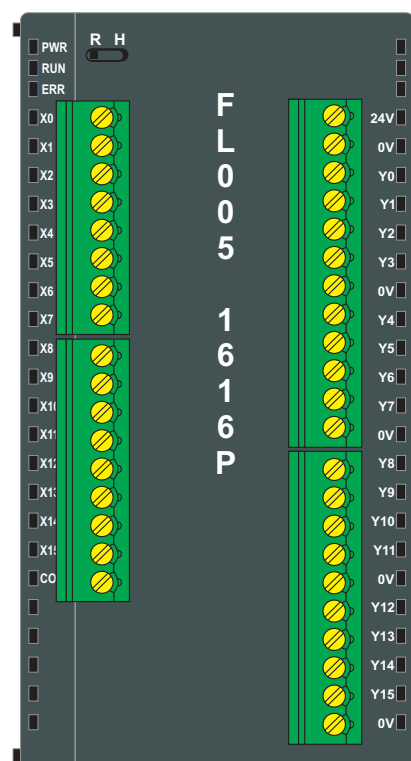For Thermocouple:
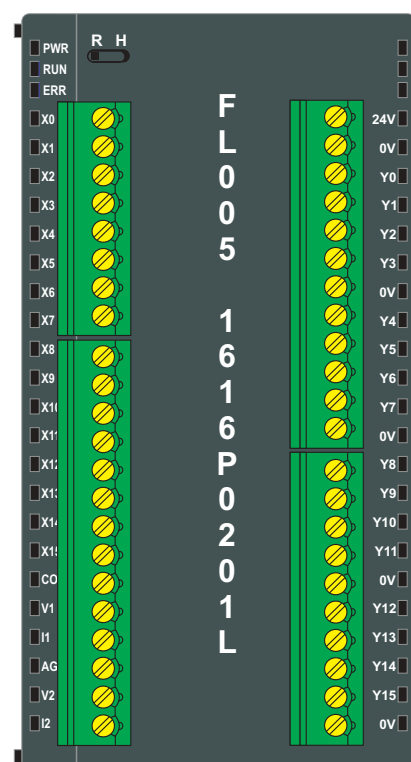

4. Wiring for Analog output types:
For Voltage

For Current:

FL005-1616P0201L, FL005-1616P and FL005-1616P0201L-S1

Power Supply	24VDC, (+20%; -15%) FL005-1616P0201L: 500mA FL005-1616P: 400mA FL005-1616P0201L-S1: 400mA
Input per channel	24VDC, 5mA
Output per channel	0.25A at 24VDC for transistor (P Type)
Standards	CE, UL (Class 1, Div 2)
Memory	
Total Program Memory	Ladder memory : 178KB (30K Steps) Application memory : 92KB
User Data	
Input Registers	6400 points / 400 Words (*max) (X/XW)
Outout Registers	6400 points / 400 Words (*max) (Y/YW)
Auxillary Registers	4096 points / 256 words (B / BW)
Data Registers	4096 words (D)
Retentive Registers	1400 words (***EEPROM)
System Registers	4096 points / 256 words (S / SW)
Timers	256 points / 256 words (T. / T)
Counters	256 points / 256 words (C. / C)
System Devices	100 points
Configuration Register	25600 points / 1600 Words (Max.*)
Index Registers	3 Words (I, J, K)
Communication Ports	
2 COM Ports: COM1 (RJ45 Type):	RS232 [RS232: For upload/download/ monitoring/communication] 5VDC, 300mA Power Source
COM2 (Open terminals):	2-wire RS485 for communication
USB Device	1, For upload / download / Monitoring
IO Specifications:	
Expansion IO capacity	**16 Expansion modules
Local I/Os	Yes (16 DC IN, 16 DC OUT & 2 ANALOG IN, 1 ANALOG OUT)
General	
Mechanical Dimension	100mm X 70mm X 52mm (HxDxW in mm)
Weight	241 gm. max.

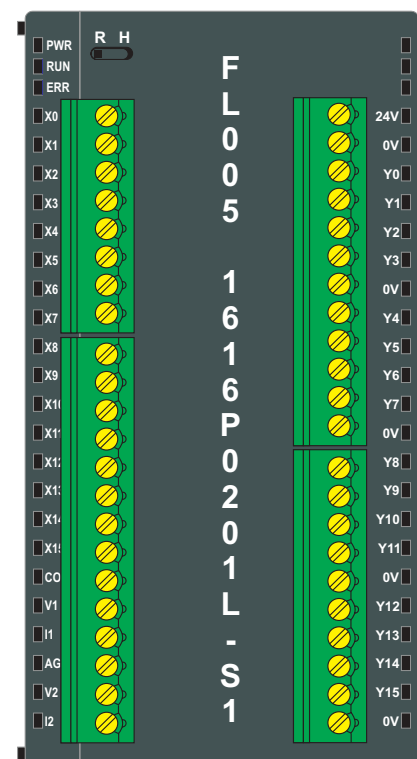| **General**	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	As per IEC60068-2-6
Shock Test	As per IEC60068-2-27

Notes:
* : Depends upon I/O allocation.

Note: Expansions will not be applicable to FL005-1616P0201L-S1 model.

****Maximum 30000 EEPROM write cycles are allowed. Above this performance may degrade.*

Local IO's Specifications:

24V DC Digital Inputs

Number of Inputs	16 Inputs Bi-directional Type (Within which 4 are high speed)
Input Design	According to EN 61131-2 Type 1
Minimum ON Voltage	15 VDC
Maximum ON Voltage	30 VDC
Maximum OFF Voltage	5 VDC
Minimum OFF voltage	-3 VDC
Nominal input voltage	24 VDC
Nominal input current	5mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage(BV= 3.7KV)
Input Impedance	3K ohm
Turn OFF time	10msec
Turn ON time	10msec

High Speed Inputs

Number of HS Inputs	2
High Speed Channels	X0, X1, X2, X3
Max. input frequency	200KHz per channel
Max. input count	4294967295 (32 Bit)
Nominal inputs current	12 mA

24V DC Digital Outputs PNP Transistor type

Number of Outputs	16 includes 2 Pulse outputs
Min. ON Output Voltage	22V DC (Voltage across load)
Max. ON Voltage	30V DC (Voltage across load)
Max. OFF Voltage	1V
Minimum OFF Voltage	0.2V
Nominal Output voltage	30 V DC
Nominal Output current per channel	250mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage (BV = 3.7 KV)
Short Circuit protection	Yes
Nominal load Transistor o/p:	96ohms/6W (resistive) @ 24VDC 6VA (inductive, unity power factor)

Analog Inputs

Analog Inputs	2 Input Channels Voltage Input: 0 - 10 V, 0 - 5 V; Current Input: 0-20mA, 4-20mA
Resolution	16-Bit
Acuuracy	0.2% of full scale @ 25 DegC

Analog outputs

Analog outputs	1 Output channels Current 4 - 20 mA (Max load 500 ohm) Voltage 0 - 10 VDC (Max load 1000 ohm)
Resolution	12-Bit
Acuuracy	0.2% of full scale @ 25 DegC

*Note: Analog I/O specifications are applicable only to FL005-1616P0201L and FL005-1616P0201L-S1 models.

High Speed Counter Features

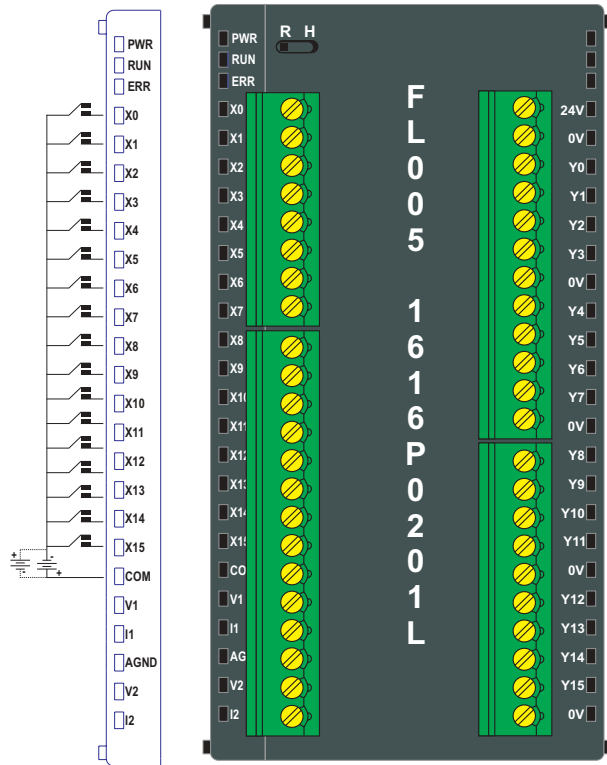| Up / down Counter Single Phase	Number of channels	2 (X0, X2)
	Physical reset input	2 (X4, X5)
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
Quadrature Counter	Number of channels	2 (X0 and X1, X2 and X3)
	Physical reset input channels	X4, X5
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
	Quadrature mode	4x

PWM Output

Number of channels	2 (Y0 and Y1)
PWM frequency (per channel)	200KHz
Frequency step	1Hz
PWM duty cycle (variable)	0 to 100%
Duty cycle step	1%

Pulse/DIR mode	Number of pulse channels	1
	Output Channels used	Y0 (Pulse), Y1 (Direction)
	Pulse frequency	200KHz Max(50% duty cycle)
	Frequency step	1Hz
CW/CCW mode	Number of pulse channels	2
	Output Channels used	Y0 (CW), Y1 (CCW)
	Pulse frequency	200KHz Max(50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Continuous)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Pulse frequency (variable)	200KHz Max(50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Trapezoidal) (Soft start)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Minimum frequency	1Hz to 200KHz
	Maximum frequency (must be>min. freq.)	1Hz to 200KHz
	Accaleration time	0 to 65535 (x10mSec base)
	Deceleration time	0 to 65535 (x10mSec base)
	Pulse count	1 to 4294967296
	Frequency step	1Hz

Wiring Diagrams:
1. Wiring diagram for digital inputs:
Note: X0, X1, X2 and X3 are high speed input:

Wiring for Single Phase up counter:

Wiring for Single Phase down counter:

Wiring for quadrature mode HSC:

2. Wiring diagram for digital outputs:

3. Wiring for Analog input types:
*Note: These wiring diagrams are applicable only to FL005-1616P0201L and FL005-1616P0201L-S1 models.

For Current   For Voltage:

4. Wiring for Analog output types:
*Note: These wiring diagrams are applicable only to FL005-1616P0201L and FL005-1616P0201L-S1 models.
For Voltage   For Current:
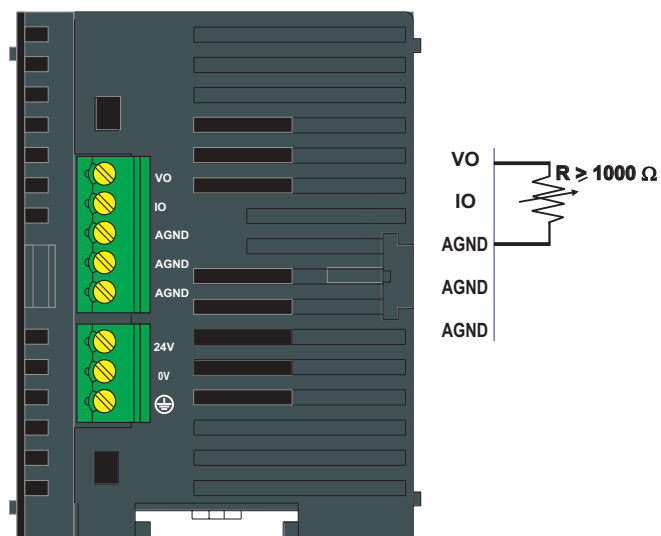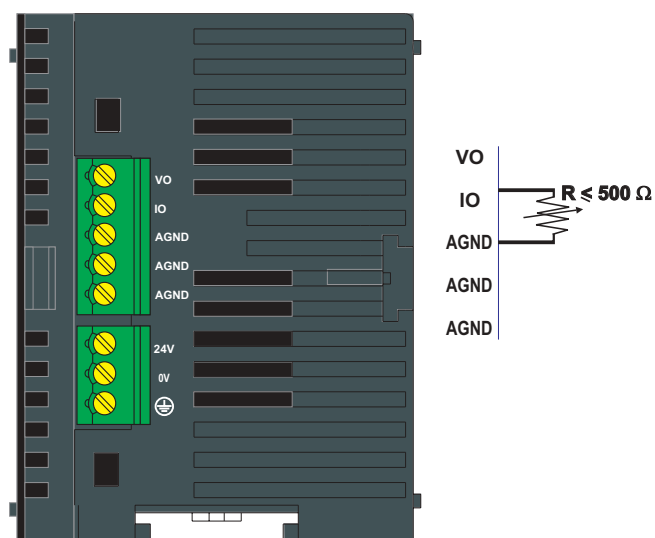
FL005-1616N0201L

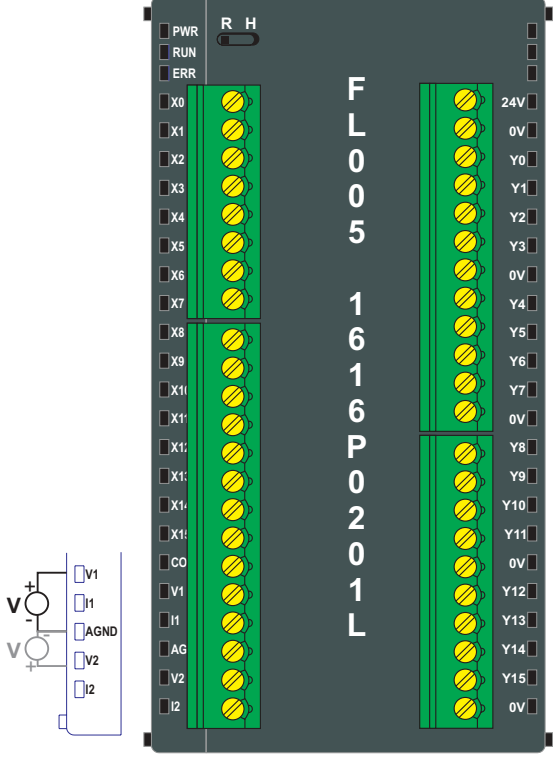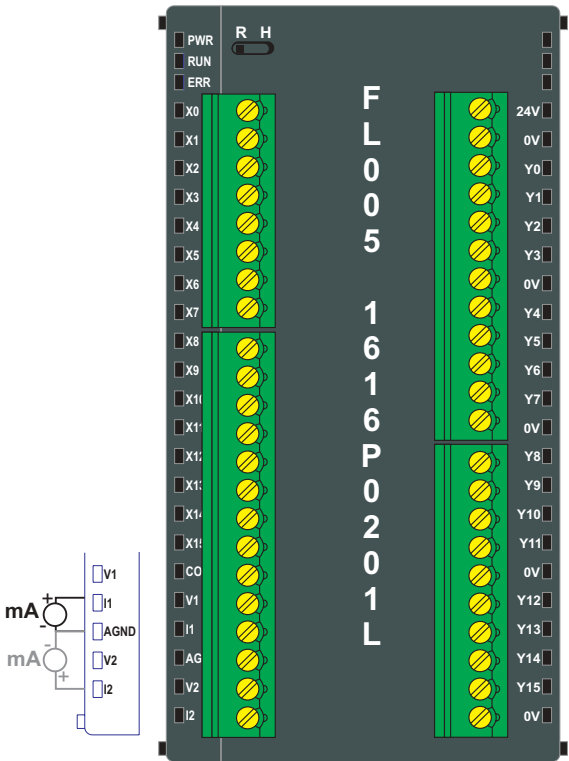| Power Supply	24VDC, 500mA (+20%; -15%)
Input per channel	24VDC, 5mA
Output per channel	0.3A at 24VDC for transistor (N Type)
Standards	CE, UL (Class 1, Div 2)
Memory	
Total Program Memory	Ladder memory : 178KB (30K Steps) Application memory : 92KB
User Data	
Input Registers	6400 points / 400 Words (*max) (X/XW)
Outout Registers	6400 points / 400 Words (*max) (Y/YW)
Auxillary Registers	4096 points / 256 words (B / BW)
Data Registers	4096 words (D)
Retentive Registers	1400 words (***EEPROM)
System Registers	4096 points / 256 words (S / SW)
Timers	256 points / 256 words (T. / T)
Counters	256 points / 256 words (C. / C)
System Devices	100 points
Configuration Register	25600 points / 1600 Words (Max.*)
Index Registers	3 Words (I, J, K)
Communication Ports	
2 COM Ports: COM1 (RJ45 Type):	RS232 [RS232: For upload/download/ monitoring/communication] 5VDC, 300mA Power Source
COM2 (Open terminals):	2-wire RS485 for communication
USB Device	1, For upload / download / Monitoring
IO Specifications:	
Expansion IO capacity	16 Expansion modules
Local I/Os	Yes (16 DC IN, 16 DC OUT & 2 ANALOG IN, 1 ANALOG OUT)
General	
Mechanical Dimension	100mm X 70mm X 52mm (HxDxW in mm)
Weight	241 gm. max.

General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	As per IEC60068-2-6
Shock Test	As per IEC60068-2-27

Note:
* : Depends upon I/O allocation.

***Maximum 30000 EEPROM write cycles are allowed. Above this performance may degrade.

Local IO's Specifications:

24V DC Digital Inputs	
Number of Inputs	16 Inputs Bi-directional Type (Within which 4 are high speed)
Input Design	According to EN 61131-2 Type 1
Minimum ON Voltage	15 VDC
Maximum ON Voltage	30 VDC
Maximum OFF Voltage	5 VDC
Minimum OFF voltage	-3 VDC
Nominal input voltage	24 VDC
Nominal input current	5mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage(BV= 3.7KV)
Input Impedance	3K ohm
Turn OFF time	10msec
Turn ON time	10msec

High Speed Inputs	
Number of HS Inputs	2
High Speed Channels	X0, X1, X2, X3
Max. input frequency	200KHz per channel
Max. input count	4294967295 (32 Bit)
Nominal inputs current	12 mA

24V DC Digital Outputs	NPN Transistor type
Number of Outputs	16 includes 2 Pulse outputs
Min. ON Output Voltage	22V DC (Voltage across load)
Max. ON Voltage	30V DC (Voltage across load)
Max. OFF Voltage	1V
Minimum OFF Voltage	0.2V
Nominal Output voltage	30 V DC
Nominal Output current per channel	300mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage (BV = 3.7 KV)
Short Circuit protection	Yes
Nominal load Transistor o/p:	80ohms/7.2W (resistive) @ 24VDC 7.2VA (inductive, unity power factor)

Analog Inputs	
	2 Input Channels Voltage Input: 0 - 10 V, 0 - 5 V; Current Input: 0-20mA, 4-20mA
Resolution	16-Bit
Acuuracy	0.2% of full scale @ 25 DegC

Analog outputs	
	1 Output channels Current 4 - 20 mA (Max load 500 ohm) Voltage 0 - 10 VDC (Max load 1000 ohm)
Resolution	12-Bit
Acuuracy	0.2% of full scale @ 25 DegC

High Speed Counter Features

Up / down Counter Single Phase	Number of channels	2 (X0, X2)
	Physical reset input	2 (X4, X5)
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)

Quadrature Counter	Number of channels	2 (X0 and X1, X2 and X3)
	Physical reset input channels	X4, X5
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
	Quadrature mode	4x

PWM Output

Number of channels	2 (Y0 and Y1)
PWM frequency (per channel)	200KHz
Frequency step	1Hz
PWM duty cycle (variable)	0 to 100%
Duty cycle step	1%

Pulse/DIR mode	Number of pulse channels	1
	Output Channels used	Y0 (Pulse), Y1 (Direction)
	Pulse frequency	200KHz Max(50% duty cycle)
	Frequency step	1Hz

CW/CCW mode	Number of pulse channels	2
	Output Channels used	Y0 (CW), Y1 (CCW)
	Pulse frequency	200KHz Max(50% duty cycle)
	Frequency step	1Hz

Fixed pulse mode (Continuous)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Pulse frequency (variable)	200KHz Max(50% duty cycle)
	Frequency step	1Hz

Fixed pulse mode (Trapezoidal) (Soft start)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Minimum frequency	1Hz to 200KHz
	Maximum frequency (must be>min. freq.)	1Hz to 200KHz
	Accaleration time	0 to 65535 (x10mSec base)
	Deceleration time	0 to 65535 (x10mSec base)
	Pulse count	1 to 4294967296
	Frequency step	1Hz

Wiring Diagrams:
1. Wiring diagram for digital inputs:
Note: X0, X1, X2 and X3 are high speed input:

Wiring for Single Phase up counter:

Wiring for Single Phase down counter:

Wiring for quadrature mode HSC:

2. Wiring diagram for digital outputs:

3. Wiring for Analog input types:
For Current

For Voltage:

4. Wiring for Analog output types:

For Voltage

VO
IO
AGND
AGND
AGND

24V
0V

VO
IO
AGND
AGND
AGND
AGND

R ≥ 1000 Ω

For Current:

VO
IO
AGND
AGND
AGND

24V
0V

VO
IO
AGND
AGND
AGND
AGND

R ≤ 500 Ω

FL005-1616RP0201L and FL005-1616RP

Power Supply	24VDC, FL005-1616RP0201L: 700mA (+20%; -15%) FL005-1616RP: 600mA (+20%; -15%)
Input per channel	24VDC, 5mA
Output per channel	230V / 2A or 24VDC / 2A for Relay, 0.25A at 24VDC for transistor (P Type)

Standards	CE, UL (Class 1, Div 2)
Memory	
Total Program Memory	Ladder memory : 178KB (30 K Steps) Application memory : 92KB
User Data	
Input Registers	6400 points / 400 Words (*max) (X/XW)
Outout Registers	6400 points / 400 Words (*max) (Y/YW)
Auxillary Registers	4096 points / 256 words (B / BW)
Data Registers	4096 words (D)
Retentive Registers	1400 words (***EEPROM)
System Registers	4096 points / 256 words (S / SW)
Timers	256 points / 256 words (T. / T)
Counters	256 points / 256 words (C. / C)
System Devices	100 points
Configuration Register	25600 points / 1600 Words (Max.*)
Index Registers	3 Words (I, J, K)
Communication Ports	
2 COM Ports: COM1 (RJ45 Type):	RS232 [RS232: For upload/download/ monitoring/communication] 5VDC, 300mA Power Source
COM2 (Open terminals):	2-wire RS485 for communication
USB Device	1, For upload / download / Monitoring
IO Specifications:	
Expansion IO capacity	16 Expansion modules
Local I/Os	Yes (16 DC IN, 16 DC OUT & 2 ANALOG IN, 1 ANALOG OUT)
General	
Mechanical Dimension	100mm X 70mm X 52mm (HxDxW in mm)
Weight	241 gm. max.

General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration Tests	As per IEC60068-2-6
Shock Test	As per IEC60068-2-27

Note:
* : Depends upon I/O allocation.

***Maximum 30000 EEPROM write cycles are allowed. Above this performance may degrade.

Local IO's Specifications:

24V DC Digital Inputs	
Number of Inputs	16 Inputs Bi-directional Type (Within which 4 are high speed)
Input Design	According to EN 61131-2 Type 1
Minimum ON Voltage	15 VDC
Maximum ON Voltage	30 VDC
Maximum OFF Voltage	5 VDC
Minimum OFF voltage	-3 VDC
Nominal input voltage	24 VDC
Nominal input current	5mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage(BV= 3.7KV)
Input Impedance	3K ohm
Turn OFF time	10msec
Turn ON time	10msec

High Speed Inputs	
Number of HS Inputs	2
High Speed Channels	X0, X1, X2, X3
Max. input frequency	200KHz per channel
Max. input count	4294967295 (32 Bit)
Nominal inputs current	12 mA

24V DC Digital Outputs	Relay and PNP Transistor type
Number of Outputs	16 includes 14 relay type and 2 Pulse outputs
Min. ON Output Voltage	22V DC (Voltage across load)
Max. ON Voltage	30V DC (Voltage across load)
Max. OFF Voltage	1V
Minimum OFF Voltage	0.2V
Nominal Output voltage	30 V DC
Nominal Output current per channel	250mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage (BV = 3.7 KV)
Short Circuit protection	Yes
Nominal load Relay o/p :	a) DC load: 12 ohms / 48W(resistive) @24VDC 48VA(inductive ,unity power factor) b) AC load: 115 ohms/ 460W(resistive) @ 230VAC 460VA(inductive, unity power factor)
Transistor o/p:	96ohms/6W (resistive) @ 24VDC 6VA (inductive, unity power factor)

Analog Inputs	
	2 Input Channels Voltage Input: 0 - 10 V, 0 - 5 V; Current Input: 0-20mA, 4-20mA
Resolution	16-Bit
Acuuracy	For Voltage input: 0.2% of full scale @ 25 DegC For Current input: 0.3% of full scale @ 25 DegC

Analog outputs	
	1 Output channels Current 4 - 20 mA (Max load 500 ohm) Voltage 0 - 10 VDC (Max load 1000 ohm)
Resolution	12-Bit
Acuuracy	0.2% of full scale @ 25 DegC

*Note: Analog I/O specifications are applicable only to FL005-1616RP0201L model.

High Speed Counter Features

Up / down Counter Single Phase	Number of channels	2 (X0, X2)
	Physical reset input	2 (X4, X5)
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
Quadrature Counter	Number of channels	2 (X0 and X1, X2 and X3)
	Physical reset input channels	X4, X5
	Maximum input frequency (per channel)	200KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y2, Y3)
	Quadrature mode	4x

PWM Output

Number of channels	2 (Y0 and Y1)
PWM frequency (per channel)	200KHz
Frequency step	1Hz
PWM duty cycle (variable)	0 to 100%
Duty cycle step	1%

Pulse/DIR mode	Number of pulse channels	1
	Output Channels used	Y0 (Pulse), Y1 (Direction)
	Pulse frequency	200KHz Max(50% duty cycle)
	Frequency step	1Hz
CW/CCW mode	Number of pulse channels	2
	Output Channels used	Y0 (CW), Y1 (CCW)
	Pulse frequency	200KHz Max(50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Continuous)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Pulse frequency (variable)	200KHz Max(50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Trapezoidal) (Soft start)	Number of pulse channels	2
	Output Channels used	Y0, Y1
	Minimum frequency	1Hz to 200KHz
	Maximum frequency (must be>min. freq.)	1Hz to 200KHz
	Accalaration time	0 to 65535 (x10mSec base)
	Deceleration time	0 to 65535 (x10mSec base)
	Pulse count	1 to 4294967296
	Frequency step	1Hz

Wiring Diagrams:
1. Wiring diagram for digital inputs:
Note: X0, X1, X2 and X3 are high speed input:

Wiring for Single Phase up counter:

Wiring for Single Phase down counter:

Wiring for quadrature mode HSC:

2. Wiring diagram for digital and relay outputs:
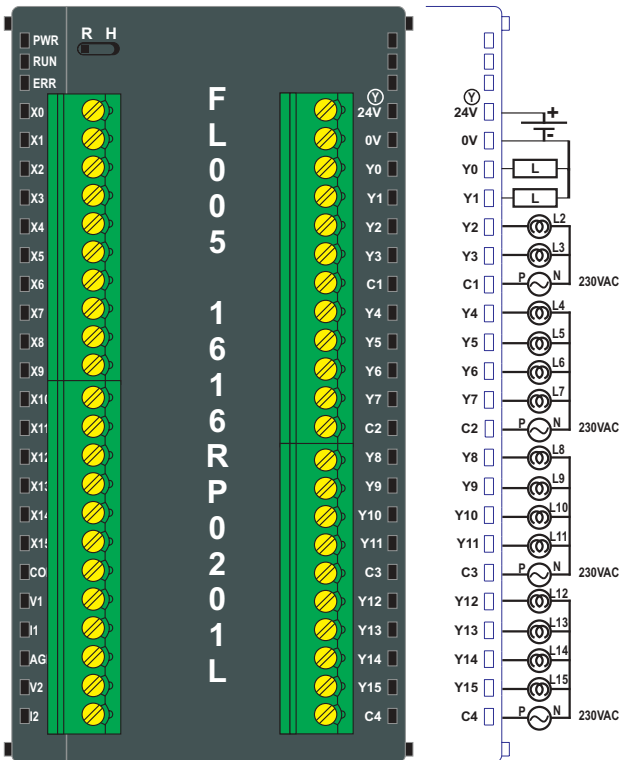
3. Wiring for Analog input types:
These diagrams are pplicable to FL005-1616RP0201L model only.

For Current

For Voltage:
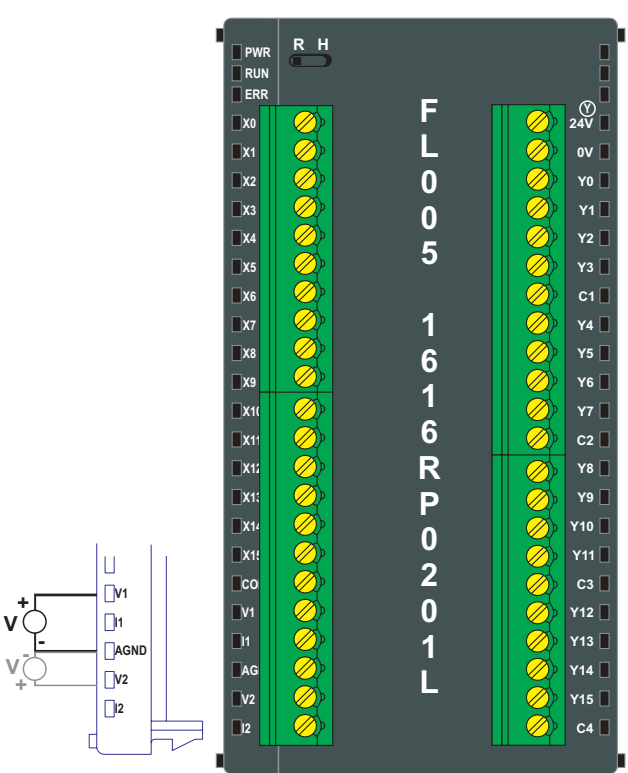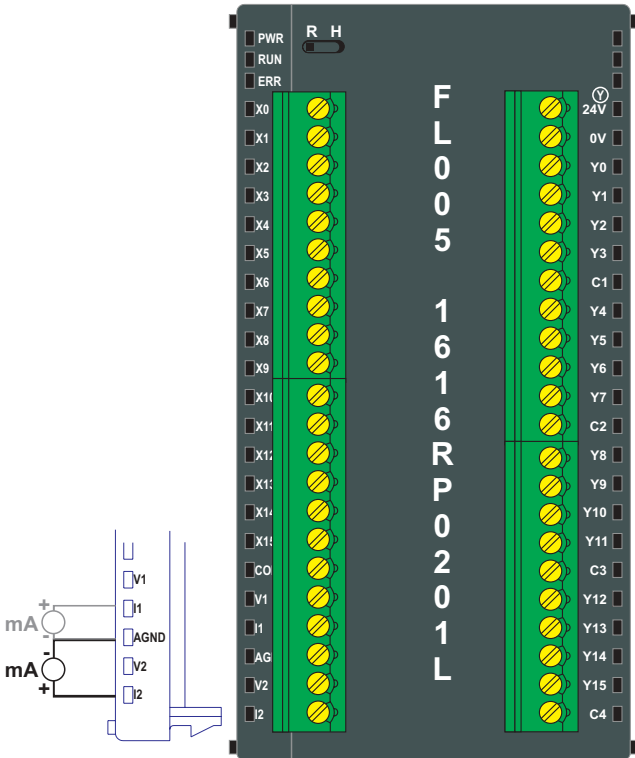
4. Wiring for Analog output types:
These diagrams are pplicable to FL005-1616RP0201L model only.

For Voltage

VO

IO

AGND

AGND

AGND

24V

0V

VO

IO

AGND

AGND

AGND

R ≥ 1000 Ω

For Current:

VO

IO

AGND

AGND

AGND

24V

0V

VO

IO

AGND

AGND

AGND

R ≤ 500 Ω
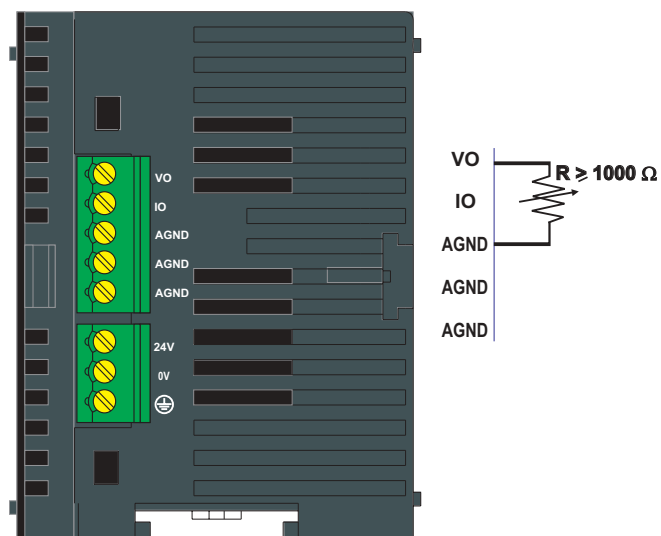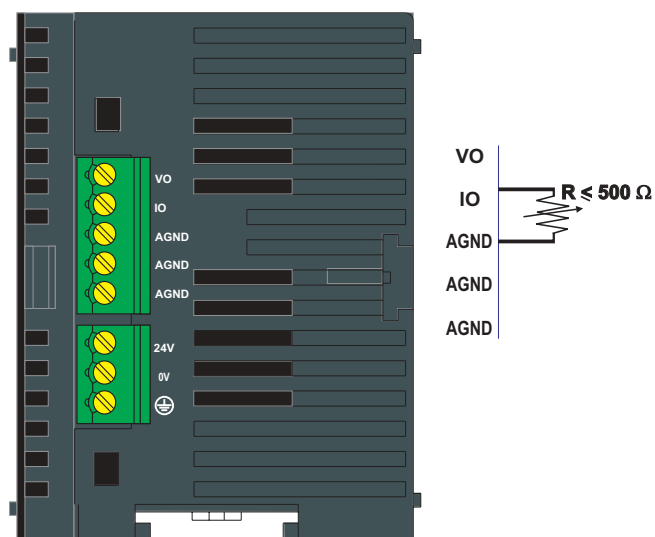
1.4.3 Specification for Expansion Models
FLD1600

Digital Inputs	16 Normal Inputs, 8 points per common. Bidirectional type.
Input per channel	5mA, 24VDC
Output per channel	NA
Input Impedance	5.4K ohm
Minimum ON voltage	9.6 VDC
Maximum OFF voltage	3.6 VDC
Turn ON time	10 msec
Turn OFF time	10 msec
Isolation	Digital inputs are optically isolated from the internal circuit
Connection method	Removable terminals (3.81mm pitch)
Digital outputs	0
General	
Mechanical Dimension	100mm X 35mm X 70mm
Weight	Approx. 120 gm.

Power Rating (Back Plane)	
Voltage Rating	3.75 VDC derived from base model
Current Rating	Upto 80mA

Wiring Diagram for FLD1600

Closing Swx will turn on respective inputs
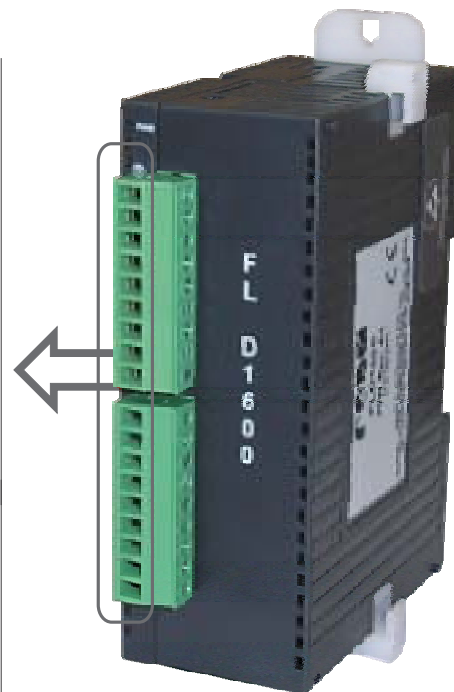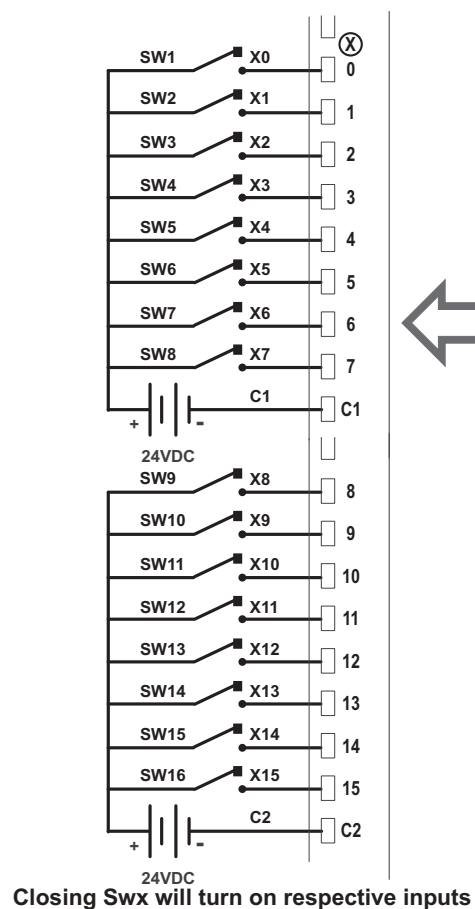
FLD0016P (PNP Type transistor output)

Digital Inputs	0
Digital outputs	16 PNP type Transistor output. 4 points per common
Rated load	500mA max for PNP and NPN type transistor output
General	
Mechanical Dimension	100mm X 35mm X 70mm
Weight	Approx. 120 gm.

Power Supply	24VDC, 300mA
Input per channel	NA
Output per channel	0.5A, 24VDC per output

Power Rating (Back Plane)	
Voltage Rating	3.75 VDC derived from base model
Current Rating	Upto 80mA

Wiring Diagram for FLD0016P

FLD0016N (NPN Type transistor output)

Digital Inputs	0
Digital outputs	16 NPN type Transistor output. 4 points per common
Rated load	500mA max for PNP and NPN type transistor output
General	
Mechanical Dimension	100mm X 35mm X 70mm
Weight	Approx. 120 gm.

Power Supply	24VDC, 300mA
Input per channel	NA
Output per channel	0.5A, 24VDC per output

Power Rating (Back Plane)	
Voltage Rating	3.75 VDC derived from base model
Current Rating	Upto 80mA

Wiring Diagram for FLD0016N

FLD0016R (Relay Type output)

Digital Inputs	0
Digital outputs	16 Relay (Form A) output. 4 points per common
Rated load	230V / 2A, 30VDC / 2A
General	
Mechanical Dimension	100mm X 35mm X 70mm
Weight	Approx. 180 gm.

Power Supply	24VDC, 300mA
Input per channel	NA
Output per channel	230V, 2A / 30 VDC, 2A per output
Power Rating (Back Plane)	
Voltage Rating	3.75 VDC derived from base model
Current Rating	Upto 80mA

Wiring Diagram for FLD0016R
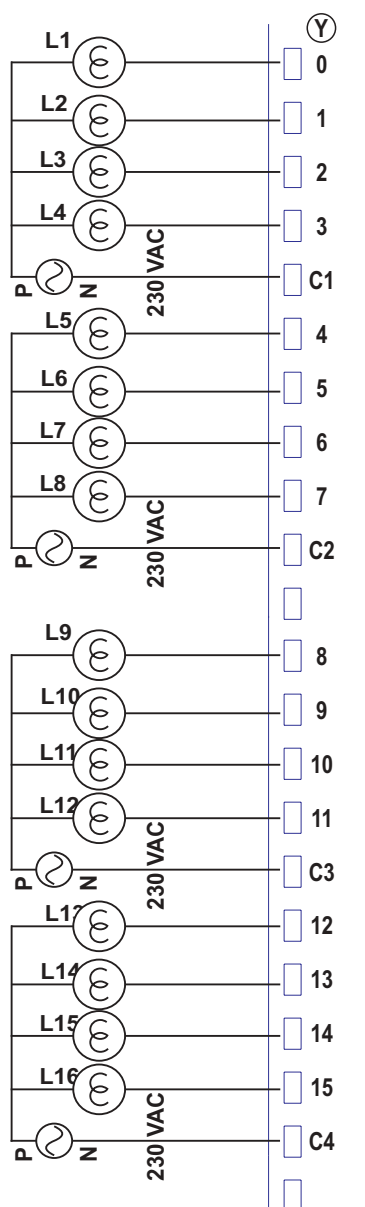
*L1 to L16 are A.C. Load.
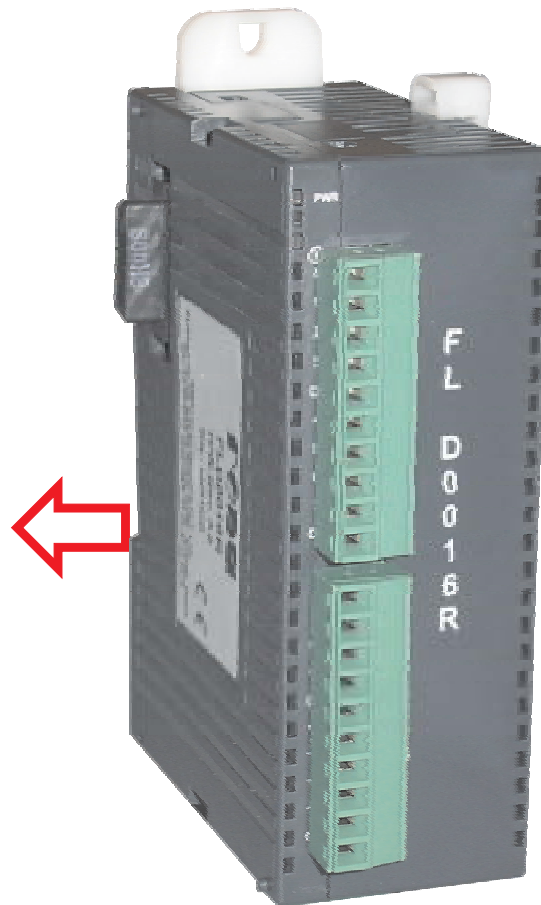
FLD0808R (Relay Type transistor output)
FLD0808P (PNP Type transistor output)
FLD0808N (NPN Type transistor output)

Digital Inputs	8 Normal inputs 4 points per common. Bidirectional type.
Digital outputs	8 Relay (Form A) outputs. 4 points per common.
	8 PNP type Transistor output. 4 points per common.
	8 NPN type Transistor output. 4 points per common.
Rated Input voltage	24VDC
Rated Input Current	Upto 5mA
Input Impedance	5.4K ohm
Minimum ON voltage	9.6 VDC
Maximum OFF voltage	3.6 VDC
Turn ON time	10 msec
Turn OFF time	10 msec
Isolation	Optically isolated from the internal circuit
Connection method	Removable terminals (3.81mm pitch)
Output Capacity	2A per o/p. 8A per common for Relay type output
	500mA max for PNP and NPN type transistor output
Rated load	230V / 2A, 30VDC / 2A (for Relay), 500mA at 24VDC (for transistor)

General	
Operating Temperature	0 to 55 deg.C.
Storage Temperature	-20 to 85 deg.C.
Operating Humidity	10% to 90% (Non condensing)
Vibration	10Hz to 150Hz ,displacement of 0.2 mm (peak) (3 mutually perpendicular axes)
Shock	490.5 m/s2,2 half-sine shocks per axis, on 3 mutually perpendicular axes)
Mechanical Dimension	100mm X 35mm X 70mm
Weight	For FLD0808N and FLD0808P: Approx. 120 gm. For FLD0808R: Approx. 160gm
FTB (Fast Transient / Burst)	IEC61000-4-4 [2.2kV (Power- Direct Injection), 1.2KV (I/O - Capacitive clamp).]
Electrostatic discharge	IEC61000-4-2 Level 3
Electromagnetic field	IEC61000-4-3, 10 V/m AM modulation (80 MHz to 1 GHz)
RF Immunity	IEC61000-4-6, 10 V/m AM modulation (0.15MHz to 80 MHz)
Dumped Oscillatory wave	IEC61000-4-12
Surge Immunity	IEC61000-4-5 Level 2
Radiated emission	EN50081-2

Power Rating (Back Plane)	
Voltage Rating	3.75 VDC derived from base model
Current Rating	Upto 80mA
Power Supply:	24VDC, 50mA 100mA for relay coil supply
Input per channel:	24VDC, 5mA
Output per channel:	0.5 A, 24VDC and For FLD0808R: 230V, 2A / 24VDC, 2A

Wiring Diagram for FLD0808R:

1. Wiring diagram for testing digital inputs:

Closing Swx will turn on respective inputs
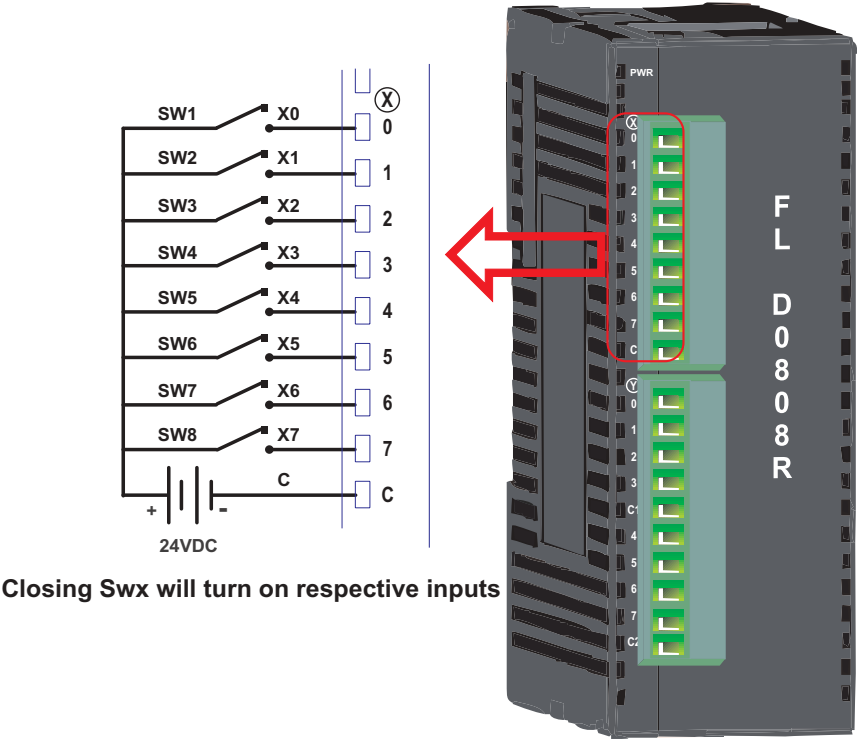
2. Wiring diagram for output connections:
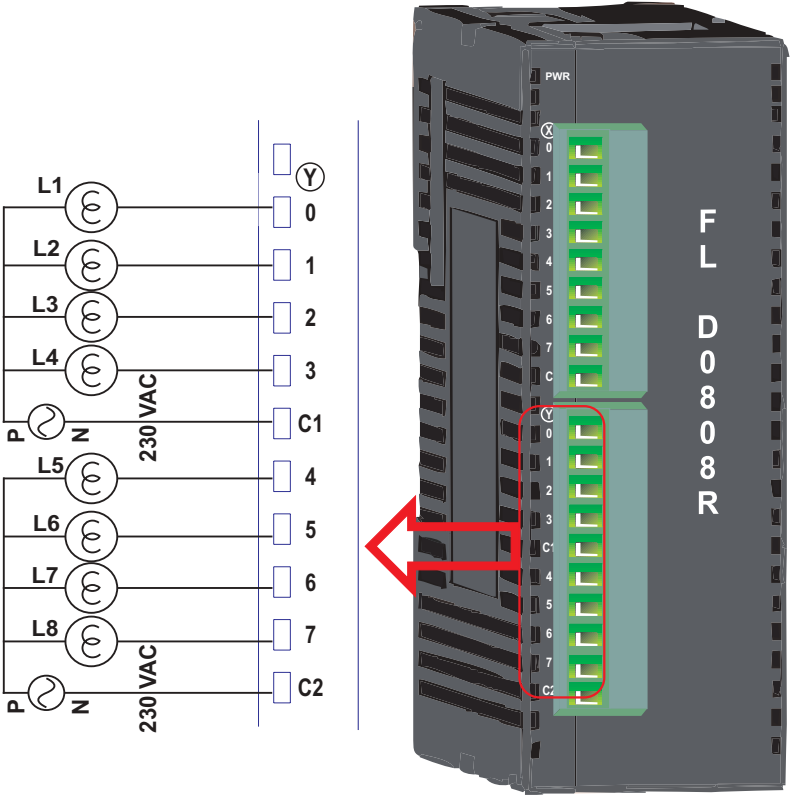
*L1 to L8 are A.C. Load.

Wiring Diagram for FLD0808P:

1. Wiring diagram for testing digital inputs:

Closing Swx will turn on respective inputs
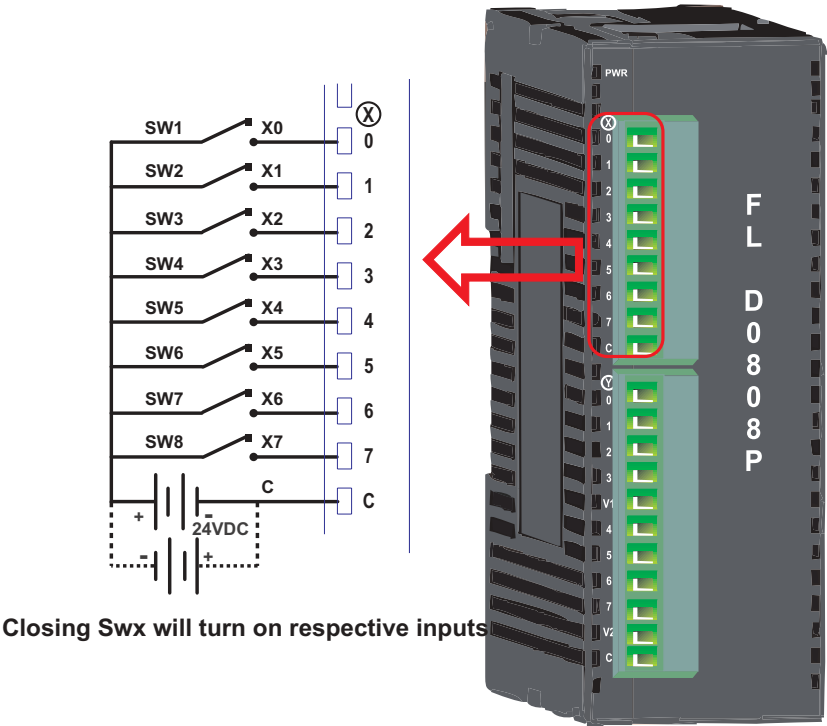
2. Wiring diagram for output connections:
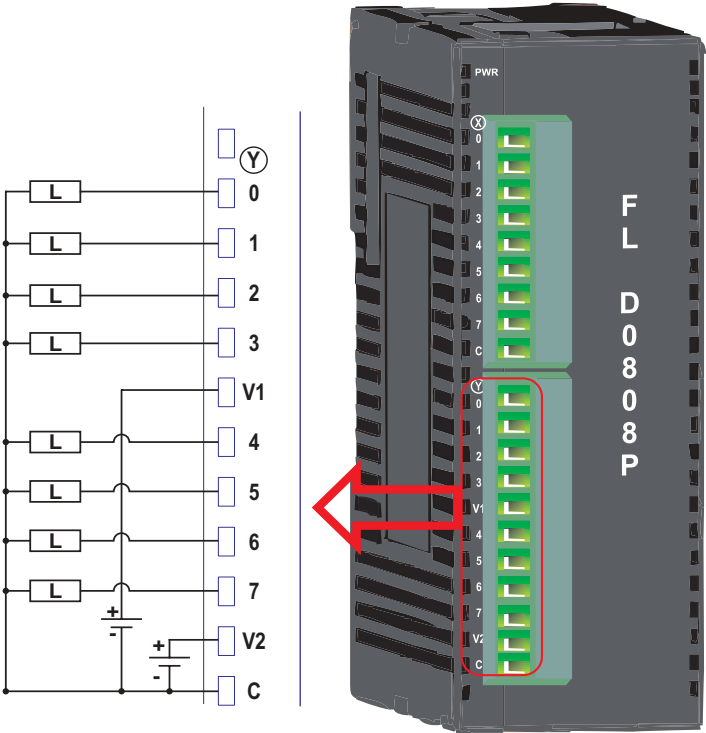
Wiring Diagram for FLD0808N:

1. Wiring diagram for testing digital inputs:

Closing Swx will turn on respective inputs
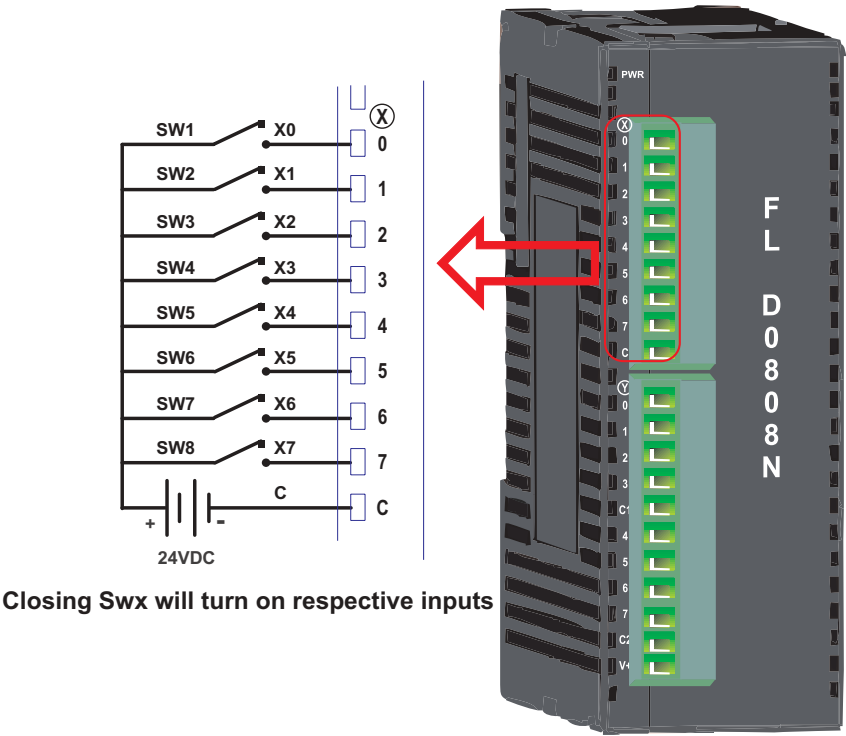
2. Wiring diagram for output connections:
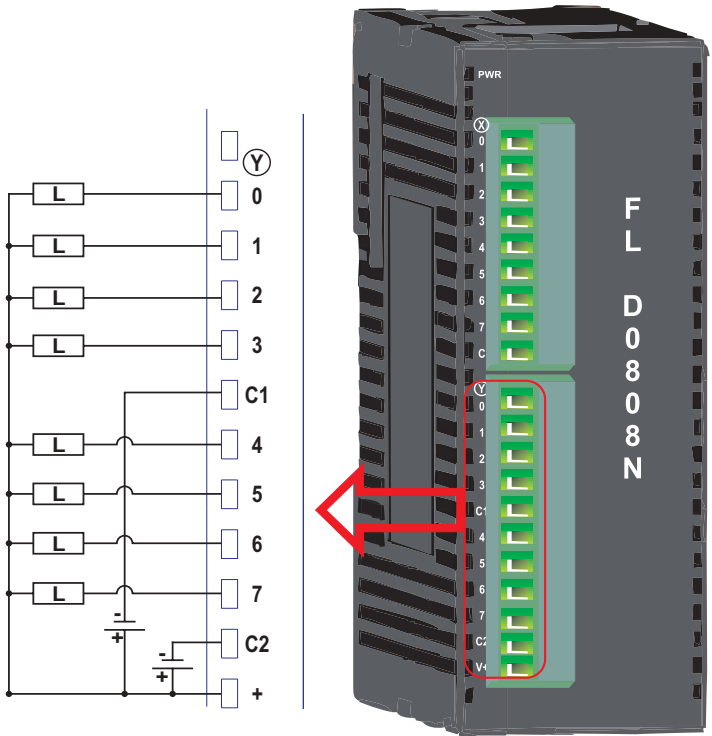
FLD-HS-0808N (NPN Type transistor output)
FLD-HS-0808P (PNP Type transistor output)

24V DC Digital Inputs	
Number of Inputs	8 Inputs Bi-directional Type (Within which 4 are high speed)
Input Design	According to EN 61131-2 Type 1
Minimum ON Voltage	15 VDC
Maximum ON Voltage	30 VDC
Maximum OFF Voltage	5 VDC
Minimum OFF voltage	-3 VDC
Nominal input voltage	24 VDC
Nominal input current	5mA Typical
Isolation	Optically isolated from internal circuit. High isolation voltage(BV= 3KV)
Input Impedance	4.7K ohm
Turn OFF time	10msec
Turn ON time	10msec

High Speed Inputs	
Number of HS Inputs	4
High Speed Channels	X0, X5, X2, X7
Max. input frequency	25KHz
Max. input count	4294967295 (32 Bit)

24V DC Digital Outputs NPN / PNP Transistor type	
Number of Outputs	8 NPN/PNP type includes 2 high speed outputs
Min. ON Output Voltage	22V DC
Max. ON Voltage	24V DC
Max. OFF Voltage	1V
Minimum OFF Voltage	0.2V
Nominal Output voltage	24 V DC
Nominal Output current per channel	500mA Typical [for high speed: FLD-HS-0808N: 300mA and FLD-HS-0808P: 250mA
Isolation	Optically isolated from internal circuit. High isolation voltage(BV=3KV)
Short Circuit protection	Auto Protection for 6 normal digital output NPN type channels.
Nominal load - Ohmic - Lamp - Inductive	48 Ohm / 12 W 12 W 12 VA (1.2 H, 50 Ohm)
Switching frequency with - Inductive nominal load	0.5 Hz (1.2 H, 50 Ohm), maximum

24V DC Auxiliary Power Supply	
Nominal value	24 V DC
Tolerance	-15% / +20% according to EN 61131-2
Ripple	±5% according to EN61131-2
Permissible range	19.2 V to 30 V
Safety equipment	Surge voltage, protection against Reverse polarity
Connection	Via power connectors

Power rating	
Voltage rating	3.75VDC derived from base unit
Current rating	Up to 100mA
Power rating	0.375W
Input per channel	24VDC, 5mA
Output per channel	500mA, 24VDC

General	
Operating Temperature	0 to 55°C
Storage Temperature	-20 to 85°C.
Operating Humidity	10% to 90% (Non condensing)
Mechanical Dimension	100mm X 35mm X 70mm (L X W X H)

High Speed Counter Features

Up Counter Single Phase	Number of channels	4 (X0, X5, X2, X7)
	Physical reset input	X1, X6, X3, X4
	Maximum input frequency (per channel)	25KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	4 (Y1, Y6, Y7, Y0)
Quadrature Counter	Number of channels	2 (X0 and X5, X2 and X7)
	Physical reset input channels	X1, X3
	Maximum input frequency (per channel)	Note[1]*20KHz
	Input count register (per channel)	1 (32-bit)
	Preset registers (per channel)	1 (32-bit)
	Configurable forced output	2 (Y1, Y7)
	Quadrature mode	1x, 2x, 4x

PWM Output

Number of channels	2 (Y2 and Y4)
PWM frequency (variable)	10KHz Max
Frequency step	1Hz
PWM duty cycle (variable)	**0 to 100%
Duty cycle step	1%

Pulse/DIR mode	Number of pulse channels	1
	Output Channels used	Y2 (Pulse), Y4 (Direction)
	Pulse frequency	10KHz Max (50% duty cycle)
	Frequency step	1Hz
CW/CCW mode	Number of pulse channels	2
	Output Channels used	Y2 (CW), Y4 (CCW)
	Pulse frequency	10KHz Max (50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Continuous)	Number of pulse channels	1
	Output Channels used	Y2 (always continuous pulse)
	Pulse frequency (variable)	10KHz Max (50% duty cycle)
	Frequency step	1Hz
Fixed pulse mode (Trapezoidal) (Soft start)	Number of pulse channels	1
	Output Channels used	Y2
	Minimum frequency	1Hz to 10KHz
	Maximum frequency (must be>min. freq.)	1Hz to 10KHz
	Accelaration time	0ms to 32767ms
	Deceleration time	0ms to 32767ms
	Pulse count	0 to 2147483647
	Frequency step	1Hz

Note [1]:*
In quadrature mode, when both the channels are used simultaniously, then maximum input frequency will be 5 KHz.
Also for the frequency to be used above 5KHz (Max. 20KHz) for single pair, then use only pair2 (X2, X7).
***In normal PWM mode, the frequency out on both the channels will be same but duty cycle can be different & variable.*

Wiring diagram of FLD-HS-0808N and FLD-HS-0808P:

1. High Speed Counter Input Connection
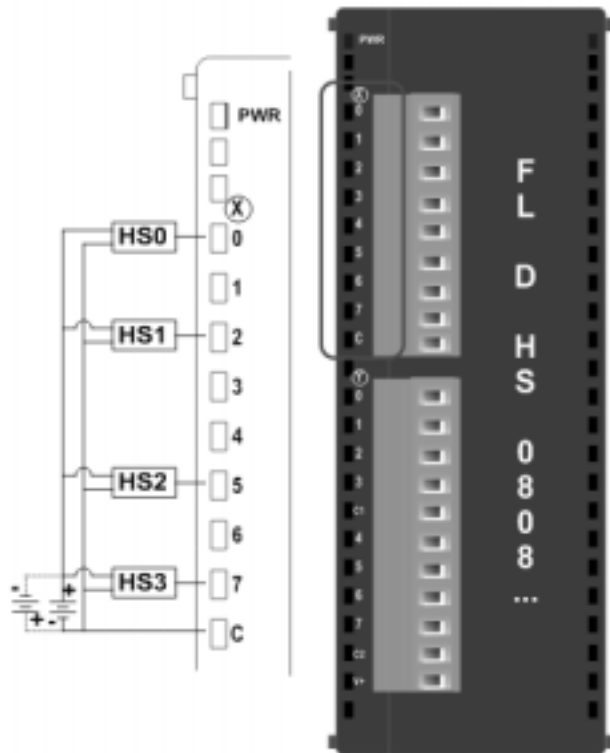
2. Normal Input Connection:

Closing SWx will turn on respective inputs
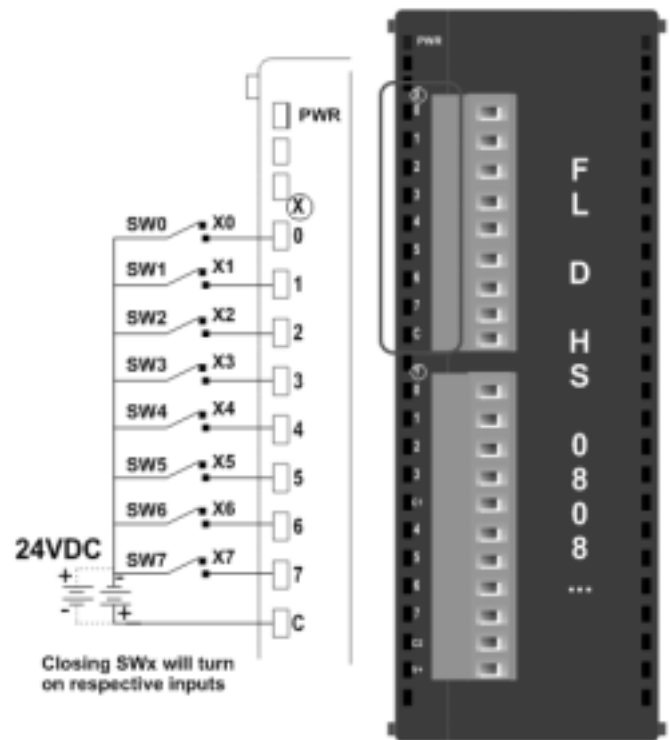
3. PWM Output Connection (Sink):
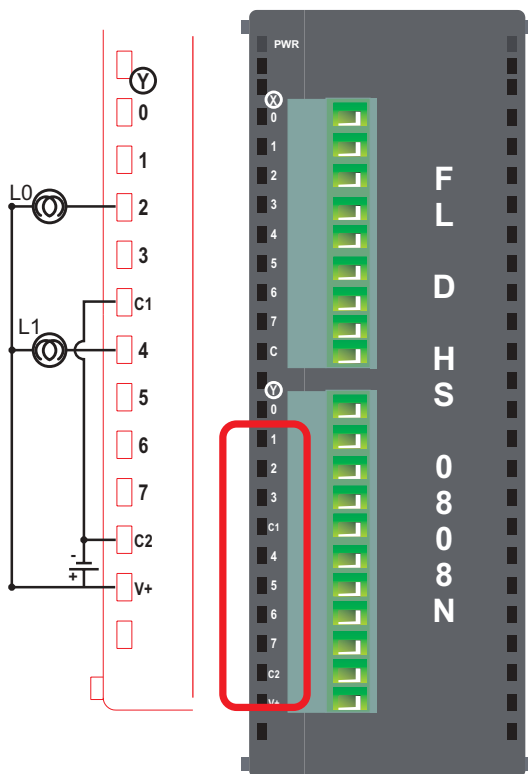
4. PWM Output Connection (Source):
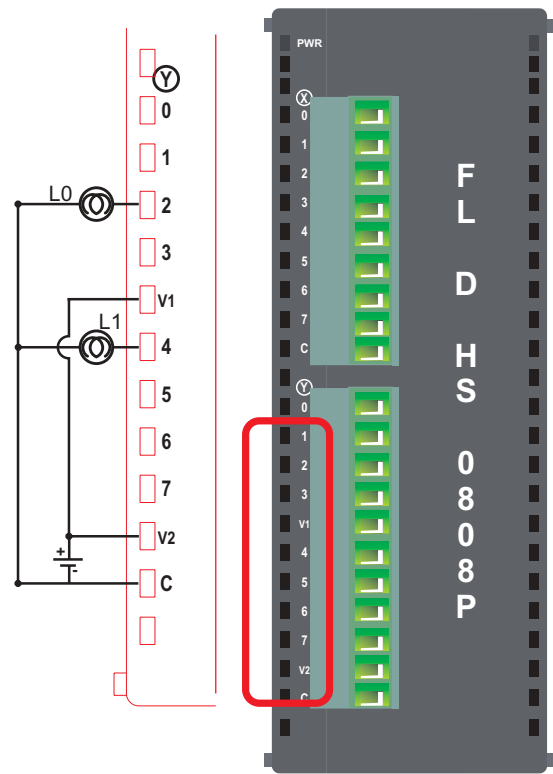
FLA0800L

| Analog Inputs	8 input channels Voltage Input 0 - 10 V Current Input 4- 20 mA
Analog Outputs	0
Isolation	Isolation between analog and digital section. No interchannel isolation. Power supply is isolated
Connection method	Removable terminals (3.81mm pitch)
Resolution	16 Bit
Accuracy	0.2 % of Full Scale
Nonlinearity	0.04% Max.
Input Impedence	470K ohm (voltage mode) 100 ohm (Current mode)
Temperatur Drift	60 ppm
General	
Operating Temperature	0 to 55 Degree.
Storage Temperature	(-20) to 85 deg.C.
Operating Humidity	10 to 90 % (Non condensing)
Vibration	10Hz to 150Hz ,displacement of 0.2 mm (peak) (3 mutually perpendicular axes)
Shock	490.5 m/s2,2 half-sine shocks per axis, on 3 mutually perpendicular axes)
Mechanical Dimension	100mm X 35mm X 70mm
Weight	Approx. 155 gm.
FTB Transient / Burst)	IEC61000-4-4 [2.2kV (Fast (Power- Direct Injection), 1.2KV (I/O - Capacitive clamp).]
Electrostatic discharge	IEC61000-4-2 Level 3
Electromagnetic field	IEC61000-4-3, 10 V/m AM modulation (80 MHz to 1 GHz)
RF Immunity	IEC61000-4-6, 10 V/m AM modulation (0.15MHz to 80 MHz)
Dumped Oscillatory wave	IEC61000-4-12
Surge Immunity	IEC61000-4-5 Level 2
Radiated emission	EN50081-2

Power Rating (Back Plane)

Digital Side: Power derived from expansion slot connector

Voltage Rating	3.75 VDC derived from base model
Current Rating	Upto 80mA
Power Supply:	24VDC, 100mA

Cycle time for all channels if all channels are configured as follows:

Mode	Cycle time
Voltage	= 1370 mSec
mA	= 1050 mSec
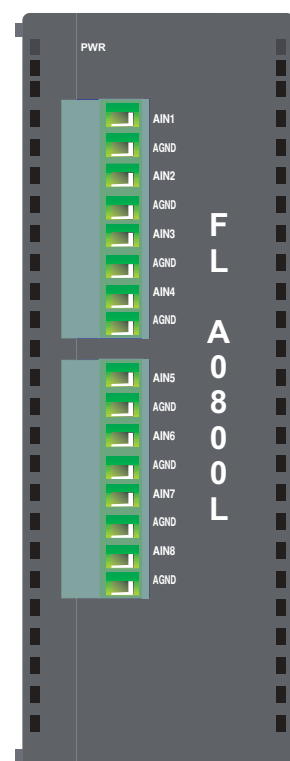
Wiring Diagram of input connection for FLA0800L:

1. Voltage Mode connections::
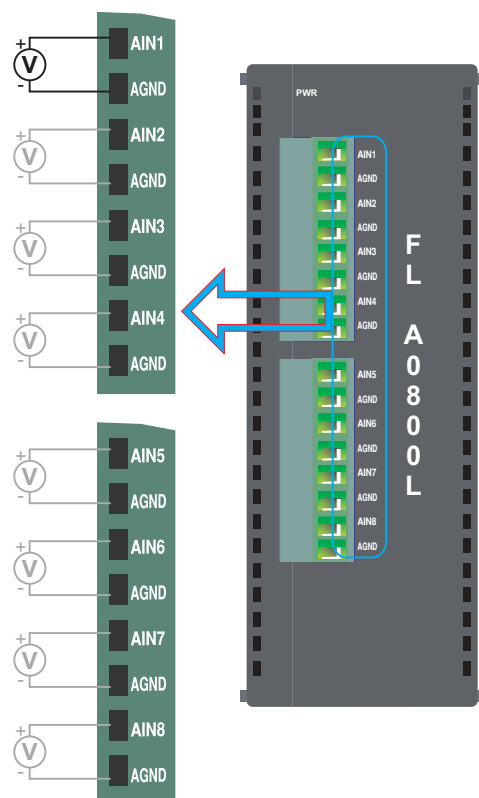
2. Current mode connections:
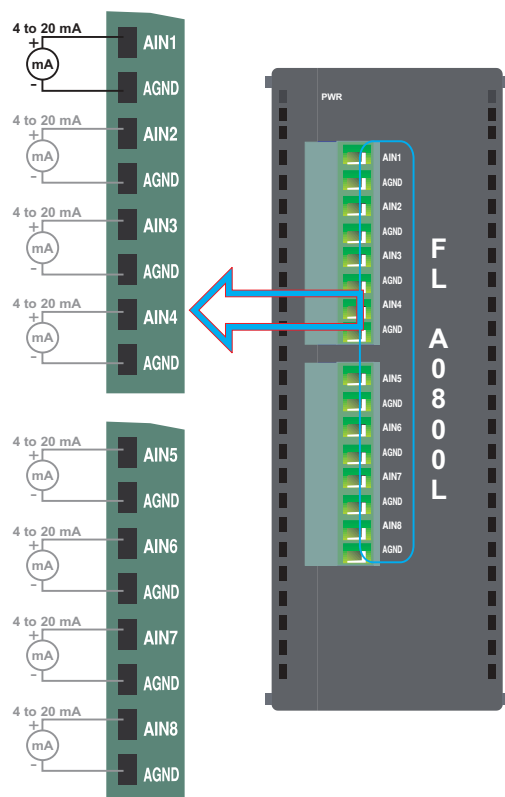
FLA0004

Analog Inputs	0
Analog Outputs	4 Output channels Voltage 0 - 10 V (Min Load 1000 ohm) Current 4 - 20 mA(Max load 500 ohm)
Isolation	Isolation between analog and digital section. No interchannel isolation. Power supply is isolated
Connection method	Removable terminals (3.81mm pitch)
Resolution	16 Bit
Accuracy	0.2 % of Full Scale
Nonlinearity	0.04% Max.
General	
Operating Temperature	0 to 55 Degree.
Storage Temperature	(-20) to 85 deg.C.
Operating Humidity	10 to 90 % (Non condensing)
Vibration	10Hz to 150Hz ,displacement of 0.2 mm (peak) (3 mutually perpendicular axes)
Shock	490.5 m/s2,2 half-sine shocks per axis, on 3 mutually perpendicular axes)
Mechanical Dimension	100mm X 35mm X 70mm
Weight	Approx. 155 gm.
FTB (Fast Transient / Burst)	IEC61000-4-4 [2.2kV (Power- Direct Injection), 1.2KV (I/O - Capacitive clamp).]
Electrostatic discharge	IEC61000-4-2 Level 3
Electromagnetic field	IEC61000-4-3, 10 V/m AM modulation (80 MHz to 1 GHz)
RF Immunity	IEC61000-4-6, 10 V/m AM modulation (0.15MHz to 80 MHz)
Dumped Oscillatory wave	IEC61000-4-12
Surge Immunity	IEC61000-4-5 Level 2
Radiated emission	EN50081-2

Power Rating (Back Plane)

Digital Side: Power derived from expansion slot

Voltage Rating	3.75 VDC derived from base model
Current Rating	Upto 80mA
Power Supply:	24VDC, 150mA

Wiring Diagram of input connection for FLA0004:

1. Current Output Connection Diagram:
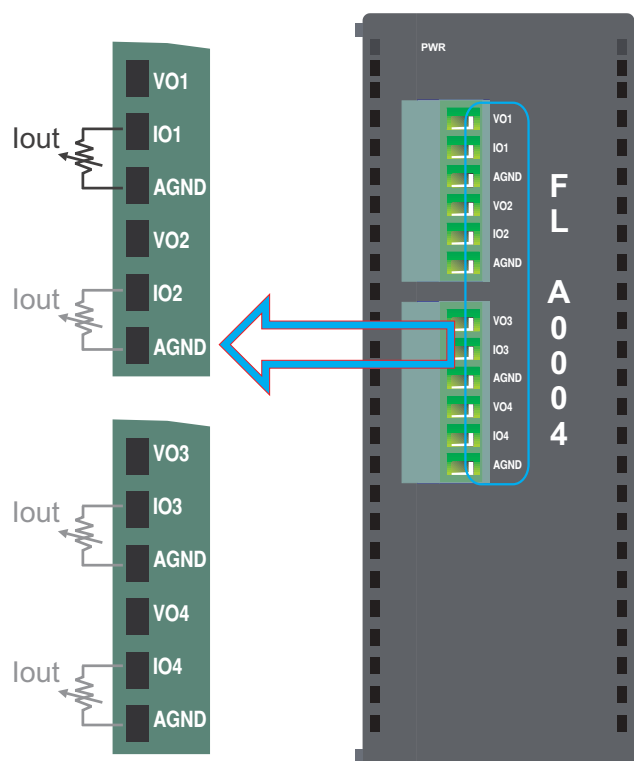
2. Voltage Output Connection Diagram:
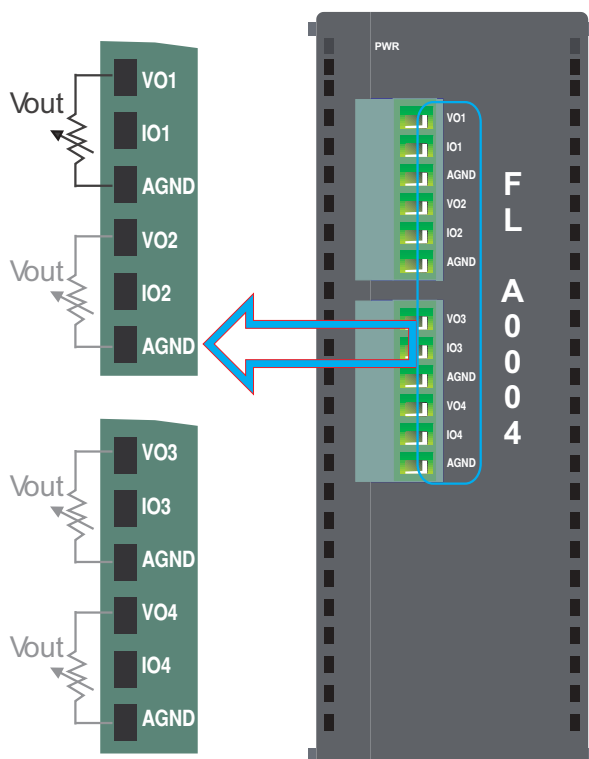
FLA0402U

Analog Inputs	4 Universal Input Channels Voltage Input 0 - 10 V, 1 - 5 V Current Input 0-20mA, 4-20mA RTD PT100 (alpha1, alpha2) Thermocouple(TYPE B,R,S,E,J,K,N,T.) mV 0-100mV, 0-50 mV
Analog Outputs	2 Output channels Voltage 0 - 10 V (Min Load 1000 ohm) or Current 4 - 20 mA (Max load 500 ohm)
Isolation	Isolation between analog and digital section. No interchannel isolation. Power supply is isolated
Connection method	Removable terminals (3.81mm pitch)
Resolution	16 Bit
Accuracy	0.2 % of Full Scale
Nonlinearity	0.04% Max.
Input Impedence	1Mohm (Voltage/mV/TC/RTD mode) typically 30 ohm (Current mode)
Excitation Current for RTD	0.5 mA
General	
Operating Temperature	0 to 55 Degree.
Storage Temperature	(-20) to 85 deg.C.
Operating Humidity	10 to 90 % (Non condensing)
Vibration	10Hz to 150Hz ,displacement of 0.2 mm (peak) (3 mutually perpendicular axes)
Shock	490.5 m/s2,2 half-sine shocks per axis, on 3 mutually perpendicular axes)
Mechanical Dimension	100mm X 35mm X 70mm
Weight	Approx. 155 gm.
FTB (Fast Transient / Burst)	IEC61000-4-4 [2.2kV (Power- Direct Injection), 1.2KV (I/O - Capacitive clamp).]
Electrostatic discharge	IEC61000-4-2 Level 3
Electromagnetic field	IEC61000-4-3, 10 V/m AM modulation (80 MHz to 1 GHz)
RF Immunity	IEC61000-4-6, 10 V/m AM modulation (0.15MHz to 80 MHz)
Dumped Oscillatory wave	IEC61000-4-12
Surge Immunity	IEC61000-4-5 Level 2
Radiated emission	EN50081-2

Power Rating (Back Plane)

Digital Side: Power derived from expansion slot

Voltage Rating	3.75 VDC derived from base model
Current Rating	Upto 80mA
Power Supply:	24VDC, 150mA

Cycle time for all channels if all channels are configured as follows:

Input Mode	Cycle time
Voltage	= 760 mSec
mV	= 670 mSec
mA	= 670 mSec
RTD	= 910 mSec
TC	= 1230 mSec
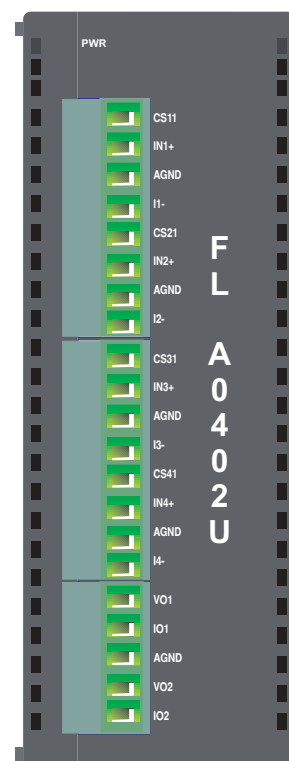
Wiring Diagram of input connection for FLA0402U:

1. Current Input Connection Diagram:
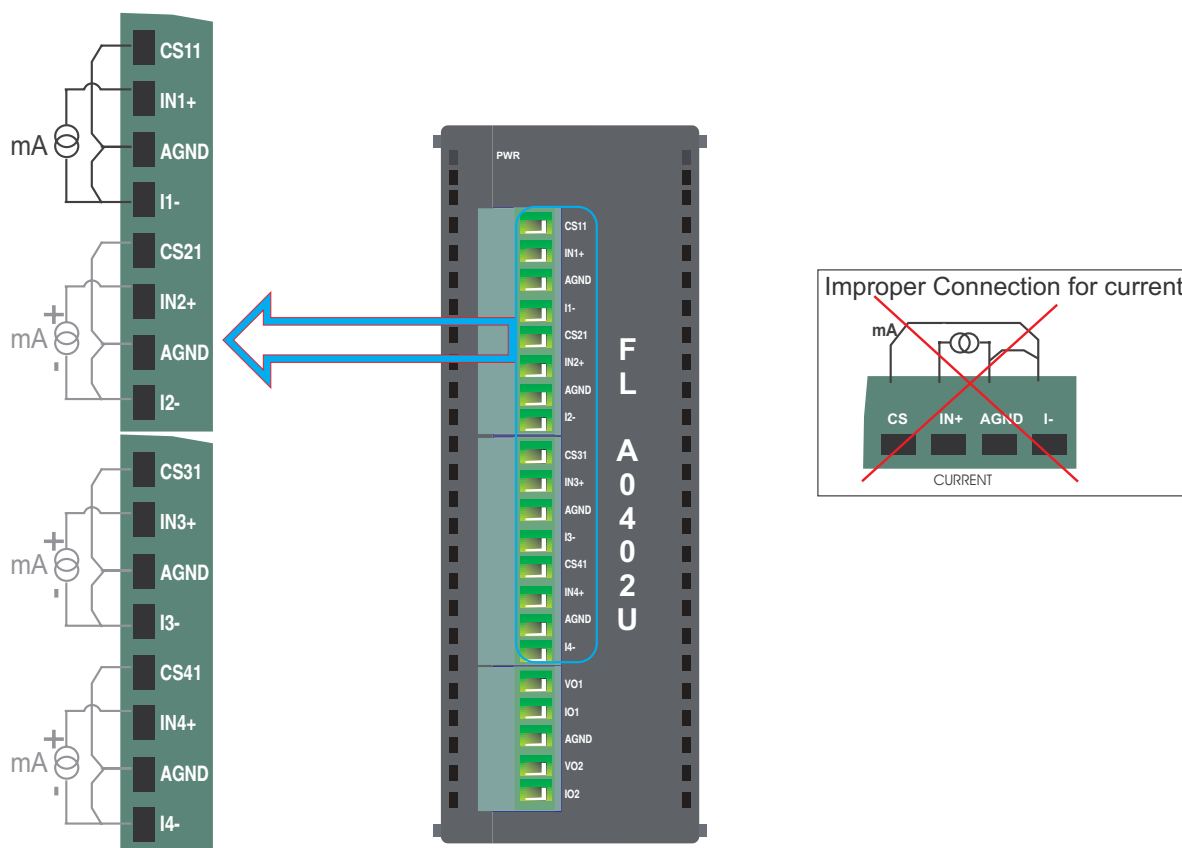
2. Voltage and mV Input Connection Diagram:
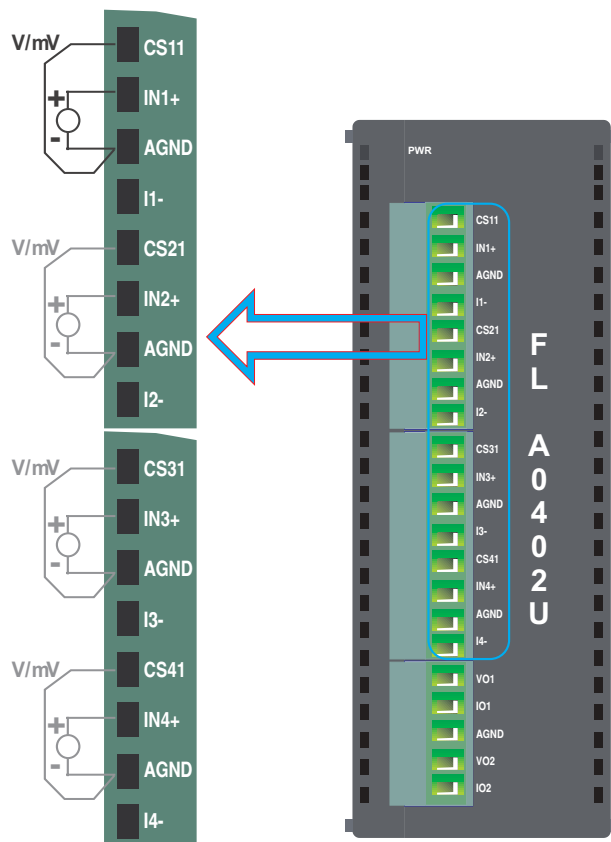
3. RTD Input Connection Diagram:

3 WIRE RTD
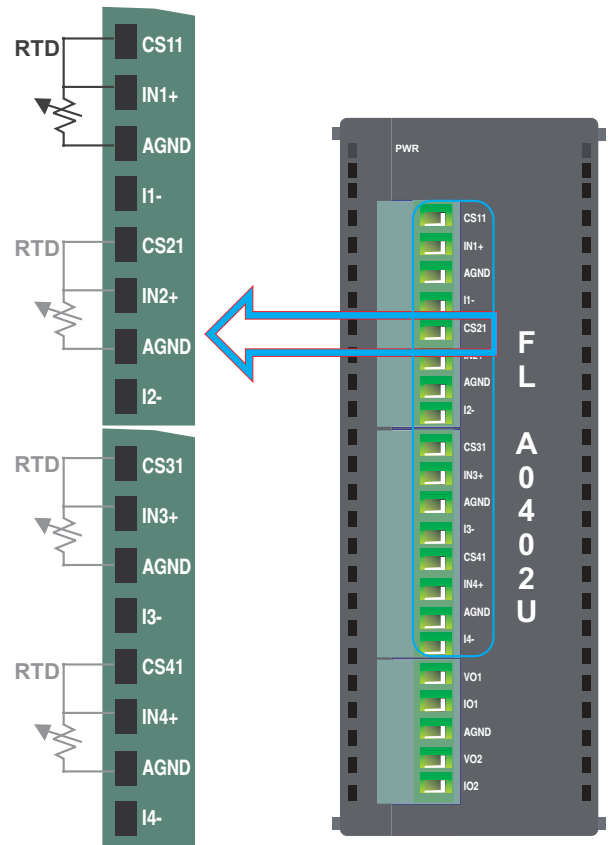
4. Thermocouple Input Connection Diagram:
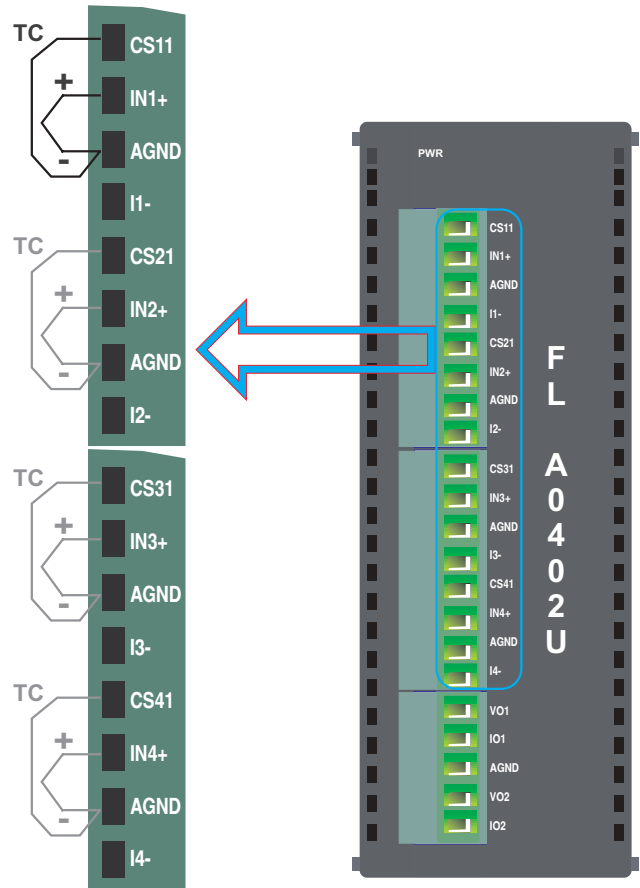
Wiring Diagram of output connection for FLA0402U:

1. Current Output Connection Diagram:

$$R \leqslant 500 \ \Omega$$

2. Voltage Output Connection Diagram:

$$R \geqslant 1000 \ \Omega$$
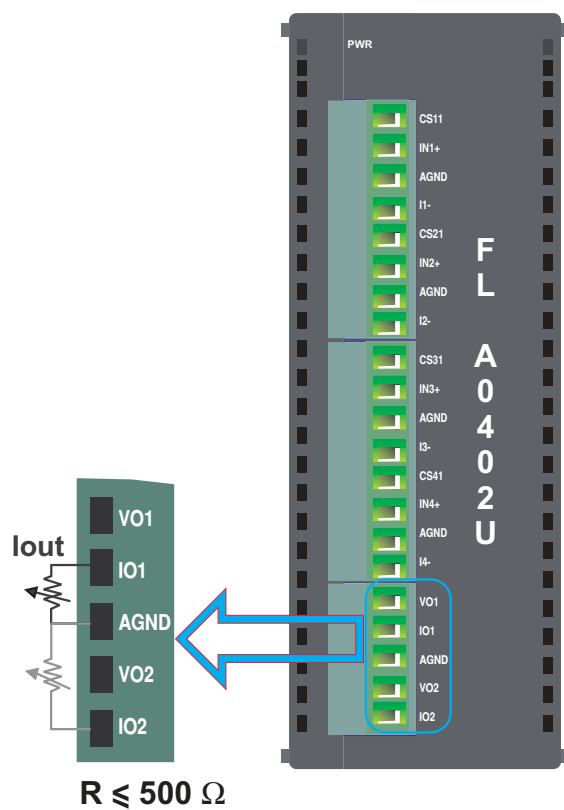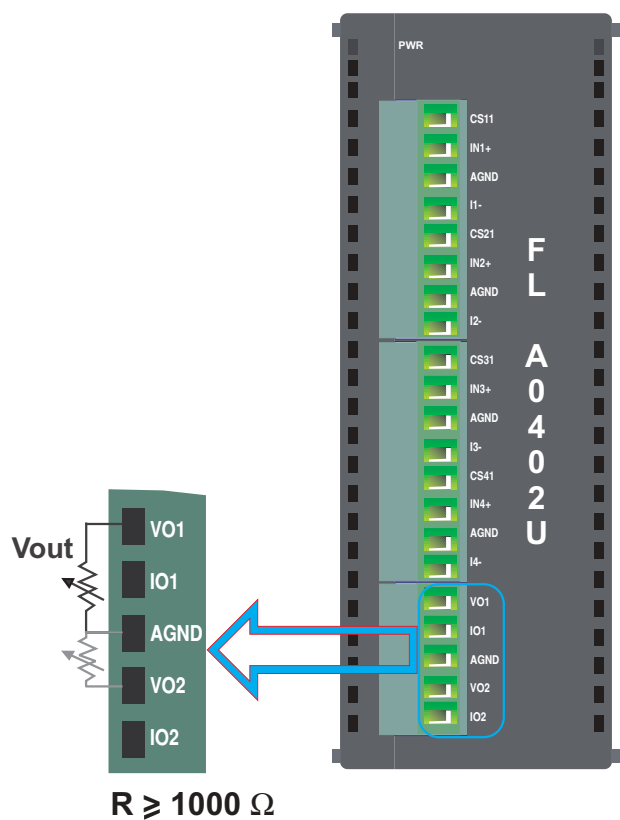
HARDWARE

In this chapter. . . .

♦   Unpacking the unit

♦   Managing Electrostatic Discharge

♦   CE Compliance

♦   Environmental rating

♦   Environmental Consideration

♦   Safety Precautions

♦   Installation Instructions

♦   Wiring Diagram

♦   Communication Port

♦   Communication Cables

2.1 Unpacking The Unit

Carefully unpack the FlexiLogics® unit. Please read all the instructions and cautions that appear on the shipping container. Check that the container includes the Mounting DIN rail slider, locking connector, and a silica gel bag. The silica gel bag is enclosed to absorb the moisture in the packing. Renu Electronics will not accept responsibility for shortages against the packing list unless notified within 30 days. The unit and its accessories were inspected and tested by Renu Electronics before shipment. All equipment should be in good working order. Examine the product carefully and notify the carrier immediately if any shipping damage is evident. You are responsible for claim negotiations with the carrier. Save the shipping container and packing material in case the equipment needs to be stored, returned to Renu Electronics, or transported for any reason.

2.2 Managing Electrostatic Discharge

It is recommanded NOT to remove the enclosure of the FlexiLogics® unit. When any part of the enclosure is re-moved, the circuitry inside is exposed to possible damage by electrostatic discharge during handling. Minimize the possibility of electrostatic discharge by:

- Dissipating static electricity of body prior to handling the FlexiLogics® unit.

- Handling the FlexiLogics® unit at a static-free grounded workstation.

- Connecting the frame ground connector of the FlexiLogics® to a clean earth ground.

- Placing the FlexiLogics® in an antistatic bag during transport.

2.3 CE Compliance

FlexiLogics® products have been tested to confirm to European CE requirements per Council Directive. The Euro-pean Union created these requirements to ensure conformity among products traded in those countries. These products are designed to withstand electrical noise in harsh industrial environment. They also confirm to require-ments that limit electrical emission. However this does not guarantee the products will be totally immune from possible malfunction in cases where severe electrical noise occurs. Therefore, we strongly recommend that you follow the guidelines outlined for proper wiring and grounding to ensure the proper operation of the Renu products.

2.4 Environmental Consideration

FlexiLogics® series models are designed to operate at temperature range defined in the specification. It is intended primarily for indoor installations and may not be suitable for certain outdoor applications. Avoid installing the FlexiLogics® in environments with severe mechanical vibration or shocks. Do not install the FlexiLogics® in enclo-sures with rapid temperature variations or high humidity. Either will cause condensation of water inside the device and eventual damage to the FlexiLogics® unit.

2.5 Safety Precaution

General Information:

1. FlexiLogics® has been designed and manufactured for use in an industrial environment. However, the FlexiLogics® is not intended to be used for systems which may endanger human life. Consult REPL if you intend to use the FlexiLogics® for a special application, such as transportation machines, medical apparatus, aviation and space systems, nuclear controls, submarine systems, etc.

2. The FlexiLogics® has been manufactured under strict quality control. However, to keep safety of overall automated system, fail-safe systems should be considered outside the FlexiLogics®.

3. In installation, wiring, operation and maintenance of the FlexiLogics®, it is assumed that the users have general knowledge of industrial electric control systems. If this product is handled or operated improperly, electrical shock, fire or damage to this product could result.

4. This manual has been written for users who are familiar with Programmable Controllers and industrial control equipment. Contact REPL if you have any questions about this manual.

Hazard Classifications:

In this manual, the following two hazard classifications are used to explain the safety precautions.

⚠ Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Even a precaution is classified as CAUTION, it may cause serious results depending on the situation. Observe all the safety precautions described on this manual.

2.6 Installation Instruction

⚠ CAUTION

1. Excess temperature, humidity, vibration, shocks, or dusty and corrosive gas environment can cause electrical shock, fire or malfunction. Install and use the FlexiLogics® and related equipment in the environment described in this manual.

2. Improper installation directions or insufficient installation can cause fire or the units to drop. Install the FlexiLogics® and related equipment in accordance with the instructions described in this manual.

3. Turn off power before installing or removing any units, modules, racks or terminal blocks. Failure to do so can cause electrical shock or damage to the FlexiLogics® and related equipment.

4. Entering wire scraps or other foreign debris into to the FlexiLogics® and related equipment can cause fire or malfunction. Pay attention to prevent entering them into the FlexiLogics® and related equipment during installation and wiring.

5. Turn off power immediately if the FlexiLogics® or related equipment is emitting smoke or odor. Operation under such situation can cause fire or electrical shock. Also unauthorized repairing will cause fire or serious accidents. Do not attempt to repair. Contact REPL for repairing.

Wiring:

⚠ CAUTION

1.   Turn off power before wiring to minimize the risk of electrical shock.

2.   Exposed conductive parts of wire can cause electrical shock. Use crimp-style terminals with insulating sheath or insulating tape to cover the conductive parts. Also close the terminal covers securely on the terminal blocks when wiring has been completed.

3.   Operation without grounding may cause electrical shock or malfunction. Connect the ground terminal on the FlexiLogics® to the system ground.

4.   Applying excess power voltage to the FlexiLogics® can cause explosion or fire. Apply power of the specified ratings described in the manual.

5.   Improper wiring can cause fire, electrical shock or malfunction. Observe local regulations on wiring and grounding.

2.7 Installation Instructions

The FlexiLogics® should be mounted on a din rail plate. A din rail sliders and locking connectors are provided with each FlexiLogics® unit for proper installation.

Environmental Considerations:
Make sure that the unit is installed correctly and that the operating limits are followed (see Specifications for FlexiLogics®). Do not operate the FlexiLogics® in areas subject to explosion hazards due to flammable gases, vapors or dusts. The FlexiLogics® should not be installed where fast temperature variations are present. Highly humid areas are also to be avoided. High humidity causes condensation of water in the unit.

Location Considerations:
Care should be taken when locating equipment behind the FlexiLogics® to ensure that AC power wiring, PLC output modules, contactors, starters, relays and any other source of electrical interference are located away from the FlexiLogics®. Particular care should be taken to locate variable speed drives and switching power supplies away from the FlexiLogics®.

Panel Mounting
This section presents the dimensional sketches and din rail sliding for FlexiLogics® models.
(All dimensions are in mm and drawing are not to scale.)

2.7.1 Panel Mounting

FlexiLogics® units are shipped with a DIN rail slider & locking connector attached to the unit. User can use the unit with or without DIN rail slider.

Dimensional Details:

Case -1:
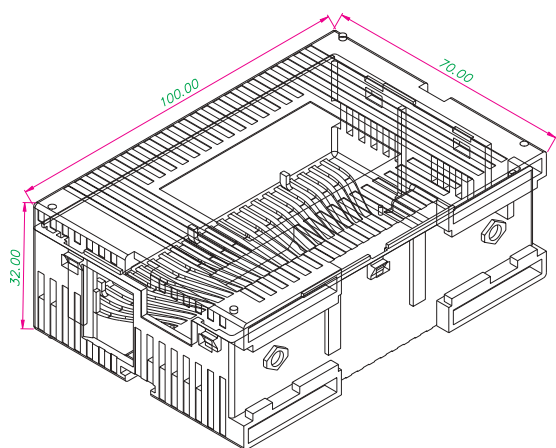
Case- 2:
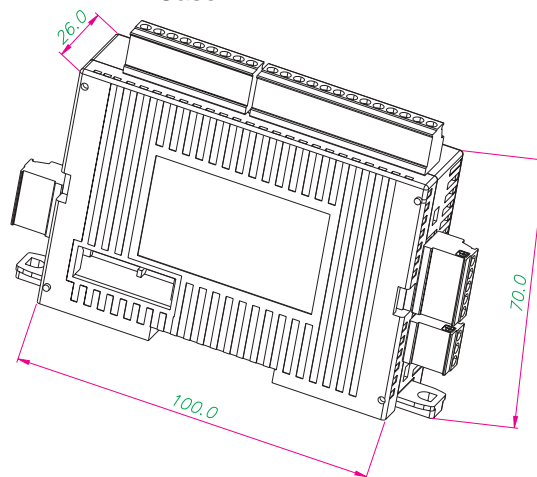
Case-3:
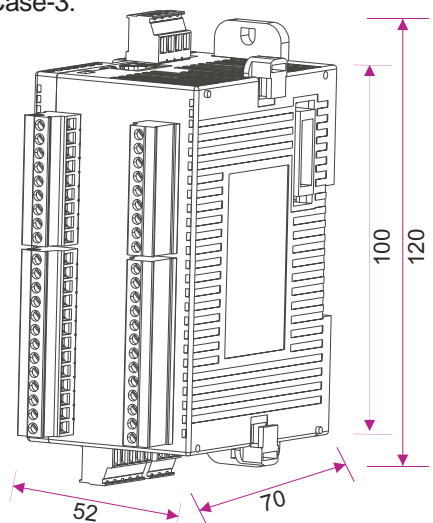
FlexiLogics® unit with DIN rail slider
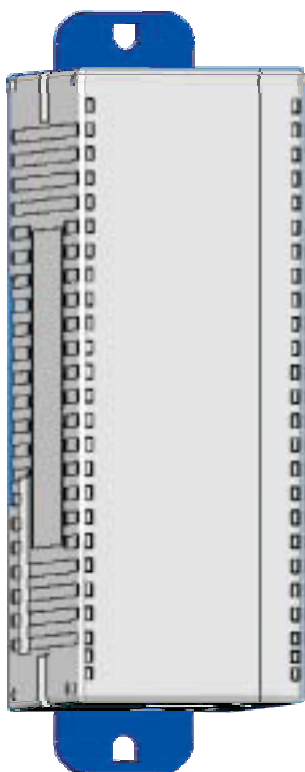
Front View Case- 1   Rear View Case-1
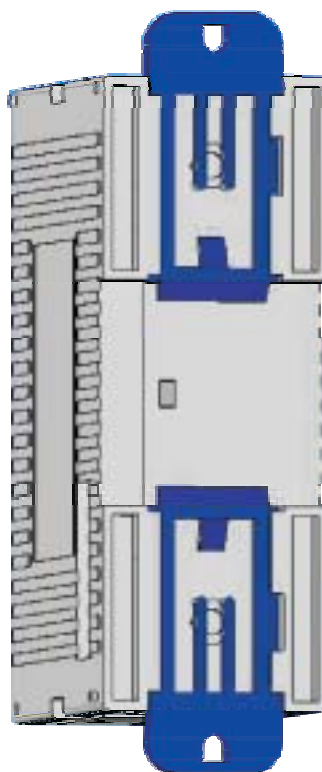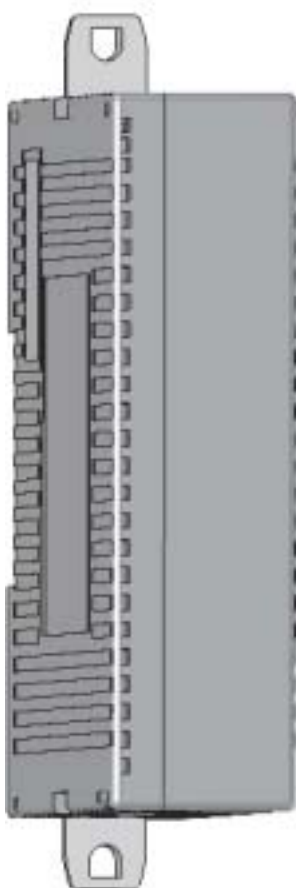
Front View Case- 2   Rear View Case-2
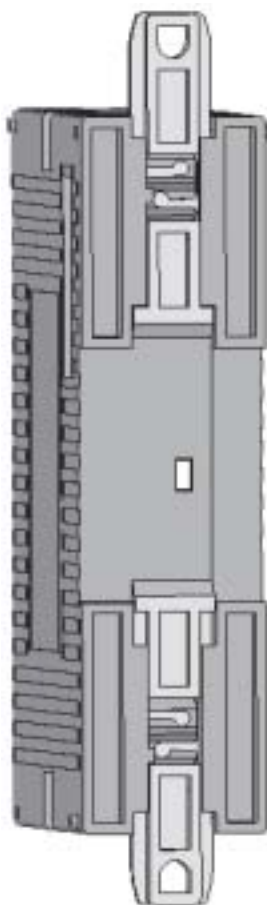
Steps to mount the unit on DIN rail plate
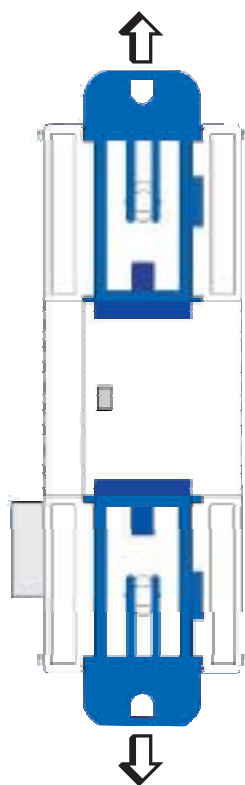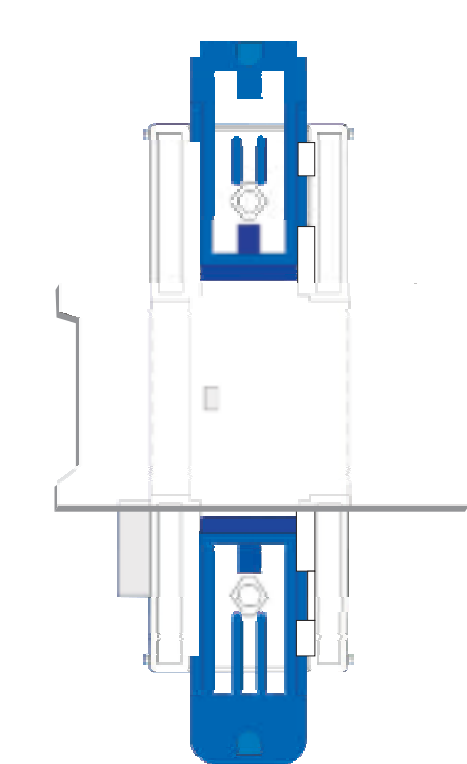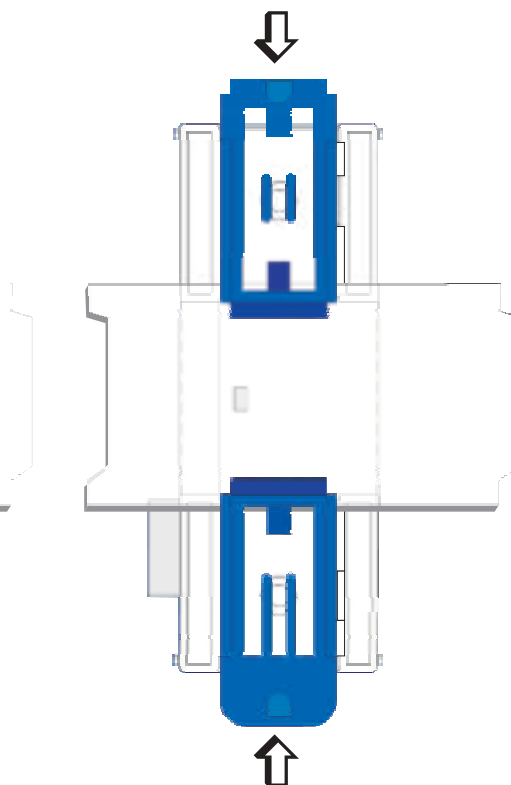
FIG-1   FIG-2   FIG-3

FIG-1 Pull up the sliders provided with the unit towards outward direction.
FIG-2 Rest the unit on the DIN rail plate
FIG-3 Pull down the slider again so that unit can fix up with the DIN rail plate

Steps to lock the expansion module with the FL series base units. (This is applicable with Case-1 units only viz: FL010, FL050 and FL100
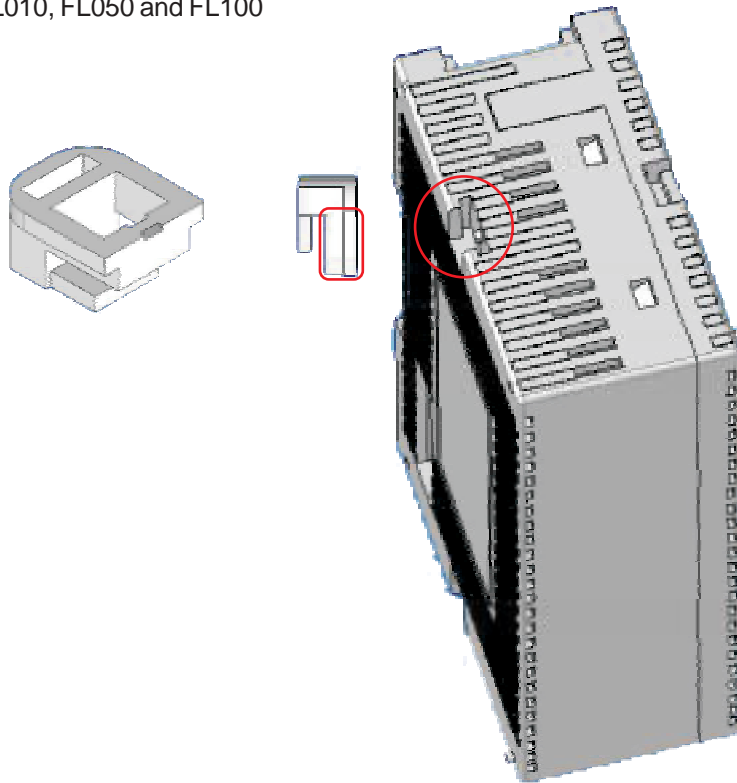
FIG-1

FIG-2
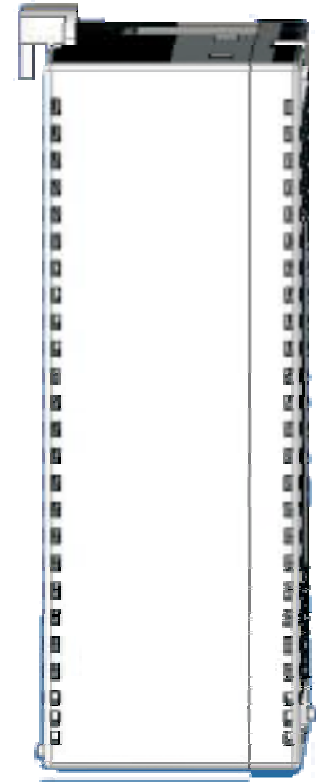
FIG-3
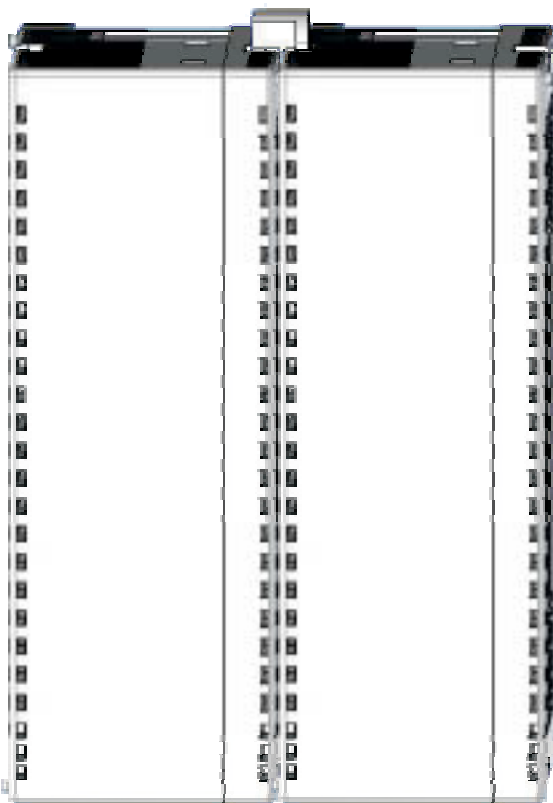
FIG-4

FIG-1   Lock connector provided with FlexiLogics® unit

FIG-2   Two slots to grip the locking connector are provided on the case highlighted by RED circle. Insert a big leg of locking connector highlighted by RED rectangle.

FIG-3   Single FlexiLogics® unit with locking connector

FIG-4   Locking connector helps the two units (FlexiLogics® base & expansions) to hold each-other properly on the DIN rail plate along with DIN rail slider.

Note: Apart from these lockings, also expansion connector is present to each FlexiLogics® unit. User can connect FlexiLogics® base to expansion unit using this connector. Also user can add more expansions to the unit with this connector only.

2.8 Wiring Diagram

If wiring is to be exposed to lightening or surges, use appropriate surge suppression devices. Keep AC, high energy and rapidly switching DC wiring separate from signal wires.

Connecting high voltages or AC power mains to the DC input will make unit unusable and may create an electrical shock hazard to personnel. Such a failure or shock could result in serious personal injury, loss of life and/or equipment damage. DC voltage sources should provide proper isolation from main AC power and similar hazards.

Pin description of the power connector for base (FL010 and FL050) models is as follows:
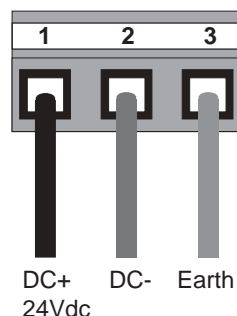
2.9 Communication Ports

FlexiLogics® communication ports support three types of serial communication.

They have two communication Ports in which COM1 is multi-signal port. Multi-Signal means COM1 port has RS232, RS422, and RS485 signal levels. COM2 is 4 Pin PBT terminal with 2 Wire RS485 signals.

FL unit can simultaneously communicate on both serial ports. The unit can be programmed from a PC on either port. Both ports can also be used with a serial printer.

Different cables are required to connect the FL unit to a specific PLC. Cable details for any particular device are given in the Operation Manual and are also available on REPL website. The pin description of the communication ports for FlexiLogics® models are as given below:

4 Pin PBT (COM 2)

RJ45 connector (COM 1)

COM1:

Pin 8: Reserved
Pin 7: RX-
Pin 6: TX-
Pin 5: RX+
Pin 4: TX+
Pin 3: GND
Pin 2: 232RXD
Pin 1: 232TXD

COM2:

A B ⏚ NC

COM2

BATTERY
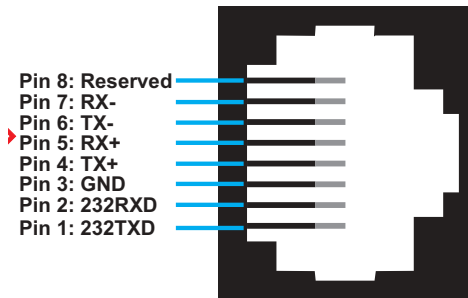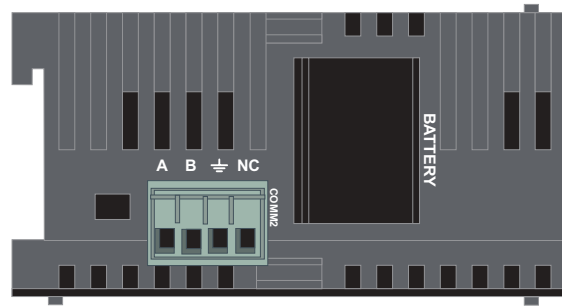
For FL005 Series models, COM1 is RJ45 connector with RS232 signal and COM2 is 4 Pin removable terminal with 2 Wire RS485 signal and are shown below:

COM 2   COM 1

COM2

A B G NC

USB DEVICE

COM1

Pin 8: VCC 5V
Pin 7: NC
Pin 6: NC
Pin 5: NC
Pin 4: NC
Pin 3: GND
Pin 2: 232 RXD
Pin 1: 232 TXD

COM1

A B ⏚ NC

USB

COM 1
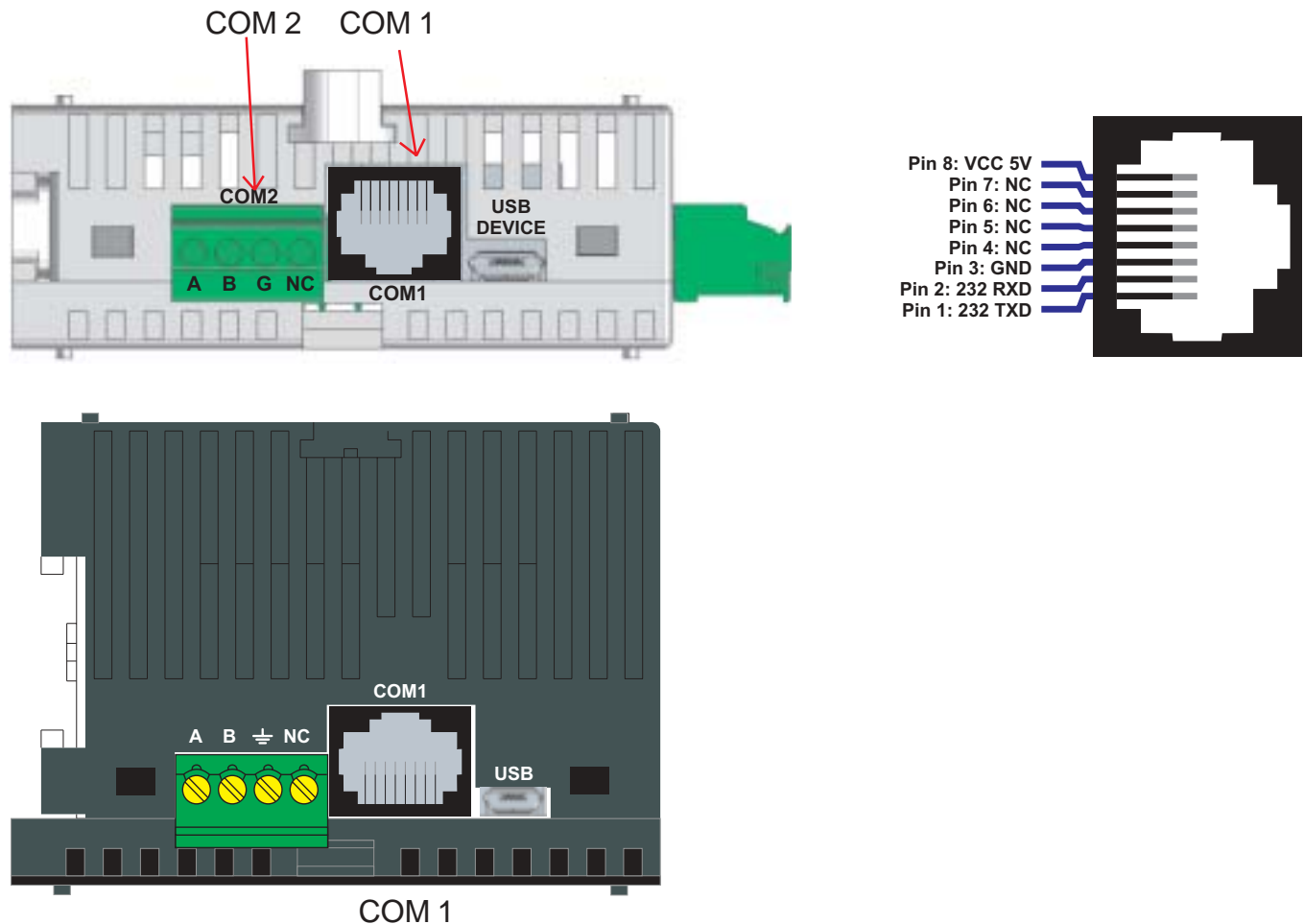
USB Device:
    1. USB Device, compliant with USB 2.0 specification, self powered device.
    2. Connector used: Standard USB Type B Female connector.

USB Host:
    The USB host port is compliant with the USB 2.0 specification. The USB host port supports USB memory stick devices. The USB sticks can be used for data logging and program upload/download, and carrying print files in CSV format

Ethernet:
    1. Fully compliant with IEEE 802.3 / 802.3u standards.
    2. 10/100 Mbps support.
    3. Connector used: Standard shielded RJ-45 female jack with in-built speed and link activity indica-
        tion LEDs.

For FL011 and FL051, port details are exactly as per other base models. But the ports palced are as shown below:

COM Port
(RS232/RS485)

USB Device
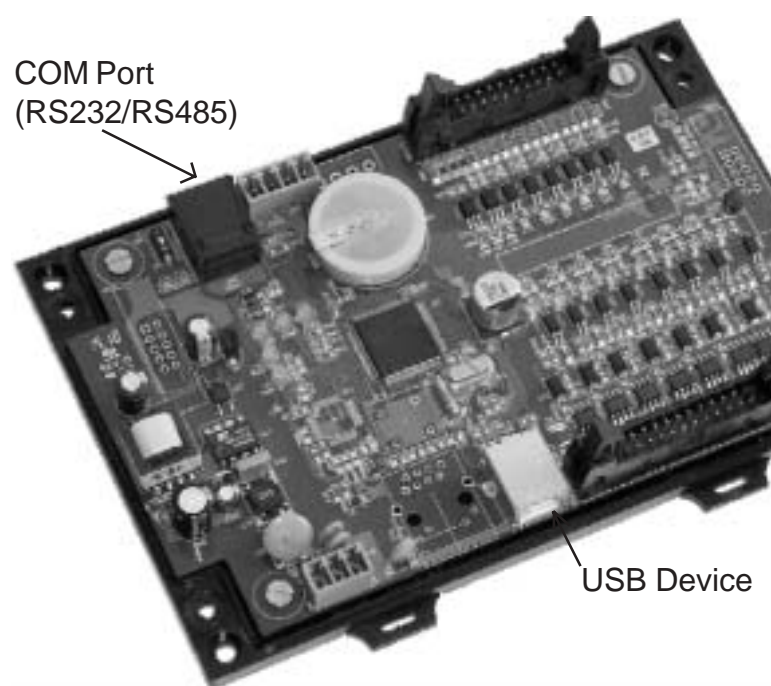
2.10 Communication Cables

Programming cable for FlexiLogics® units (IBM-H-005-00):

PC SIDE   **FlexiLogics® SIDE**

2 mtr.

R.H.S. VIEW

FRONT VIEW

Pin 1 (Left side)   Pin 8 (Right side)

DB9 FEMALE PINOUTS

8 PIN MODULAR CONNECTOR PINOUTS

Signals	Pin#
	1
RXD	2
TXD	3
	4
SG & Shield	5
	6
	7
	8
	9

Pin#	Signals
1	TXD
2	RXD
3	SG & Shield
4	
5	
6	
7	
8	
9	
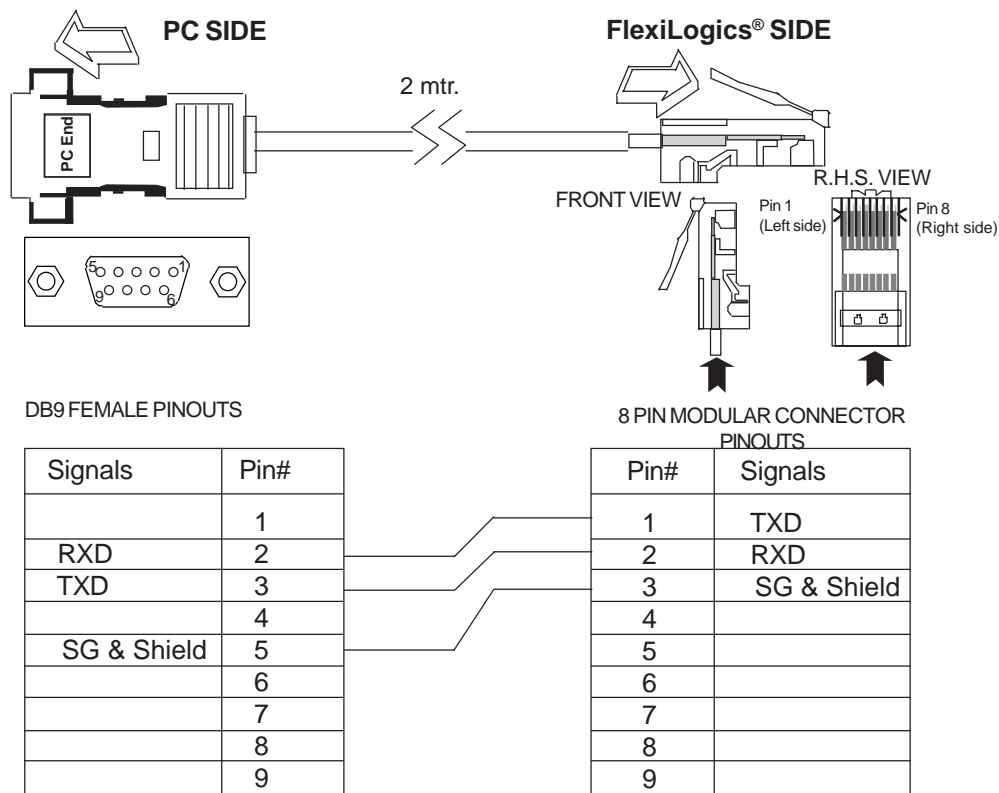
FlexiLogics® TO Toshiba T1 PLC (RC-P-019A-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	8 Pin MINIDIN MALE PIN-OUTS (PLC End)
1	TXD	8
2	RXD	6
3	GND	5 (Connect to shield)
		short pin 4 & 7 at PLC end

FlexiLogics® TO Toshiba T2 PLC (RC-P-019B-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	DB9 MALE PIN-OUTS (PLC End)
1	TXD	2
2	RXD	3
3	GND	5 (Connect to shield)
		Short 7 & 8 at PLC End (DB9 End)

FlexiLogics® TO GE 90/30 PLC (RC-P-002-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	DB15 MALE PIN-OUTS (PLC End)
4	TX+	11
5	RX+	13
6	TX-	10
7	RX-	12
3	GND	7
	Shield connect only plc End	1
		Short 8 & 14 on PLC end
		Short 6 & 15 on PLC end

FlexiLogics® TO Mitsubishi FX PLC (RC-P-008A-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	8 Pin MINIDIN MALE PIN-OUTS (PLC End)
4	TX+	2
5	RX+	7
3	SG & SHIELD	3
6	TX-	1
7	RX-	4

FlexiLogics® TO Aromat FP0 Series PLC (RC-P-015A-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	5 PIN MINIDIN MALE PIN-OUTS (PLC End)
1	TXD	1
2	RXD	2
3	SG & SHIELD	3

FlexiLogics® TO TSX 07 PLC (RC-P-026A-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	8 PIN MINIDIN MALE PIN-OUTS (PLC End)
4 & 5	A	1
3	GND & SHIELD	7
6 & 7	B	2

FlexiLogics® to A.B.Micrologix PLC(RC-P-027A-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	8 PIN MINIDIN MALE PIN-OUTS (PLC End)
1	TXD	4
2	RXD	7
3	GND (shield connect to only PLC end)	2

FlexiLogics® to Microsmart PLC (RC-P-025B-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	8 PIN MINIDIN MALE PIN-OUTS (PLC End)
1	TXD	4
2	RXD	3
3	GND (shield connect to only PLC end)	6 & 7

FlexiLogics® TO TSX17 PLC (RC-P-017-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	DB15 MALE PIN-OUTS (PLC End)
4 & 5	A	14
6 & 7	B	7
3	GND	5
	SHIELD	8
		Shield wire to DB15 pin no.8 only for PLC end

FlexiLogics® TO LG MASTER-K Serise(RC-P-037-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	DB9 MALE PIN-OUTS (PLC End)
1	TXD	2
2	RXD	3
3	GND	5
	SHIELD	5
		Connect shield wire to PLC end only.

FlexiLogics® TO Delta DVP PLC(RC-P-044-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	8 Pin MINIDIN MALE PIN-OUTS (PLC End)
1	TXD	4
2	RXD	5
3	GND (shield connect to only PLC end)	8

FlexiLogics® TO OMRON CQM(RC-P-006B-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	DB9 MALE PIN-OUTS (PLC End)
1	TXD	3
2	RXD	2
3	GND	9
	SHIELD	1
		Shield wire to DB9 pin no.1 only for PLC end

FlexiLogics® TO Siemens Step-7 Micro PLC(RC-P-029-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	DB9 MALE PIN-OUTS (PLC End)
4 & 5	A	3
3	SG	5
6 & 7	B	8
		Shield wire to DB9 body only for PLC End

FlexiLogics® TO MPI (S7-300) PLC(RC-P-077-00)

8P8C(RJ45) MALE PIN-OUTS (Unit End)	PIN SIGNALS	DB9 MALE PIN-OUTS (PLC End)
4 & 5	A	3
6 & 7	B	8
3	GND	5
		Connect shield wire to DB9 (PLC end) only.

<u>BEFORE YOU BEGIN</u>

In this chapter. . . .

♦   Installing FlexiSoft®

♦   Starting FlexiSoft® Configuration Software

♦   Launching Ladder Text Editor

♦   Creating Sample Ladder Application

3.1 Installing FlexiSoft® configuration software:

To install FlexiSoft® configuration Software:
1. Open Microsoft® Windows.
2. Select Run and Pop up window appears. Type the path for installing the Setup. This will install FlexiSoft® Configuration Setup Software.
3. When you click on OK, Welcome window appears on the screen. Click on Next.

4. Select the destination folder where setup will install the files.

5. Click on "NEXT", installation starts. A dialog box indicating the status of progress of installation will display.
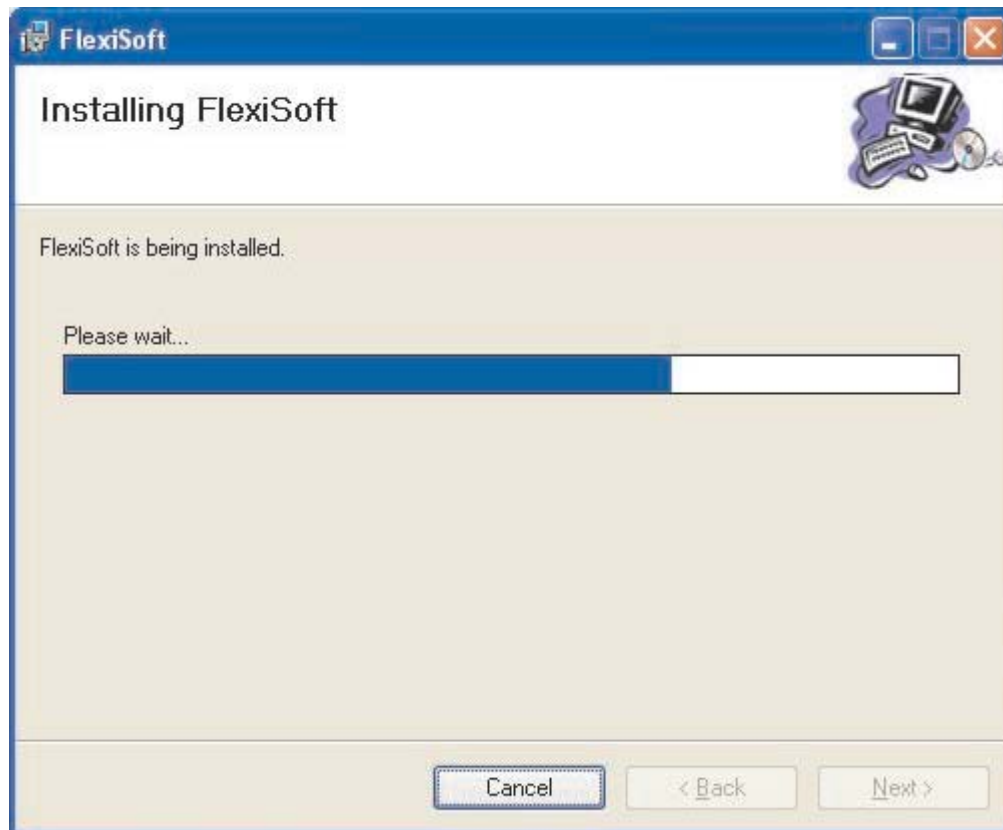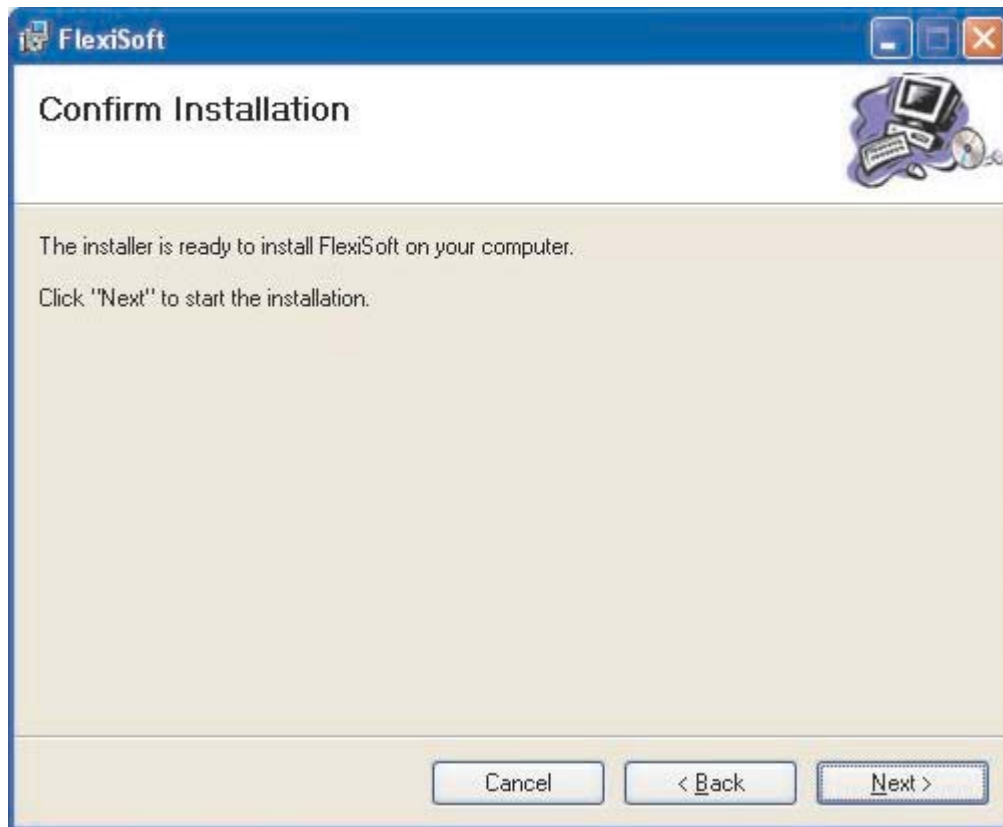
6. A screen is displayed to inform you when installation is completed.
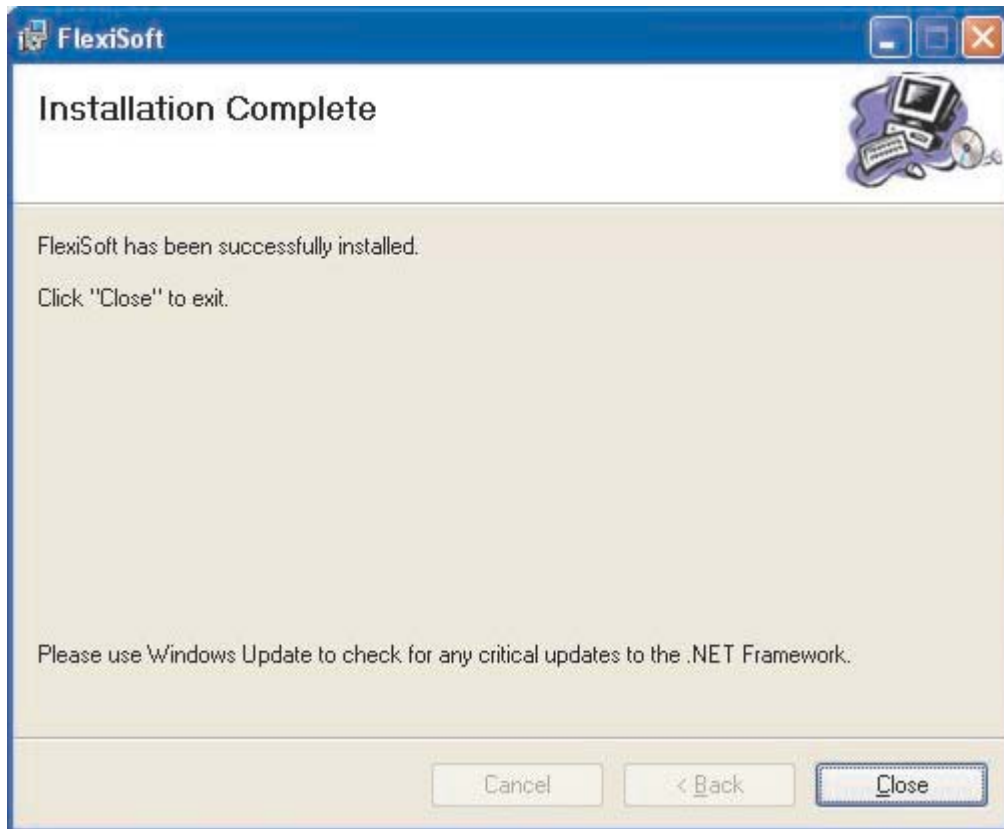
This procedure installs FlexiSoft® Software in start menu (in selected folder).

3.2   Steps for starting FlexiSoft® Software

1. Click the Start button in Windows OS.
2. Select Programs.
3. Select "FlexiSoft®".
4. Select FlexiSoft® setup exe.
5. Select New Application either from Tool station or from File Menu.
6. Select the model and product type that you would like to set by clicking on picture of the product in the list.
7. Define the Unit Settings.
8. Next step is to define Tag Database to your application.

3.3   Uninstalling FlexiSoft® Software

1. In Windows click the Start button.
2. Select Programs.
3. Select FlexiSoft®.
4. Select Uninstall FlexiSoft®.

Following screen will display. The screen will ask you for the confirmation for uninstalling FlexiSoft® configuration software.
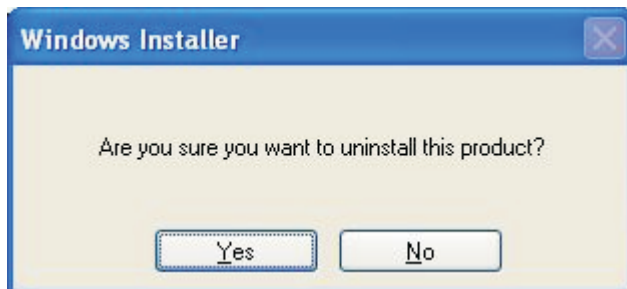
3.4 Procedure to launch ladder in FlexiSoft®

Launch FlexiSoft® setup software on your PC. Below shown welcome screen will display.

To launch a ladder application either choose Project -> New option or click on New application icon.
Choose FlexiLogics® unit and define "Project Configuration" window with the information required.
Click "OK".
This will launch ladder editor to create an application as shown:
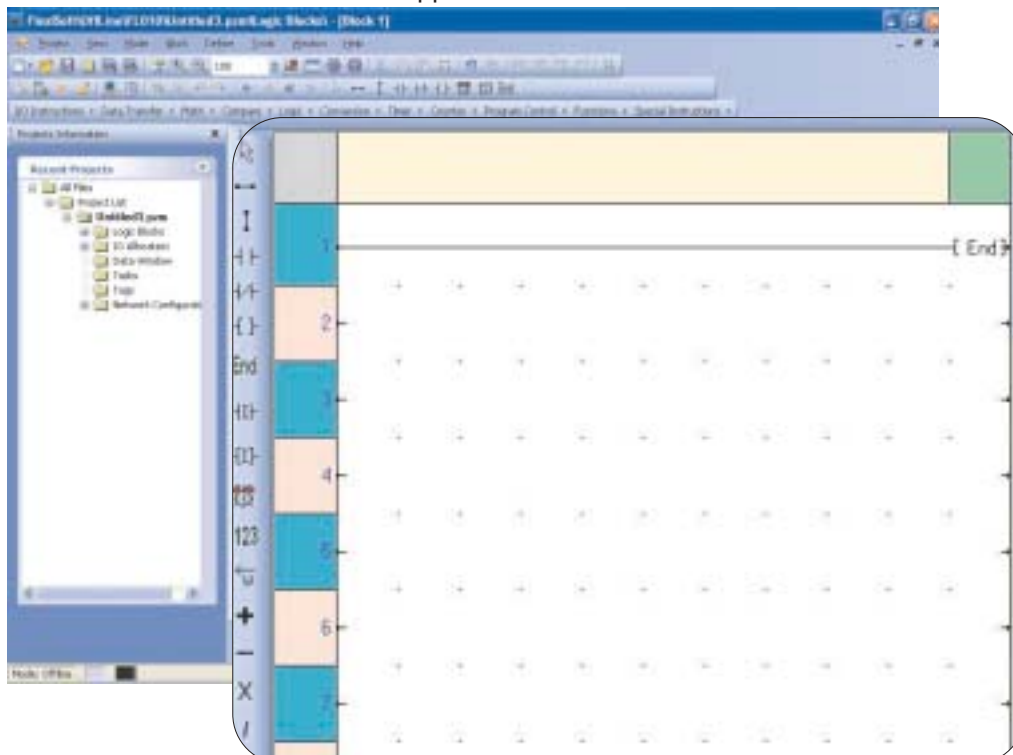
A ladder Text Editor appears as shown below:
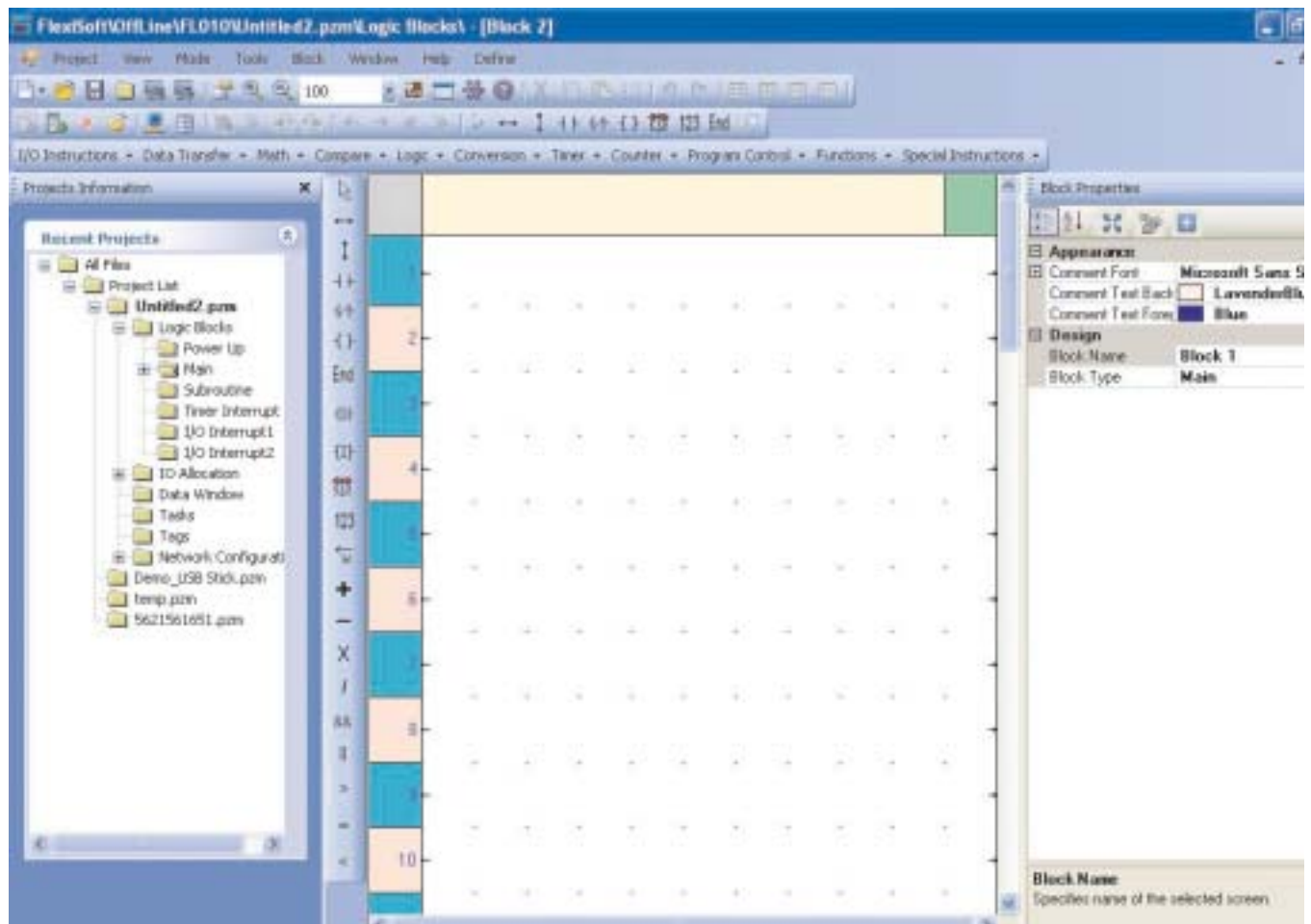
Now here you can create your ladder

3.5 Creating sample ladder

After launching Ladder Text Editor, you can create a ladder here. Steps are shown below:
Step-1:
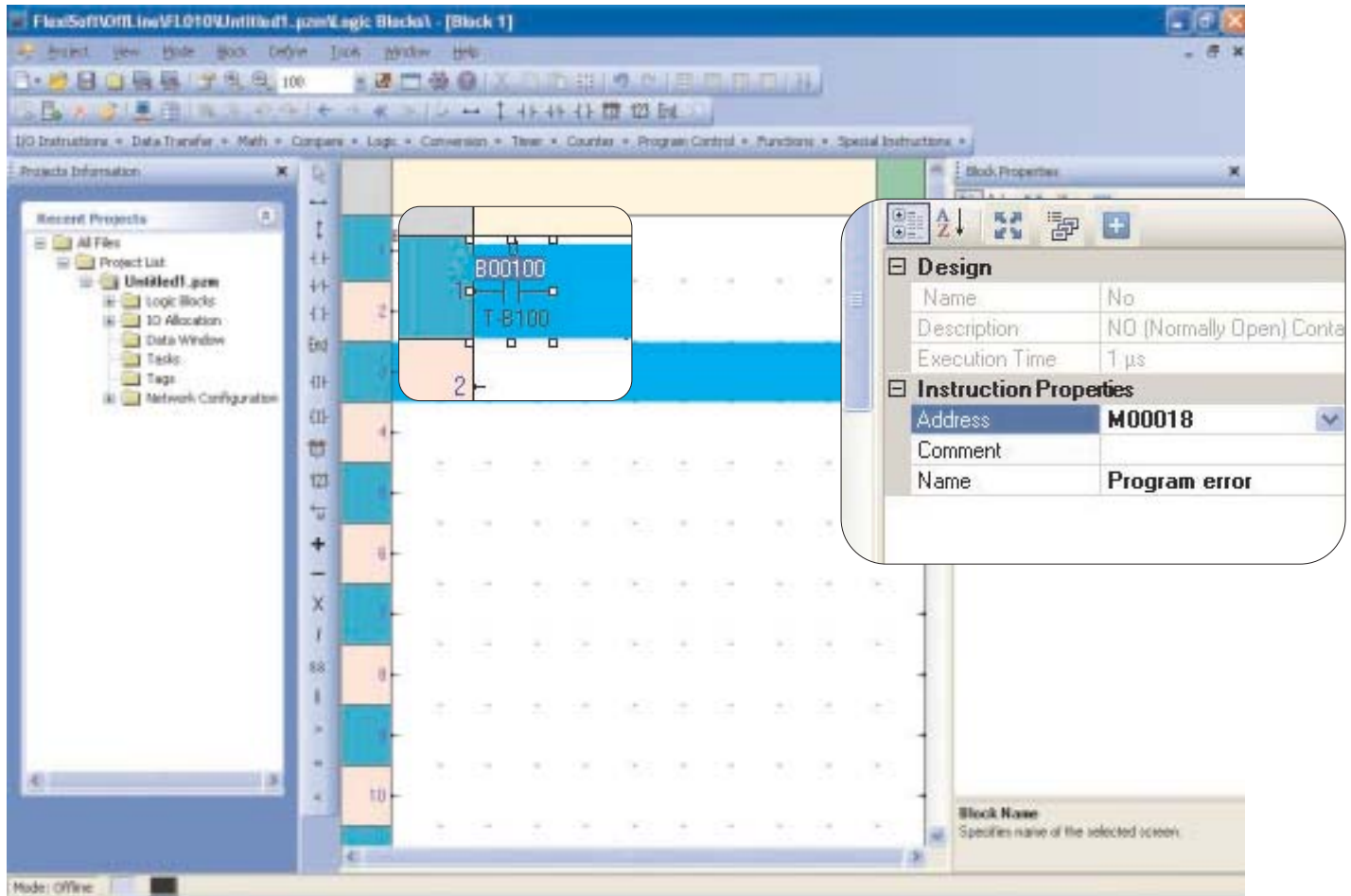
Here in the example, "NO" instruction is taken. Define its address and name from the "Instruction Properties" window seen to the left side of the application window. as shown in the above figure.
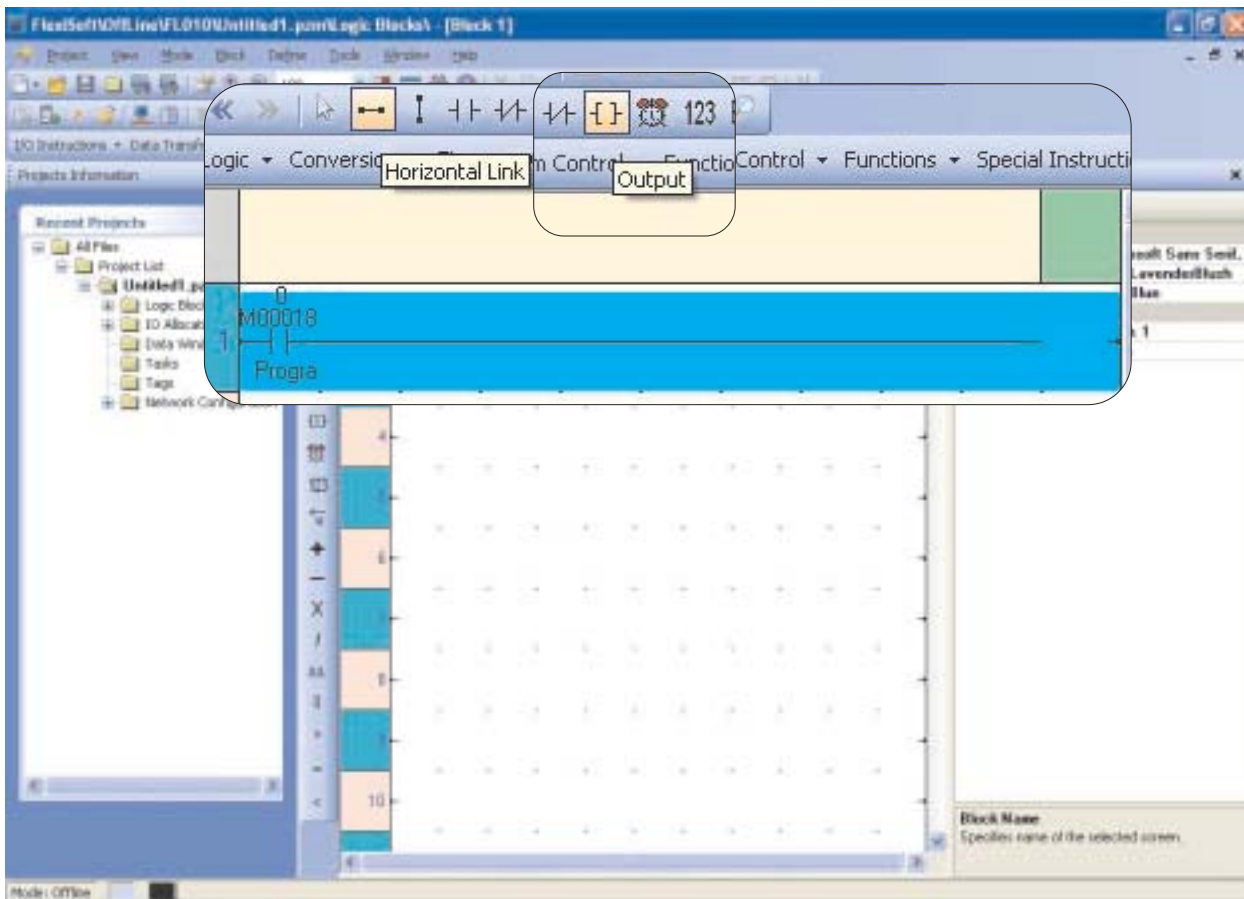
Complete the rail using "Horizontal Link" command, then put "Output" command.
User can also directly put "Output" link to the last right side point of the rail. This will complete the command. as shown below:
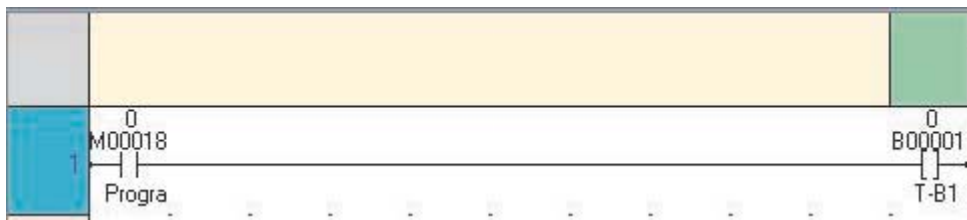
For output command also, define tag address and name from the "Instruction Properties" window seen to the right side of the application window.

Put "End" instruction as shown below:
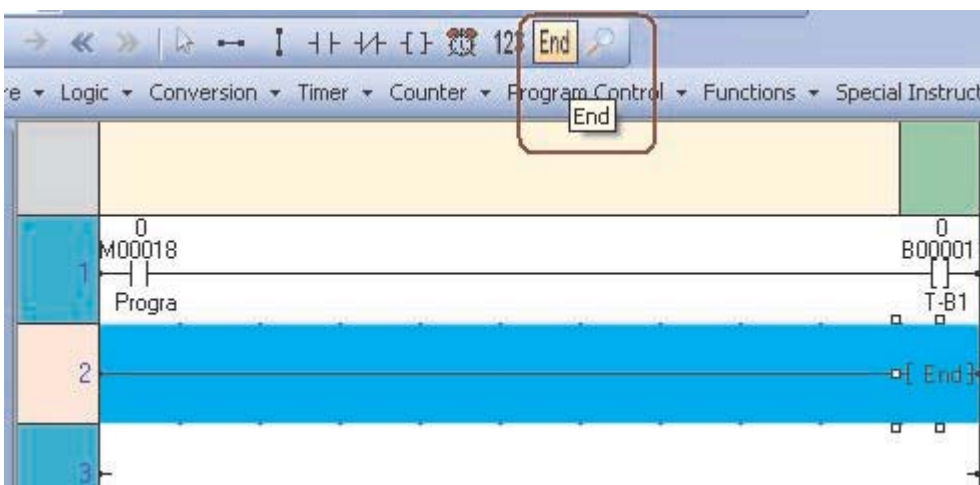
Note: Do not forget to put "END" command whenever ladder application is over.

After completing ladder, Compile it as shown below:

Or
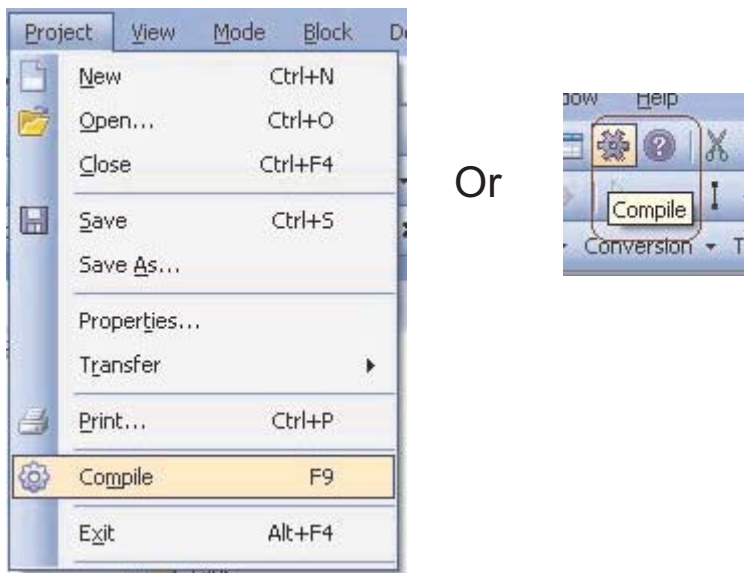
Following screen will appears if compilation is successful.
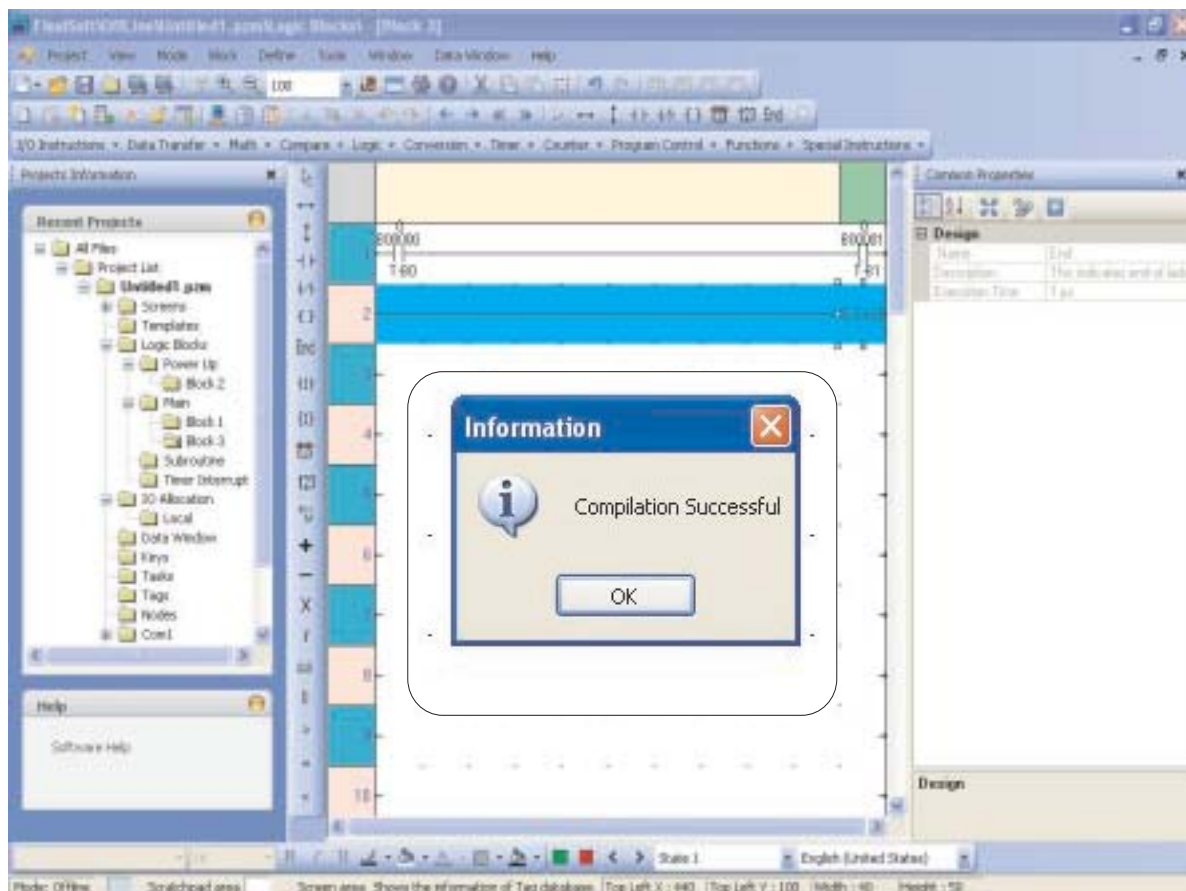
<u>CONFIGURATION</u>

In this chapter. . . .

♦ Configuring unit using FlexiSoft®

♦ Tag Database

♦ Memory Allocation of Registers

4.1 Configuring unit using FlexiSoft®

Before creating any application or connecting FlexiLogics® base unit to any system, user have to configure the unit unsing FlexiSoft®.

1. Connect the unit to the PC.
2. Power-On the unit.
3. Launch FlexiSoft® software. "Welcome" screen will seen. Press "New" from the application window or Project -> New as shown below:
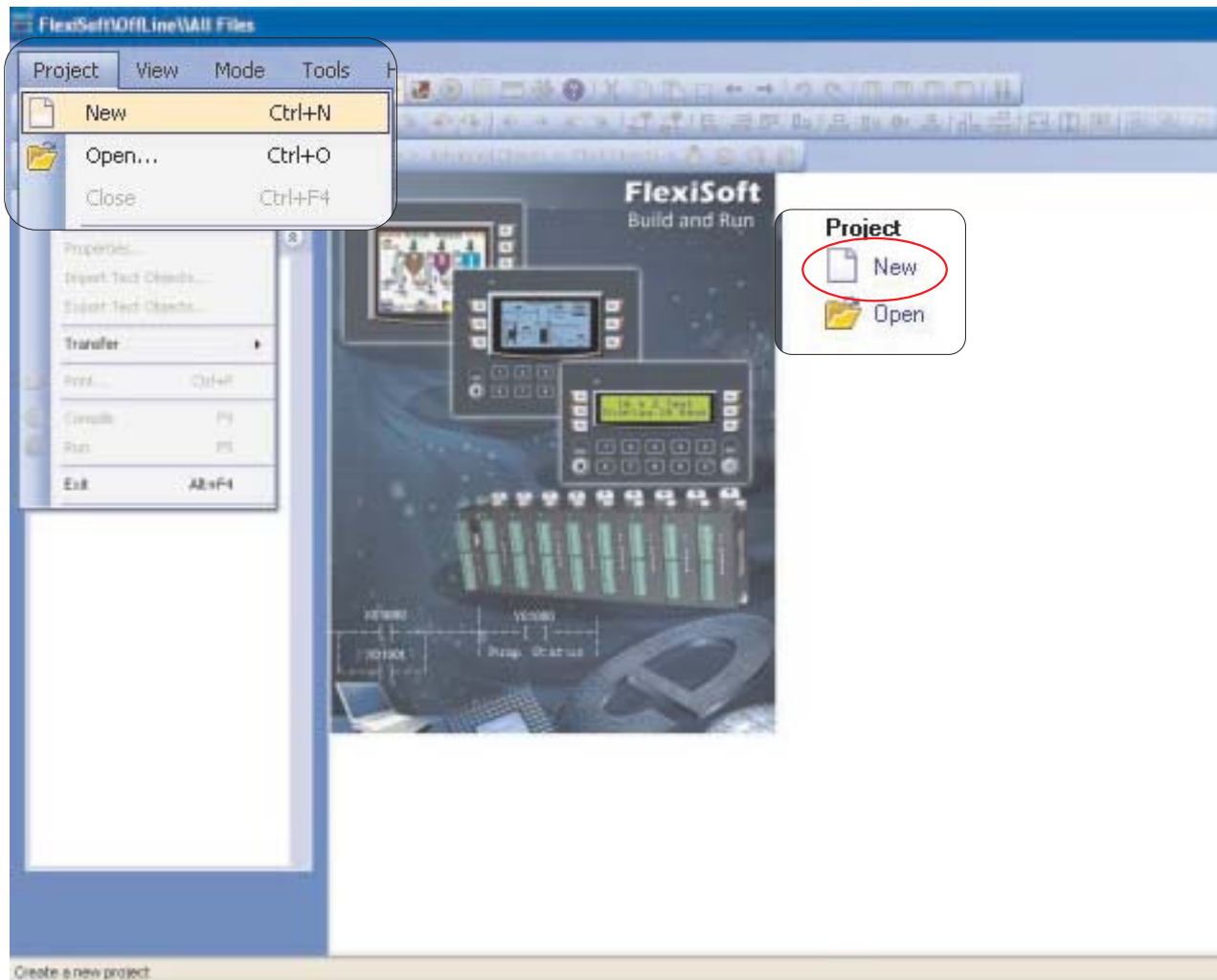
4. This will launch "Select Product" window as shown below. Select the product and the model from the listing.
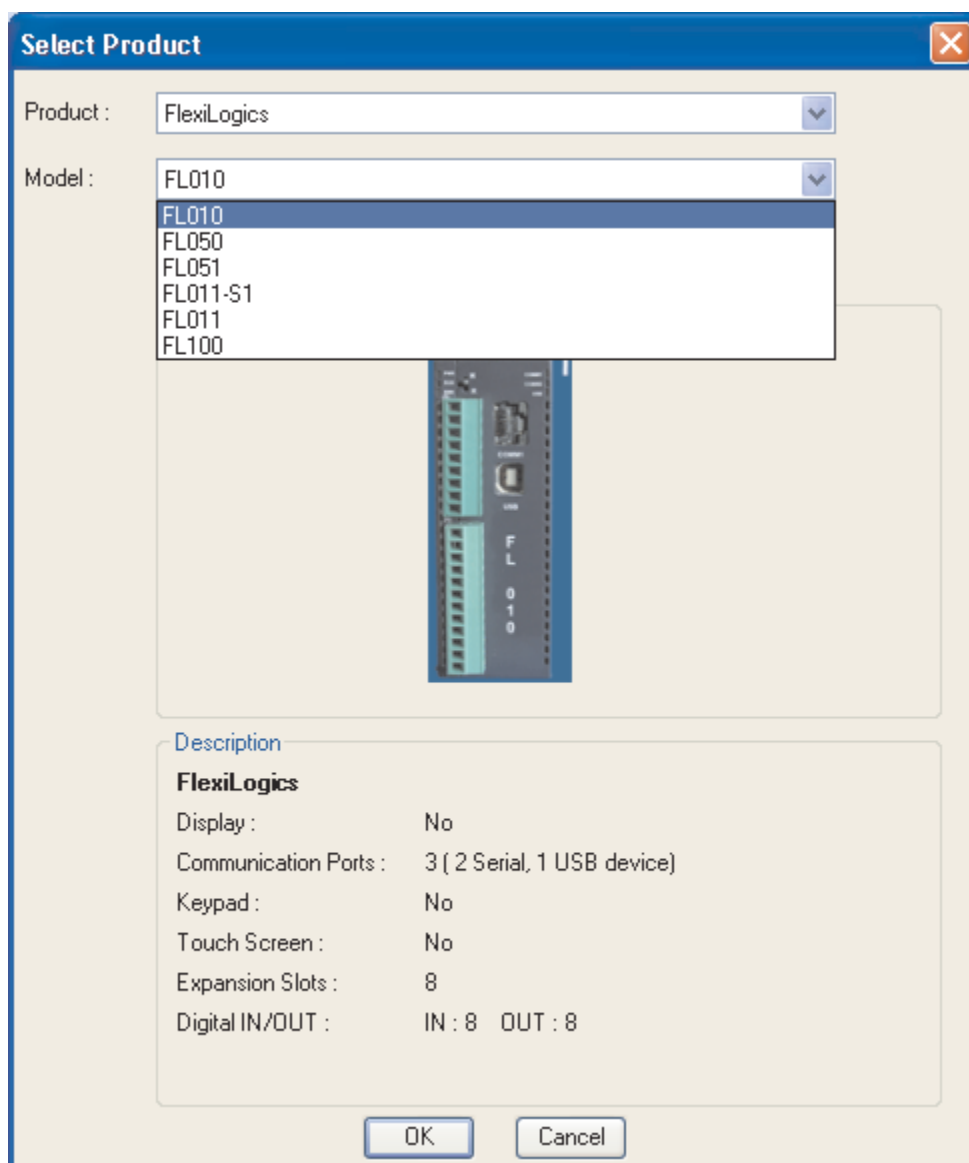
5. If user chooses model FL100, it gives aditional selection tab of ladder programming environment. FL100 supports IEC61131-3 ladder environment along with native ladder. User should select ladder type from drop-down menu in the tab.
6. Press "OK". "Project Configuration" window will pop-up as shown below:

In this dialoge box section:

Point 1: You can define project name or can keep "Untitle" as default.

Point 2: You can define path for the project to be saved.

Point 3: You can mention any special note; if required.

Point 4: You can define author name.

Point 5: You can define "password" for the project you created.

Point 6: You can see the information of the model selected.

Point 7: You can see the image of the model you selected.

Note: Point 6 and 7 will appear with all tabs of "Project Configuration" docker.

3. Press "OK" button.

You can see a application window listing information as Logic blocks, tasks, tags and Network Configuration.

After setting macro level parameters from these project items, your application is ready for downloading.

FlexiLogics®base models has expansion slot, from where user can add additional I/O modules as per requirement. FL010 and FL050 supports 8 expansion modules and FL100 supports 16 expansion modules.
In the FlexiSoft® user interface, in the area "IO Allocation", user can add any expansion model to any slot. If user click on "Base" section, this will show you the name of the base model selected along with the address range.
(Address range will appear only when user selects native ladder)
Once, you click on "Expansion" section a following screen will appear:

Here user can add expansion model to each slot.
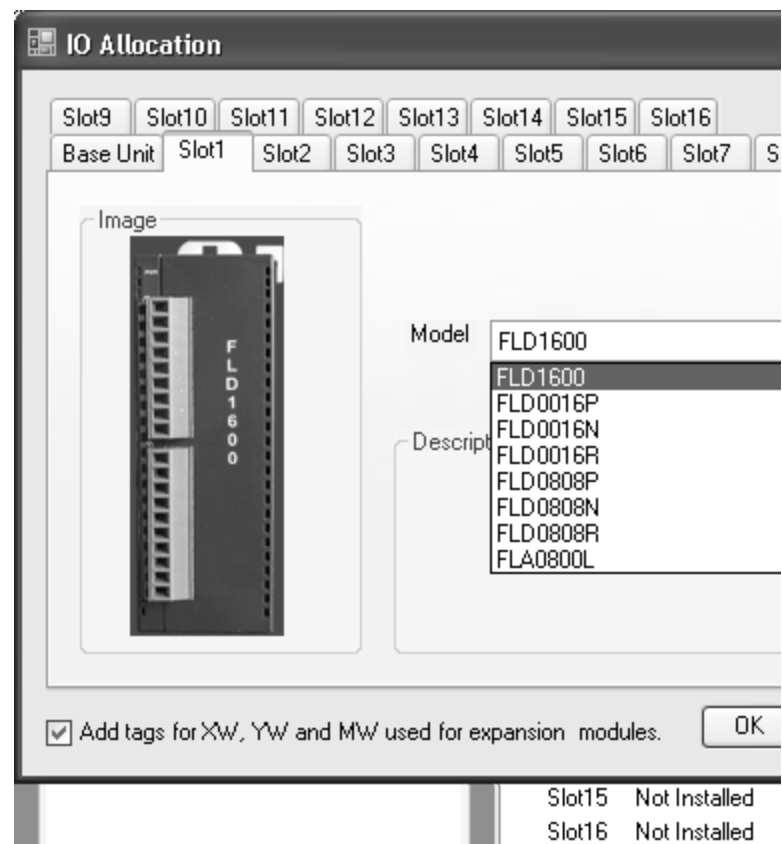
Below shown image showing FL100 unit with 16 expansions:

Power Consumption:
Base unit require 24VDC power supply (Refer 1.4.4) and all expansions take power from this base unit. Apart from this, few expansions require external auxillary power supply. Refer (1.4.5).
While configuring expansions with base unit, each expansion is provided with "Earthing" terminal (bottom side 3 pin connector). User can use it as per his application.

4.2   Tag Database

This is the central database for the tags that need to be used in the application. Once the tags are defined (as register or coils) and their attributes selected, the tags can be used in the application, tasks, etc. This screen helps you to define Tags associated with defined Nodes. A tag is a register, coil or an individual bit of a register. Select the type of tag from the Tag Type field.

If the type of tag selected is a register then the number of bytes required can also be selected. For editing a floating point data number, the number of bytes must be 4. The Tag Name field is user definable. A tag is not added to the tag list unless a tag name is defined. Once these fields are defined, click on the Add button. The Block field in the tag database defines the starting address of the tag block followed by the block size.

For example : Tag M0214 is within a block (M0214 : 1) whose starting address is M0214 and block size is 1.

This block size is optimized automatically depending on the address of PLC Tag.
Default block size is either 1 or 16. This setting varies from PLC to PLC.
The attributes of existing tag can be changed by highlighting the tag, making the changes, and clicking the Change Tag button. An existing tag can be removed from tag list by clicking on Delete Tag button. Note that removal of tags is possible only if they are not used in any application.

Add - Use this button to add a tag. After clicking this button, the user has to define the following:
1. Node : Where the tag is located.
2. Register, coil or a bit within a register. Registers can be read only or read/write.
3. The address limits are shown and vary from PLC model to model.
4. Tag name : Each tag needs to have a unique name. The name can be up to 40 characters in length.
5. Byte(s) : If the selected tag is a register, the tag can be defined as a 1 byte (either high or low byte), a 2 byte, or a 4 byte tag.

Edit – Select the tag. Edit the information and then click on the Update button.

Delete - Select the tag and click on Delete button to delete the tag. Before deleting any tag, the user must delete any references to the tag in tasks. Otherwise it can not be deleted.

Default System Tags
Note: Please do not attempt to modify read only system tags in the ladder. This could affect the functionality of the product.

System Registers / Coils:

Register / Coil	Tag Name	Read / Write	Description
SW0003_14	COM1 Status	Read Only	0 = Communication Error; 1= Communicating with PLC
SW0003_15	COM2 Status	Read Only	0 = Communication Error; 1= Communicating with PLC
SW0010	RTC Day of Month	Read only	RTC day in integer format
SW0011	RTC Month	Read only	RTC month in integer format
SW0012	RTC Year	Read only	RTC year in integer format
SW0013	RTC Hour	Read only	RTC hour in integer format
SW0014	RTC Min	Read only	RTC minute in integer format
SW0015	RTC Sec	Read only	RTC sec in integer format
SW0016	RTC Day of Week	Read only	RTC day of week in integer format
SW0017	Scan time register	Read only	Valu is in multiple of 0.1 mSec. This includes execution time for reading inputs, executing tasks, executing ladder, update outputs, etc. (Refer flow chart)
SW0018	COM1 failed node reconnect time (Sec)	Read/write	Shows time in sec recover the communication with failed nodes for port1.the default value is 60Sec
SW0019	COM2 failed node reconnect time (Sec)	Read/write	Shows time in sec recover the communication with failed nodes for port1.the default value is 60Sec
SW022	COM3 failed node reconnect time (Sec)	Read/write	Shows time in sec recover the communication with failed nodes for port3.the default value is 60Sec
SW044	IO Interrupt 1 Ladder Execution Time	Read only	Value is multiple of 0.1
SW045	IO Interrupt 2 Ladder Execution Time	Read only	Value is multiple of 0.1
SW046	Ladder Scan Time	Read only	Value is multiple of 0.1 mSec
SW047	Timer interrupt ladder execution time	Read Only	Value is multiple of 0.1 mSec
SW64-SW65	Node Status Registers for COM1	Read only	Shows the status of the node, whether node is present or not. Total 2 word Register are mapped for 32 nodes.
SW80-SW81	Node Status Registers for	Read only	Shows the status of the node, whether node is COM2 present or not. Total 2 word Register are mapped for 32 nodes.
SW96-SW111	Node Status Registers for	Read only COM3	Shows the status of the node, whether node is present or not. Total 16 word Register are mapped for 256 nodes. (Not applicable for FL010 and FL011)

Register / Coil	Tag Name	Read / Write	Description
S0000	Carry Bit	Read/Write	Overflow indication in math operations of ladder and also used in rotate with carry instruction.
S0019	Invalid RTC date entry	Read only	0=valid date 1= Invalid date
S0021	COM1 failed node reconnect control	Read/write	If this bit is set communication with the failed nodes is detected after scan time SW0018 for port1.By default : ON
S0022	COM2 failed node reconnect control	Read/write	If this bit is set communication with the failed nodes is detected after scan time SW0019 for port2.By default : ON
S0023	COM3 failed node reconnect control	Read/write	If this bit is set communication with the failed nodes is detected after scan time SW0022 for port3.By default : ON
S0034	Ladder Instruction Error	Read/Write	Set if Division by zero operation is performed in Status the ladder instruction and for invalid conditions or operands in case of conversion instructions.

Configuration Words and coils

Register / Coil	Tag Name	Read / Write	Description
MW0000	PLC Operation Mode (Bit 0 to Bit 3)	Read/Write	Bit0-3: 0: Initialization 1: HALT Mode 2: RUN Mode 3: RUN-F Mode 4: HOLD Mode 6: ERROR Mode.
MW0001	Error Register 1	Read Only	Refer mapped coils M16 to M31
MW0002	Error Register 2	Read Only	Refer mapped coils M32 to M47
MW0003	RUN/STOP Switch Control (Retentive)	Read Only	1: HALT, 0: RUN. Only LSB is used. other bits (1 to 15) are not used.
MW0005	Digital Filter constant	Read/Write	Enabled when MW10 bit 16 is ON. (0 to 15 mS)
MW0010	Configuration Register for Special inputs	Read/Write	Refer Special input - output section
MW0011	Configuration Register for PWM output	Read/Write	Refer Special input - output section
MW0012	Preset values for high Speed Counter	Read/Write	Used to set the preset values for high speed counter
MW0013			
MW0014			
MW0015			
MW0016	Count Values for high Speed Counter	Read/Write	Preset count values of the high speed counters are stored
MW0017			
MW0018			
MW0019			
MW0020	High Speed counter control flags	Read/Write	Control flags for high speed counters
MW0021	Special output control flags	Read/Write	Refer Special input - output section
MW0022	Special Output Control Flags	Read/Write	Control flags for high speed counters
MW0023			
MW0024	Special output Frequency Setting	Read/Write	Refer Special input - output section
MW0025			
MW0030	System Timer Coils	Read Only	Refer mapped coils M00480 to M00487
MW0031	User Interrupt program Status Flags	Read Only	Bit 0 for timer ,Bit 1 for IO1, Bit 2 for IO2. Refer mapped coils M496,M497 & M498 when MW10 bit 16 is ON.
MW0033	Unit IP Address High Word	Read Only	Used for Ethernet Model
MW0034	Unit IP Address Low Word	Read Only	e.g. if IP adress is "1.2.3.4"
MW0035	Unit Subnet Mask Address High Word	Read Only	MW0033 = 0x0201 MW0034 = 0x0403
MW0036	Unit Subnet Mask Address Low Word	Read Only	Same format is used for other ethernet setting registers.
MW0037	Unit Default Gateway High Word	Read Only	
MW0038	Unit Default Gateway Low Word	Read Only	
M00016	CPU error	Read Only	ON at error state
M00017	I/O error	Read Only	ON at error state
M00018	Program error	Read Only	ON at error state. This group includes Laader Scan time.
M00021	Clock/calendar illegal value warning	Read Only	ON when clock/calendar data is illegal
M00022	Retentive data invalid warning	Read Only	ON when retentive data in RAM are invalid
M00027	Watchdog timer error	Read Only	ON at error state
M00029	I/O mismatch error	Read Only	ON at error state
M00031	I/O communication error	Read Only	ON at error state
M00033	Ladder Scan time error	Read Only	ON when the scan time exceeds 200ms (default)

M00480	System timer coil for 0.1 sec interval	Read Only	Toggle at 50 % duty cycle
M00481	System timer coil for 0.2 sec interval	Read Only	Toggle at 50 % duty cycle
M00482	System timer coil for 0.4 sec interval	Read Only	Toggle at 50 % duty cycle
M00483	System timer coil for 0.8 sec interval	Read Only	Toggle at 50 % duty cycle
M00484	System timer coil for 1 sec interval	Read Only	Toggle at 50 % duty cycle
M00485	System timer coil for 2 sec interval	Read Only	Toggle at 50 % duty cycle
M00486	System timer coil for 4 sec interval	Read Only	Toggle at 50 % duty cycle
M00487	System timer coil for 8 sec interval	Read Only	Toggle at 50 % duty cycle
M00496	Timer interrupt ladder execution status	Read Only	ON when Timer program is executing
M00497	IO1 interrupt execution status	Read Only	ON when IO1 program is executing
M00498	IO2 interrupt execution status	Read Only	ON when IO2 program is executing
M00512	ALWAYS ON	Read Only	This coil is always ON
M00513	ALWAYS OFF	Read Only	This coil is always OFF

4.3 Input (XW), Output (YW) and configuration (MW) Register allocation For expansion models

For Digital Expansion Models:
The Physical Inputs and Outputs in the Expansion modules are accessed using XW and YW registers respectively. The digital inputs in the Digital Expansion Models are updated in the (Input) XW registers.

The expansion model may have XW or YW registers depending on availability of the physical input/outputs for that model type. As given in Section 7.2 'Memory Allocation of XW, YW and MW', different expansion models have different number of XW, YW and MW memory assigned for them in the base model.
e.g. The digital expansion model FLD1600 has 1 XW register memory assigned for it.
There are no outputs so no YW memory. So the input condition of FLD1600 is read in Input Register XWxx00. Same inputs are shown in the input coils Xxx000 to Xxx015. Here xx denotes the slot number in which the expansion model is connected to FlexiLogics®.
Similarly, outputs register for FLD0016R model is YWxx00. For FLD0808R model it has one XW and one YW, but only 8 bits are used. Other bits are not used.

For Analog Expansion Models:
Analog Inputs and Outputs in the Analog Expansion models are accessed using XW and YW registers respectively. The type of input channel is configured from configuration registers MW.

FLA0800L:

Sr. No.	Description	Register	Type
1	Channel 1 Input Data	XWxx00	R
2	Channel 2 Input Data	XWxx01	R
3	Channel 3 Input Data	XWxx02	R
4	Channel 4 Input Data	XWxx03	R
5	Channel 5 Input Data	XWxx04	R
6	Channel 6 Input Data	XWxx05	R
7	Channel 7 Input Data	XWxx06	R
8	Channel 8 Input Data	XWxx07	R
9	Channel 1 Type Select	MWxx08	R/W
10	Channel 2 Type Select	MWxx12	R/W
11	Channel 3 Type Select	MWxx16	R/W
12	Channel 4 Type Select	MWxx20	R/W
13	Channel 5 Type Select	MWxx24	R/W
14	Channel 6 Type Select	MWxx28	R/W
15	Channel 7 Type Select	MWxx32	R/W
16	Channel 8 Type Select	MWxx36	R/W
17	Input Conversion Enable	MWxx40	R/W
18	Reserved	MWxx41	-
19	Reserved	MWxx42	-
20	Reserved	MWxx43	-
21	Reserved	MWxx44	-
22	Reserved	MWxx45	-

FLA0402U:

Sr. No.	Description	Register	Type
1	Input Channel 1 Data	XWxx00	R
2	Input Channel 2 Data	XWxx01	R
3	Input Channel 3 Data	XWxx02	R
4	Input Channel 4 Data	XWxx03	R
5	Output Channel 1 Data	YWxx00	R/W
6	Output Channel 2 Data	YWxx01	R/W
7	Input Channel 1 Type Select	MWxx06	R/W
8	Input Channel 2 Type Select	MWxx10	R/W
9	Input Channel 3 Type Select	MWxx14	R/W
10	Input Channel 4 Type Select	MWxx18	R/W
11	Output Channel 1 Type Select	MWxx22	R/W
12	Output Channel 2 Type Select	MWxx26	R/W
13	Input and Output Conversion Enable	MWxx30	R/W
14	Reserved	MWxx31	-
15	Reserved	MWxx32	-
16	Reserved	MWxx33	-
17	Reserved	MWxx34	-
18	Reserved	MWxx35	-

FLA0004:

Sr. No.	Description	Register	Type
1	Output Channel 1 Data	YWxx00	R/W
2	Output Channel 2 Data	YWxx01	R/W
3	Output Channel 3 Data	YWxx02	R/W
4	Output Channel 4 Data	YWxx03	R/W
5	Output Channel 1 Type Select	MWxx04	R/W
6	Output Channel 2 Type Select	MWxx08	R/W
7	Output Channel 3 Type Select	MWxx12	R/W
8	Output Channel 4 Type Select	MWxx16	R/W
9	Output Conversion Enable	MWxx20	R/W

Channel Type Selection Values Table:

Use the following values in the Input and output channel type select register to configure the corresponding channel to particular type.

e.g. If you want to configure the Input channel 3 of FLA0800L model as (0 – 10 V) type, then move value 19 in MWxx16 configuration register. Here xx digital denotes the slot number in which the FLA0800L model is connected to PLC. The Conversion Enable Flag should be one to start the conversion (A to D or D to A).

Input Channel Type	Value
Not Defined	0
mV(0 - 100 mV)	1
mV(0 - 50 mV)	3
mA(0 - 20mA)	5
mA(4 - 20mA)	7
Voltage (0 - 10V)	19
Voltage (1 - 5V)	20
RTD PT-100 (alpha1)	9
RTD PT-100 (alpha2)	10
RTD PT-1000	21
Thermocouple (B-Type)	11
Thermocouple (R-Type)	12
Thermocouple (S-Type)	13
Thermocouple (E-Type)	14
Thermocouple (J-Type)	15
Thermocouple (K-Type)	16
Thermocouple (N-Type)	17
Thermocouple (T-Type)	18

Output Channel Type	Value
Not Defined	0
mA(4 - 20mA)	1
Voltage (0 - 10V)	2

XW Register Table for High Speed Expansion models:

Normal digital input registers:

Expansion Slot	XW Type/Number
Slot1_InputReg	XW0100
Slot2_InputReg	XW0200
Slot3_InputReg	XW0300
Slot4_InputReg	XW0400
Slot5_InputReg	XW0500
Slot6_InputReg	XW0600
Slot7_InputReg	XW0700
Slot8_InputReg	XW0800

Digital Input coils:

XW Coil Name	Expansion Slot 1							
	X0	X1	X2	X3	X4	X5	X6	X7
Slot1_InputCoil	X01000	X01001	X01002	X01003	X01004	X01005	X01006	X01007

XW Coil Name	Expansion Slot 2							
	X0	X1	X2	X3	X4	X5	X6	X7
Slot2_InputCoil	X02000	X02001	X02002	X02003	X02004	X02005	X02006	X02007

XW Coil Name	Expansion Slot 3							
	X0	X1	X2	X3	X4	X5	X6	X7
Slot3_InputCoil	X03000	X03001	X03002	X03003	X03004	X03005	X03006	X03007

XW Coil Name	Expansion Slot 4							
	X0	X1	X2	X3	X4	X5	X6	X7
Slot4_InputCoil	X04000	X04001	X04002	X04003	X04004	X04005	X04006	X04007

XW Coil Name	Expansion Slot 5							
	X0	X1	X2	X3	X4	X5	X6	X7
Slot5_InputCoil	X05000	X05001	X05002	X05003	X05004	X05005	X05006	X05007

XW Coil Name	Expansion Slot 6							
	X0	X1	X2	X3	X4	X5	X6	X7
Slot6_InputCoil	X06000	X06001	X06002	X06003	X06004	X06005	X06006	X06007

XW Coil Name	Expansion Slot 7							
	X0	X1	X2	X3	X4	X5	X6	X7
Slot1_InputCoil	X07000	X07001	X07002	X07003	X07004	X07005	X07006	X07007

XW Coil Name	Expansion Slot 8							
	X0	X1	X2	X3	X4	X5	X6	X7
Slot1_InputCoil	X08000	X08001	X08002	X08003	X08004	X08005	X08006	X08007

YW Register Table for High Speed Expansion models:

Normal digital output registers:

Expansion Slot	XW Type/Number
Slot1_OutputReg	YW0100
Slot2_OutputReg	YW0200
Slot3_OutputReg	YW0300
Slot4_OutputReg	YW0400
Slot5_OutputReg	YW0500
Slot6_OutputReg	YW0600
Slot7_OutputReg	YW0700
Slot8_OutputReg	YW0800

Digital Output coils:

YW Coil Name	Expansion Slot 1							
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Slot1_OutputCoil	Y01000	Y01001	Y01002	Y01003	Y01004	Y01005	Y01006	Y01007

YW Coil Name	Expansion Slot 2							
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Slot2_OutputCoil	Y02000	Y02001	Y02002	Y02003	Y02004	Y02005	Y02006	Y02007

YW Coil Name	Expansion Slot 3							
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Slot3_OutputCoil	Y03000	Y03001	Y03002	Y03003	Y03004	Y03005	Y03006	Y03007

YW Coil Name	Expansion Slot 4							
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Slot4_OutputCoil	Y04000	Y04001	Y04002	Y04003	Y04004	Y04005	Y04006	Y04007

YW Coil Name	Expansion Slot 5							
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Slot5_OutputCoil	Y05000	Y05001	Y05002	Y05003	Y05004	Y05005	Y05006	Y05007

YW Coil Name	Expansion Slot 6							
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Slot6_OutputCoil	Y06000	Y06001	Y06002	Y06003	Y06004	Y06005	Y06006	Y06007

YW Coil Name	Expansion Slot 7							
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Slot1_OutputCoil	Y07000	Y07001	Y07002	Y07003	Y07004	Y07005	Y07006	Y07007

YW Coil Name	Expansion Slot 8							
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Slot1_OutputCoil	Y08000	Y08001	Y08002	Y08003	Y08004	Y08005	Y08006	Y08007

4.4 Tag name for FL005 expandable series when connect with FL high speed expansion

If user connects FL high speed expansion model in series with FL005 expandable series, tag name change as given below. This change is applicable to both IEC and native ladder programming environment.

Old Names	New Names
HSC Reset Bit (CH1)	R1
HSC Preset Reached (CH1)	PR1
HSC Enable Bit (CH2)	E2
HSC Reset Bit (CH2)	R2
HSC Preset Reached (CH2)	PR2
HSC Enable Bit (CH3)	E3
HSC Reset Bit (CH3)	R3
HSC Preset Reached (CH3)	PR3
HSC Enable Bit (CH4)	E4
HSC Reset Bit (CH4)	R4
HSC Preset Reached (CH4)	PR4
Pulse Enable Flag (CH1)	PE1
Pulse Enable Flag (CH2)	PE2
Direction Marker Flag	DirMrkr
ON duty setting error flag (CH1)	DtyEr1
ON duty setting error flag (CH2)	DtyEr2
Frequency Setting error flag	FreqEr
Acceleration Time Setting error flag	AcelEr
Deceleration Time Setting error flag	DecelEr
No of Total Pulses Setting error flag	TtlPulsesEr
End of Total Pulses Flag	PulseFinish
InputReg_00000	XW0
InputReg_00001	XW1
InputReg_00002	XW2
InputReg_00003	XW3
InputReg_00004	XW4
InputReg_00005	XW5
InputReg_00006	XW6
InputReg_00007	XW7
OutputReg _00000	YW0
OutputReg _00001	YW1
OutputReg _00002	YW2

Old Names	New Names
OutputReg _00003	YW3
OutputReg _00004	YW4
OutputReg _00005	YW5
OutputReg _00006	YW6
OutputReg _00007	YW7
HSC Configuration register (CH1)	H1
HSC Configuration register (CH2)	H2
HSC Configuration register (CH3)	H3
HSC Configuration register (CH4)	H4
PWM Config. Register (CH1)	PWM1
PWM Config. Register (CH2)	PWM2
Acceleration time	AcT
Deceleration Time	DcT
High Speed Counter (HSC) Register (CH1)	C1
HSC Preset Register (CH1)	P1
High Speed Counter (HSC) Register (CH2)	C2
HSC Preset Register (CH2)	P2
High Speed Counter (HSC) Register (CH3)	C3
HSC Preset Register (CH3)	P3
High Speed Counter (HSC) Register (CH4)	C4
HSC Preset Register (CH4)	P4
Frequency Setting register / Min. Freq. Setting register	Freq
ON duty setting register / Max. Freq. setting register (CH1)	Dty1
ON duty setting register (CH2)	Dty2
Total Pulses	TtlPulses
Elapsed Value	ElpsdVal

SPECIAL INPUT AND OUTPUT

In this chapter. . . .

♦   Special I/O Function Overview

♦   Single Phase Counter

♦   Single Phase speed-counter

♦   Quadrature bi-pulse counter

♦   Interrupt input function

♦   Pulse Output Function

♦   PWM Output Function

5.1   Special I/O Function overview

The FlexiLogics® PLCs support the special I/O functions as listed below:

Function name		Function summary	Remarks
Variable input filter constant		Input filter constant (ON/OFF delay time) can be set by user program. The setting range is 0 to 15 ms (1 ms units). Default value is 0 ms. This function is applied for X000 to X007 (8 points as a block).	MW10 setting is necessary to use this function.
High Speed Counter	Single phase up-counter	Counts the number of pulses of single phase pulse train. For Base model: 2 channels of pulse input are available. The countable pulse rate is up to 50 kHz for each channel. Channel 1 ..... X000 count input, X002 reset input Channel 2 ..... X001 count input, X003 reset input For High speed expansion models: 4 channels of pulse input are available. The countable pulse rate is up to 25 KHz for each channel. Channel 1 ..... X000 count input, X001 reset input Channel 2 ..... X005 count input, X006 reset input Channel 3 ..... X002 count input, X003 reset input Channel 4 ..... X007 count input, X004 reset input	Only one among these 4 functions can be selected.
	Single phase speedcounter	Counts the number of pulses in a specified sampling time. This is only applicable to FL base model. The sampling time setting is 10 to 1000 ms (10 ms units). 2 channels of pulse input are available. The countable pulse rate is up to 50 kHz for each channel. Channel 1 ..... X000 count input Channel 2 ..... X001 count input	
	Quadrature bi-pulse counter	Counts the 2-phase pulses whose phases are shifted 90° each other. Counts up when phase A precedes, and counts down when phase B precedes. The countable pulse rate is up to 5 kHz. For base model: For high speed expansions: Phase A ..... X000 Pair -1 Pair - 2 Phase B ..... X001 Phase A- X000 Phase A- X002 Reset .... X002 Phase B- X005 Phase B- X007	
Interrupt input function		Immediately activates the corresponding I/O interrupt program when the interrupt input is changed from OFF to ON (or ON to OFF). 2 points of interrupt input are available. For base model: X000 ..... Interrupt 1 (I/O interrupt program #1) X001 ..... Interrupt 2 (I/O interrupt program #2)	

Pulse output function	Variable frequency pulse train can be output. The For base model: The available pulse rate is 50Hz to 5 KHz (1Hz units) Y0 ..... CW or Pulse (PLS) Y1 ..... CCW or Direction (DIR) For high speed expansions: The vailable pulse rate is 1Hz to 10KHz. Y2 ..... CW or Pulse (PLS) Y4 .... CCw or Direction (DIR)	Either one between these 2 functions can be used. For base model: MW11 is used to select the function.
PWM output function	Variable duty cycle pulse train can be output. The available ON duty setting is 0 to 100 % (1 % units). For base model: Y0 ..... PWM output For High speed models: Y2 and Y4 ..... PWM output	

Note:
If the input wiring runs through an area subject to high electro-magnetic interference, please use the Digital Filter Instruction on the field inputs.

5.2   High Speed Counter Design
High Speed Counter Design for Base Model: FL010
Configuration Registers for Special Function Inputs and PWM outputs:

Register Description	Register Number
Configuration Register for Special inputs	MW10
Configuration Register for PWM output	MW11
Single Phase Counter Set Value Channel 1 Channel 2	 MW12, MW13 MW14, MW15
Count Value Channel 1 Channel 2	 MW16, MW17 MW18, MW19
Soft Gate (Device) Channel 1 Channel 2 Interrupt Enable (Device) Channel 1 Channel 2 Count Preset (Device) Channel 1 Channel 2	 M 320 M 328 M 322 M330 M323 M331
Single Phase Speed Counter Sampling Time Channel 1 Channel 2 Hold Value Channel 1 Channel 2 Soft Gate (Device) Channel 1 Channel 2	 MW12 MW14 MW16, MW17 MW18, MW19 M 320 M 328
Quadrature Bi Pulse Comparision Value1 Comparision Value2 Count Value Soft Gate (Device) Interrupt Enable1 (Device) Count Preset 1 (Device) Interrupt Enable 2 (Device) Count Preset 2 (Device)	 MW12, MW13 MW14, MW15 MW16, MW17 M320 M322 M324 M323 M325
Pulse Output Function Pulse Enable Flag (Device) Frequency Setting Register Frequency Setting Error Flag (Device)	 M336 MW22, MW23 M191

PWM Output Function	
Pulse Enable Flag (Device)	M336
Frequency Setting Register	MW22, MW23
ON duty setting register	MW24, MW25
pulse width error flag	M189
On duty setting error flag	M190
Frequency Setting Error Flag (Device)	M191

The Mode selection is done through two registers as below.

Configuration Register 10 (High Speed Input): (MW0010).

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
0	0	0	0												

Reserved

0: Variable input filter disable
1: Variable input filter enable

000: Normal   000: Normal
001: CH2 INT   001: CH1 INT
010: CH2 HSC   010: CH1 HSC
011: Quadrature   011: Quadrature
100: CH2 HSC   100: CH1 HSC
        with rate   with rate

0: INT1 Rising
1: INT1 Falling

0: INT2 Rising
1: INT2 Falling

Channel1 HSC (Adding Counter)
0: Single Phase Up Counter
1: Single Phase Down Counter

Channel2 HSC (Adding Counter)
0: Single Phase Up Counter
1: Single Phase Down Counter

Quadrature
00: 1X mode
01: 2X mode
10: 4X Mode

Configuration Register 11 (Pulse / PWM Output): MW0011

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
							0					F			

Bit F < Frequency setting error >
0: Normal
1: Error

Bit E < PWM ON duty setting error >
0: Normal
1: Error

P-OUT / PWM operation error flag
(These are not user setting items)
Bit D <PWM pulse width error>
0: Normal   1: Error

Bit 0
< P-OUT and PWM master flag >
0: No use
1: Use

Bit 1 < P-OUT / PWM selection >
0: PWM
1: P-OUT

Bit 2 < PLS mode >
0: CW/CCW
1: Pulse/Direction (PLS/DIR)

1 - Fixed pulse Mode
(Bit1 and 2 ignored)

Not used

0 - 50% Duty cycle
1 - Not care

Bit C < Acceleration Time Range error >
0: Normal   1: Error

Bit B < Deceleration Time Range error >
0: Normal   1: Error

Bit A < Pulse Counts Total Range error >
0: Normal   1: Error

Bit 9 < End of Total Pulses Flag >
0: Total Pulses not finished
1: End of Total Pulses

High speed output control flag Register: MW0021

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	D	E

Unused

Pulse Enable Flag (M00336 coil)

Direction Marker Flag (M00337 coil)
0   : DIR off
1   : DIR on
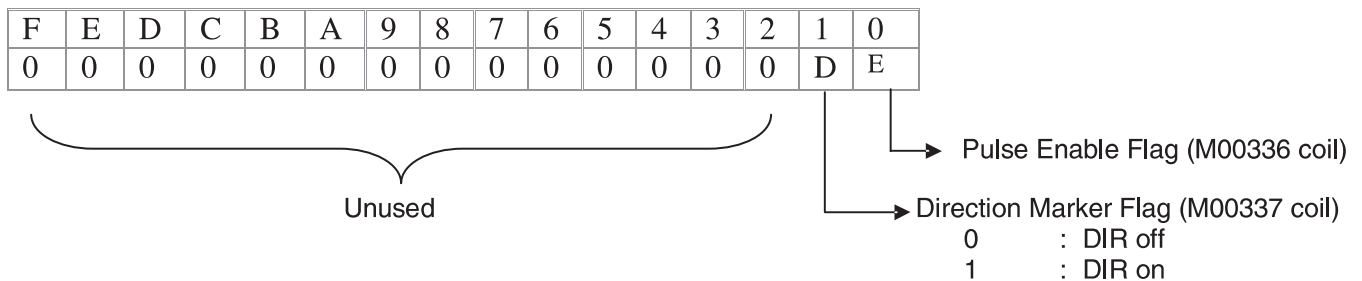
5.2.1 High Speed Counter Design for high speed expansion model

Configuration Registers for Special Function Inputs and PWM outputs:

MW register table for expansion I/O module:
High speed Digital inputs:
Number of inputs: 4
Input channels: X0, X5, X2, X7

MW Type	Expansion Slot 1			
	CH1 (X0)	CH2 (X5)	CH3 (X2)	CH4 (X7)
HSC Configuration register	MW0110	MW0114	MW0118	MW0122
High Speed Counter (HSC) Register	XW0104 XW0105	XW0106 XW0107	XW0108 XW0109	XW0110 XW0111
HSC Preset Register	MW0111 MW0112	MW0115 MW0116	MW0119 MW0120	MW0123 MW0124
HSC Enable Bit	MW0113_0 (M01208)	MW0117_0 (M01272)	MW0121_0 (M01336)	MW0125_0 (M01400)
HSC Reset Bit	MW0113_1 (M01209)	MW0117_1 (M01273)	MW0121_1 (M01337)	MW0125_1 (M01401)
HSC Preset Reached	XW0103_0 (X01048)	XW0103_1 (X01049)	XW0103_2 (X01050)	XW0103_3 (X01051)

MW Type	Expansion Slot 2			
	CH1	CH2	CH3	CH4
HSC Configuration register	MW0210	MW0214	MW0218	MW0222
High Speed Counter (HSC) Register	XW0204 XW0205	XW0206 XW0207	XW0208 XW0209	XW0210 XW0211
HSC Preset Register	MW0211 MW0212	MW0215 MW0216	MW0219 MW0220	MW0223 MW0224
HSC Enable Bit	MW0213_0 (M02208)	MW0217_0 (M02272)	MW0221_0 (M02336)	MW0225_0 (M02400)
HSC Reset Bit	MW0213_1 (M02209)	MW0217_1 (M02273)	MW0221_1 (M02337)	MW0225_1 (M02401)
HSC Preset Reached	XW0203_0 (X02048)	XW0203_1 (X02049)	XW0203_2 (X02050)	XW0203_3 (X02051)
MW Type	Expansion Slot 3			
	CH1	CH2	CH3	CH4
HSC Configuration register	MW0310	MW0314	MW0318	MW0322
High Speed Counter (HSC) Register	XW0304 XW0305	XW0306 XW0307	XW0308 XW0309	XW0310 XW0311
HSC Preset Register	MW0311 MW0312	MW0315 MW0316	MW0319 MW0320	MW0323 MW0324
HSC Enable Bit	MW0313_0 (M03208)	MW0317_0 (M03272)	MW0321_0 (M03336)	MW0325_0 (M03400)
HSC Reset Bit	MW0313_1 (M03209)	MW0317_1 (M03273)	MW0321_1 (M03337)	MW0325_1 (M03401)
HSC Preset Reached	XW0303_0 (X03048)	XW0303_1 (X03049)	XW0303_2 (X03050)	XW0303_3 (X03051)

MW Type	Expansion Slot 4			
	CH1	CH2	CH3	CH4
HSC Configuration register	MW0410	MW0414	MW0418	MW0422
High Speed Counter (HSC) Register	XW0404 XW0405	XW0406 XW0407	XW0408 XW0409	XW0410 XW0411
HSC Preset Register	MW0411 MW0412	MW0415 MW0416	MW0419 MW0420	MW0423 MW0424
HSC Enable Bit	MW0413_0 (M04208)	MW0417_0 (M04272)	MW0421_0 (M04336)	MW0425_0 (M04400)
HSC Reset Bit	MW0413_1 (M04209)	MW0417_1 (M04273)	MW0421_1 (M04337)	MW0425_1 (M04401)
HSC Preset Reached	XW0403_0 (X04048)	XW0403_1 (X04049)	XW0403_2 (X04050)	XW0403_3 (X04051)

MW Type	Expansion Slot 5			
	CH1	CH2	CH3	CH4
HSC Configuration register	MW0510	MW0514	MW0518	MW0522
High Speed Counter (HSC) Register	XW0504 XW0505	XW0506 XW0507	XW0508 XW0509	XW0510 XW0511
HSC Preset Register	MW0511 MW0512	MW0515 MW0516	MW0519 MW0520	MW0523 MW0524
HSC Enable Bit	MW0513_0 (M05208)	MW0517_0 (M05272)	MW0521_0 (M05336)	MW0525_0 (M05400)
HSC Reset Bit	MW0513_1 (M05209)	MW0517_1 (M05273)	MW0521_1 (M05337)	MW0525_1 (M05401)
HSC Preset Reached	XW0503_0 (X05048)	XW0503_1 (X05049)	XW0503_2 (X05050)	XW0503_3 (X05051)

MW Type	Expansion Slot 6			
	CH1	CH2	CH3	CH4
HSC Configuration register	MW0610	MW0614	MW0618	MW0622
High Speed Counter (HSC) Register	XW0604 XW0605	XW0606 XW0607	XW0608 XW0609	XW0610 XW0611
HSC Preset Register	MW0611 MW0612	MW0615 MW0616	MW0619 MW0620	MW0623 MW0624
HSC Enable Bit	MW0613_0 (M06208)	MW0617_0 (M06272)	MW0621_0 (M06336)	MW0625_0 (M06400)
HSC Reset Bit	MW0613_1 (M06209)	MW0617_1 (M06273)	MW0621_1 (M06337)	MW0625_1 (M06401)
HSC Preset Reached	XW0603_0 (X06048)	XW0603_1 (X06049)	XW0603_2 (X06050)	XW0603_3 (X06051)

MW Type	Expansion Slot 7			
	CH1	CH2	CH3	CH4
HSC Configuration register	MW0710	MW0714	MW0718	MW0722
High Speed Counter (HSC) Register	XW0704 XW0705	XW0706 XW0707	XW0708 XW0709	XW0710 XW0711
HSC Preset Register	MW0711 MW0712	MW0715 MW0716	MW0719 MW0720	MW0723 MW0724
HSC Enable Bit	MW0713_0 (M07208)	MW0717_0 (M07272)	MW0721_0 (M07336)	MW0725_0 (M07400)
HSC Reset Bit	MW0713_1 (M07209)	MW0717_1 (M07273)	MW0721_1 (M07337)	MW0725_1 (M07401)
HSC Preset Reached	XW0703_0 (X07048)	XW0703_1 (X07049)	XW0703_2 (X07050)	XW0703_3 (X07051)

MW Type	Expansion Slot 8			
	CH1	CH2	CH3	CH4
HSC Configuration register	MW0810	MW0814	MW0818	MW0822
High Speed Counter (HSC) Register	XW0804 XW0805	XW0806 XW0807	XW0808 XW0809	XW0810 XW0811
HSC Preset Register	MW0811 MW0812	MW0815 MW0816	MW0819 MW0820	MW0823 MW0824
HSC Enable Bit	MW0813_0 (M08208)	MW0817_0 (M08272)	MW0821_0 (M08336)	MW0825_0 (M08400)
HSC Reset Bit	MW0813_1 (M08209)	MW0817_1 (M08273)	MW0821_1 (M08337)	MW0825_1 (M08401)
HSC Preset Reached	XW0803_0 (X08048)	XW0803_1 (X08049)	XW0803_2 (X08050)	XW0803_3 (X08051)

Configuration registers details:

The Mode selection is done through two registers as below:

Configuration register (High speed input) : MWssrr

ss: Slot number

rr: Register number

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	FC	Q	Q	R	R	E	C	C	C

Not Used

000: Normal
010: Ch HSC
011: Quadrature

0: Falling
1: Rising

HSC
00: Single Phase Up counter

Applicable if Quadrature mode
00: 1x Mode
01: 2x Mode
10: 4x Mode

Forced Output Configuration
0: Forced Output ON for Preset1
1: Forced Output will be ON
   when Enable and OFF when
   Preset1 is reached

0 0 : reset counter if, SW Reset bit or physical I/P
        reset bit goes from 0 to 1
0 1 : reset counter if the sw reset bit goes from 0 to 1
1 0 : reset counter if physical input reset bit goes from
        0 to 1
1 1 : future use
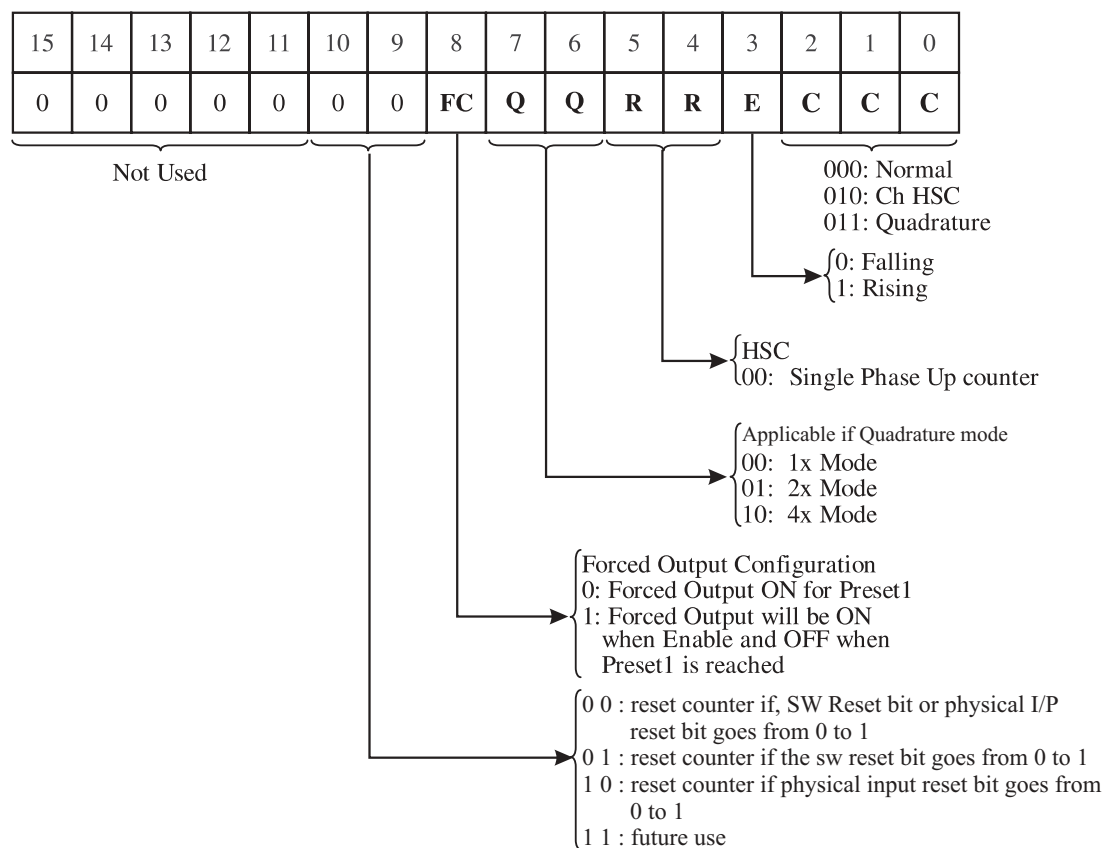
Configuration register (Pulse/PWM Output): **MWssrr**
ss: Slot number
rr: Register number

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
							0	0	0	0	0	F			

P-OUT /PW operation error flag
(These are not user setting items)

Bit E < PWM ON duty setting error
0: Normal   1: Error

Bit F < Frequency setting error >
0: Normal   1: Error

Bit C < Acceleration Time Range error >
0: Normal   1: Error

Bit B < Deceleration Time Range error >
0: Normal   1: Error

Bit A < Pulse Counts Total Range error >
0: Normal   1: Error

Bit 9 < End of Total Pulses Flag >
0: Total Pulses not finished
1: End of Total Pulses

Bit 0
< P-OUT and PWM master flag >
0: No use
1: Use

Bit 1 < P-OUT / PWM selection >
0: PWM
1: P-OUT

Bit 2 < PLS mode >
0: CW/CCW
1: Pulse/Direction (PLS/DIR)

1 – Fixed pulse Mode
(Bit1 and 2 ignored)

5.2.2 Single Phase Counter

[MW0010 Mode Select Bits = 010]

When the count input is changed from OFF to ON, the count value is increased by 1. When the count value reaches the set value, the count value is reset to 0, and I/O interrupt program is activated (if the interrupt enable flag is ON). The count value is reset to 0 when the reset input comes ON. This counter operation is enabled while the soft-gate is ON. The count value is reset to 0 when the soft-gate is changed from ON to OFF. The set value is set internally at the timing of the soft-gate changing from OFF to ON. When the soft-gate is OFF, count value can be changed by writing the data into the set value register and setting the count preset flag to ON. The count value range is H0000 0000 to HFFFF FFFF (32-bit data).

Hardware Condition for base model (FL010):
Count input (IP 1 and IP 2) (X000 and X001)
ON/OFF pulse width: 10 micro or more (max. 50 kHz)
Reset input (X002 and X003)
ON/OFF duration: 2 ms or more

Related Registers for FL010:

Function	Register/device		Remarks
	Channel 1	**Channel 2**	
Count input	IP 1 (X000)	IP 2 (X001)	
Reset input	IP 3 (X002)	IP 4 (X003)	
Set value	MW12 SW13	MW14 MW15	Data range: H0000 0000 to HFFFF FFFF
Count value	MW16 MW17	MW18 MW19	
Soft-gate	M320	M328	Operation is enabled when ON
Interrupt enable	M322	M330	Interrupt is enabled when ON
Count preset	M323	M331	Used to preset the counter value

Note1:
When both the channels are configured in high speed mode, IP1 to IP4 cannot be used as normal input devices. However, if either one channel is configured in high speed mode, the inputs for other channel can be used as normal input devices.

Note2:
Two words are used for storing the double word (32bit) count/set values. Lower word will contain Lower 16bit value and Higher word will contain higher 16 bit. This register storage scheme is applicable for all the modes.
value. Eg. Count value : MW16,MW17
So if count value is (Hex) 87654321
MW16 = 4321 (Hex)
MW17= 8765 (Hex)

Note3:
Input 3 and input 4 are used as reset inputs for count inputs 1 and 2. So do not use input 3 and 4 as normal inputs when PLC is configured in this mode.

Interrupt assignment
Channel 1 --- I/O interrupt program #1
Channel 2 --- I/O interrupt program #2
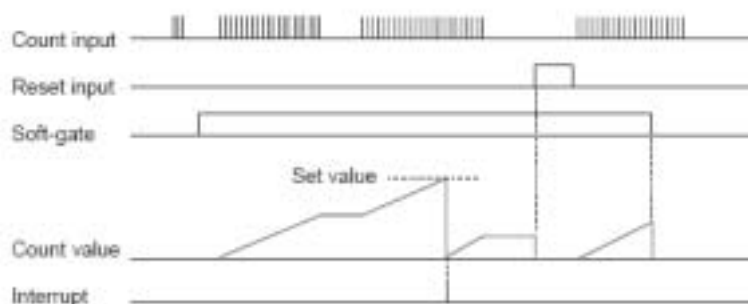
Configuration details for FL005 models:

Related Registers

Function	Register / device		Remarks
	Channel 1	channel 2	
PWM Pulse	Y6	Y7	PWM O/P Channel
PWM Config Reg	MW059	MW075	Put value 1
Frequency setting Register	MW060 MW061	MW076 MW077	Data range: 1 to 100000
ON duty setting register	MW062 MW063	MW078 MW079	Data range: 0 to 100
Pulse enable flag	M0816	M0832	Output is enabled when ON
ON duty setting error flag	M0818	M0834	ON at error (reset OFF automatically)
Frequency setting error flag	M0819	M0835	ON at error (reset OFF automatically)

Hardware Condition for high speed expansion models (FLD-HS-0808N):

ON/OFF pulse width: 10msec or more (max. 25 kHz)
ON/OFF duration: 2 ms or more

Related Registers

Function	Register/device				Remarks
	Channel 1	Channel 2	Channel 3	Channel 4	
Configuration Register	MW0110	MW0114	MW0118	MW0122	Config value = 2
Count input	X0	X5	X2	X7	Count Input channels
Reset input	X1	X6	X3	X4	Physical reset input channels
Count Value	XW0104 XW0105	XW0106 XW0107	XW0108 XW0109	XW0110 XW0111	Data range: H0000 0000 to HFFFF FFFF
Preset	MW0111 MW0112	MW0115 MW0116	MW0119 MW0120	MW0123 MW0124	Set count value: Max. 4294967295
Soft gate	MW0113_0	MW0117_0	MW0121_0	MW0125_0	Operation is enabled when bit ON
Reset Bit	MW0113_1	MW0117_1	MW0121_1	MW0125_1	Used to reset the counter value

Above shown register table is applicable for slot-1. For slot 2 and remaining slots, configuration value for this mode is similar. For the tag registers refer section 5.2.2.

Note1: When all channels are used, channel 1 to channel 8 cannot be used as normal input devices. However, if either one channel is used, these inputs for unused channel can be used as normal input devices.

Note2: Two words are used for storing the double word (32bit) count/set values. Lower word will contain Lower 16bit value and Higher word will contain higher 16 bit
This register storage scheme is applicable for all the modes.
value. Eg.   Count value   :   XW0104, XW0105
So if count value is (Hex) 87654321
XW0104 = 4321 (Hex)
XW0105= 8765 (Hex)

Note3: X1, X6, X3 and X4 are used as reset inputs for count inputs X0, X5, X2 and X7. So do not use X1, X6, X3 and X4 as normal inputs when expansion module is configured in this mode.

5.2.3　Single Phase High Speed Counter [with rate]

For Base Model: [MW0010 Mode Select Bits = 100]

This function counts the number of changes of the count input from OFF to ON during the every specified sampling time. The count value in a sampling time is stored in the hold value register. This counter operation is enabled while the soft-gate is ON. When the soft-gate is OFF, the hold value is cleared to 0. The setting range of the sampling time is 1 to 1000 ms (1 ms units). The count value range is H0000 0000 to HFFFF FFFF (32-bit).

The function selection is done through configuration register1.

Function	Register/device		Remarks
	Channel 1	**Channel 2**	
Count input	IP 1 (X000)	IP 2 (X001)	
Sampling time	MW12	MW14	Data range: 1 to 1000
Hold value	MW16	MW18	Data range: H0000 0000 to HFFFF FFFF
Soft-gate	M320	M328	Operation is enabled when ON

Note 1)　The setting data range of the sampling time is 1 to 1000. (1 ms multiplier)
Note 2)　When both the channels are configured in high speed mode, IP1 & IP2 cannot be used as normal input devices. However, if either one channel is configured in high speed mode, the input of other channel can be used as normal input device.

Hardware condition:
Count input (X000 and X001)
ON/OFF pulse width: 10 micro or more (max. 50 kHz)

Interrupt assignment:
No interrupt function
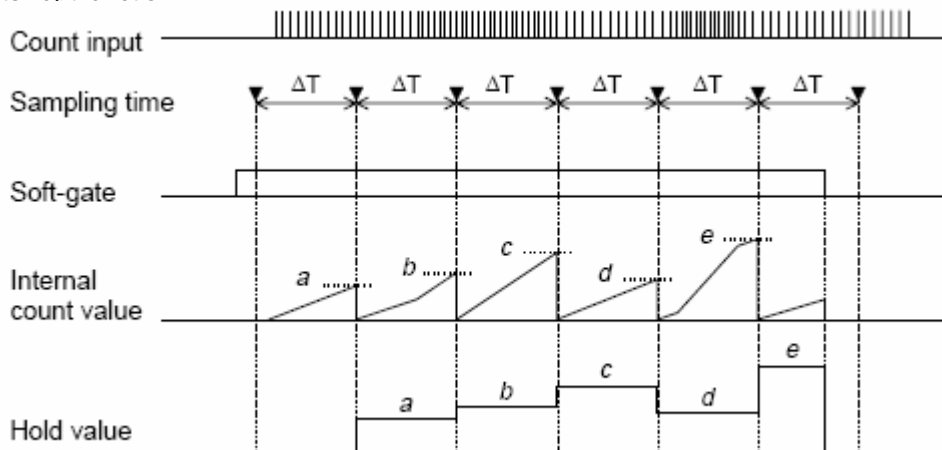
5.2.4   Quadrature bi-pulse counter

This function counts up or down the quadrature bi-pulse (2-phase pulses whose phases are shifted 90° each other). Counts up when phase A precedes, and counts down when phase B precedes.

1-edge count:
The current value increments or decrements at the rising or falling edge of the phase B input after the phase A input has turned on.
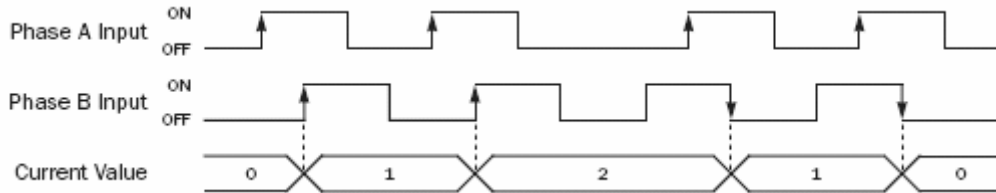
2-edge Count:
The current value increments or decrements at the rising or falling edge of the phase B input after the phase A input has turned on or off.
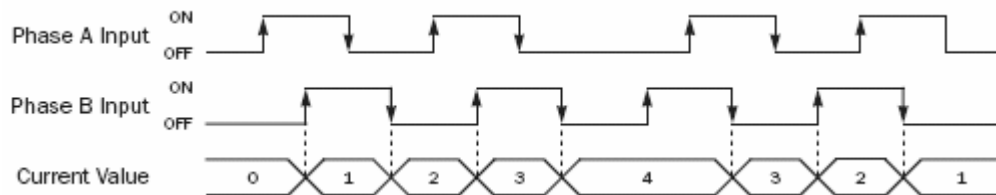
4-edge Count:
The current value increments or decrements at the rising or falling edges of the phase A and B inputs.
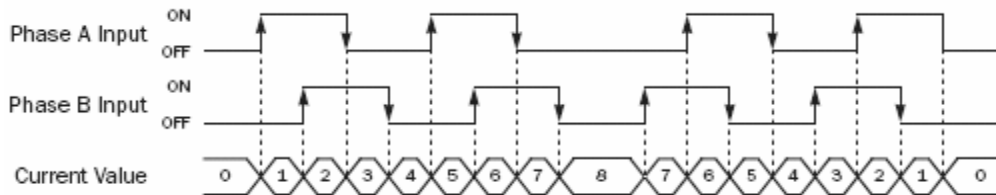
Both rising and falling edges of each phase are counted.
Consequently, 4 times count value against the pulse frequency is obtained.

When the count value reaches the comparison value 1 (or 2), the I/O interrupt program#1 (or #2) is activated (if the interrupt enable flag for each is ON). This counter operation is enabled while the soft-gate is ON. The count value is reset to 0 when the soft-gate is changed from ON to OFF. The count value is also reset to 0 when the reset input comes ON. When the soft-gate is OFF, the count value can be changed by writing the data into the comparison value 1 (or 2) register and setting the count preset flag 1 (or 2) to ON. The comparison value 1 and 2 can be changed even when the soft-gate is ON. The count value range is 0 to 4294967295 (32-bit data).

For FL010 base model:

The function selection is done through configuration register1

Function	Register/device	Remarks
Phase A	IP 1 (X000)	
Phase B	IP 2 (X001)	
Reset input	IP 3 (X002)	
Comparison value 1	MW12 MW13	Data range: 0 to 4294967295
Comparison value 2	MW14 MW15	
Count value	MW16 MW17	
Soft-gate	M320	Operation is enabled when ON
Interrupt enable 1	M322	Interrupt 1 is enabled when ON
Count preset 1	M324	Used to preset the count value
Interrupt enable 2	M323	Interrupt 2 is enabled when ON
Count preset 2	M325	Used to preset the count value

Hardware condition:
Phase A and phase B (IP 1 and IP 2)
1X Mode
ON/OFF pulse width: 100 microsec. or more (max. 5 kHz)
2X Mode
ON/OFF pulse width: 100 microsec. or more (max. 5 kHz)
4X Mode
ON/OFF pulse width: 100 microsec. or more (max. 5 kHz)

Reset input (IP3)
ON/OFF duration: 2 ms or more

Interrupt assignment:
Comparison value 1 — I/O interrupt program #1
Comparison value 2 — I/O interrupt program #2
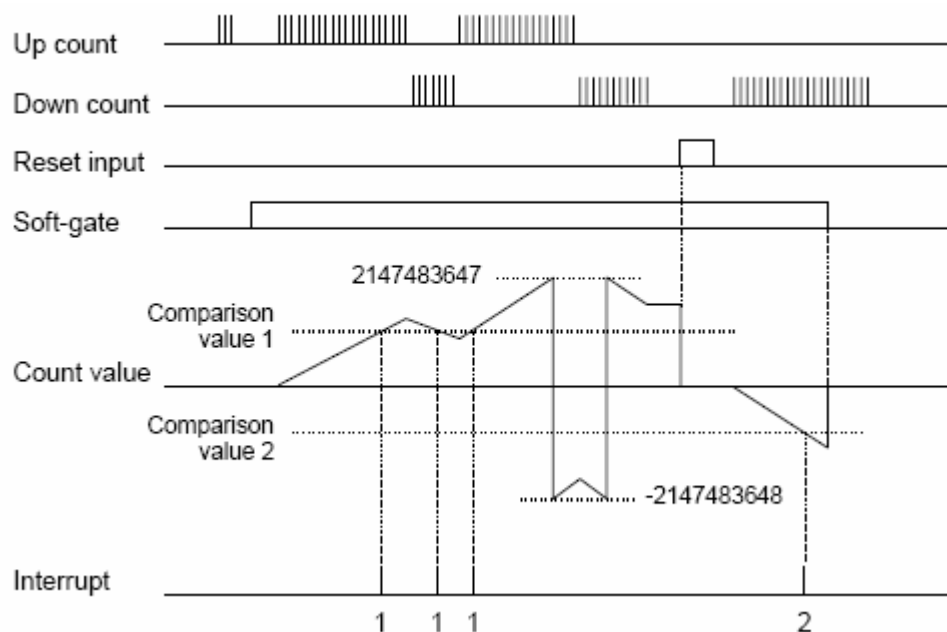
For High Speed Expansion models [FLD-HS-0808N]:

Hardware condition:
Phase A and phase B (Pair 1**:** X0 & X5, Pair 2**:** X2 & X7)
1X Mode:
ON/OFF pulse width: 100 microsec or more (max. 25 kHz)

2X Mode:
ON/OFF pulse width: 100 microsec or more (max. 25 kHz)

4X Mode:
ON/OFF pulse width: 100 microsec or more (max. 25 kHz)

Reset input (X1 & X3)
ON/OFF duration: 2 ms or more

Related Registers

Function	Register/device		Remarks
	Pair 1 X0 and X5	Pair 2 X2 and X7	
Phase A	X0	X2	Two input pulses phase shifted by 90° each other
Phase B	X5	X7	
Reset input	X1	X3	Physical reset input channels
Config Register	MW0110	MW0118	Configuration value* for 1X mode = 3; for 2X mode = 67 for 4X mode = 131
Count value	XW0104 XW0105	XW0108 XW0109	
Soft-gate	M01208	M01336	Operation is enabled when ON
Soft Reset	M01209	M01337	Used to reset count
Count preset	MW0111 MW0112	MW0119 MW0120	Used to preset the count value

Note*: User can evalute configuration value as per requirement by referring "Configuration registers details" (Section 5.2.2, Pg 98)

Above shown register table is applicable for slot-1. For slot 2 and remaining slots, configuration value for different quadrature modes are similar and refer tag registers from section 5.2.2.

Note:
In quadrature mode, when both the pairs are used simultaniously, then maximum input frequency will be 5 KHz. Also for the frequency to be used above 5KHz (Max. 20KHz) for single pair, then use only pair2 (X2, X7).

5.2.5 Interrupt Input Function

When the signal state of the interrupt input is changed from OFF to ON (or ON to OFF), the corresponding I/O interrupt program is activated immediately. Up to 2 interrupt inputs can be used. The interrupt generation condition can be selected either rising edge (OFF to ON) or falling edge (ON to OFF) for each input. The I/O interrupt program #1 is corresponding to the interrupt input 1, and the I/O interrupt program #2 is corresponding to the interrupt input 2.

For base models:
Hardware condition
Interrupt input (IP 1 and IP 2)
ON/OFF pulse width: 100 microsec. or more

Interrupt assignment
Interrupt input 1 — I/O interrupt program #1
Interrupt input 2 — I/O interrupt program #2
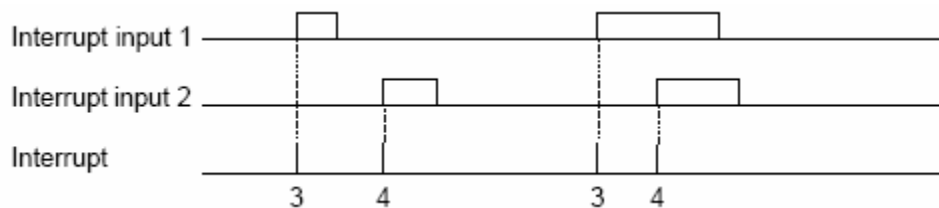
5.2.6 Pulse Output Function

There are two transistor outputs Y0 and Y1 and can be used for pulse output.

When CW/CCW mode is selected if frequency is positive, match output 1 will be selected so that pulses will be out on Y0 and if frequency is negative match output 2 will be selected so that pulses will be out on Y1.
In PULSE/DIR mode the pulses will be out on Y0 i.e. Match output1. If the frequency is negative then direction pin can be set to high through Match output 2.
For base models: FL010:

Function		Register/device	Remarks
CW/ CCW	PLS/DIR		
CW Pulse	PLS	Y0	
CCW Pulse	DIR	Y1	
Pulse enable flag		M336	Output is enabled when ON
Frequency setting register		MW22 MW23	Data range: -5000 to –50, 50 to 5000
			For FL011 and FL011-S3:
			Data range: -10000 to -1, 1 to 10000
Frequency setting error flag		M191	ON at error (Reset OFF automatically)
Direction Marker CH1		M337	Direction Marker Flag (M337 Coil) 0: DIR OFF or +ve frequency data range 1: DIR ON or -ve frequency data range

Pulse Output Function for high speed expansion models [FLD-HS-0808N]

There are two transistor outputs Y2 and Y4 and can be used for pulse output.
a. CW/CCW mode: [MWssrr Mode Select Bits =0x03]
b. PULSE/DIR mode: [MWssrr Mode Select Bits =0x07]

When CW/CCW mode is selected if frequency data range is positive, match output 6(MR6) will be selected so that pulses will be out on Y2 and if frequency data range is negative match output 1(MR1) will be selected so that pulses will be out on Y4.

In PULSE/DIR mode the pulses will be out on Y2 i.e. Match output6 (MR6). If the frequency data range is negative then direction pin can be set to high through Match output 1(MR1).i.e. direction status can be out on Y4.

For Slot - 1

Function	Register/device	Remarks
CW Pulse	Y2	
CCW Pulse	Y4	
Config Registers	MW0100	Config value = 3
Pulse enable flag	M01016	Output is enabled when ON
Frequency setting register	MW0102 MW0103	For CW: Data range: 1 to 10000 For CCW: Data range: -10000 to –1
Frequency setting error flag	X01063	ON at error (Reset OFF automatically)

Function	Register/device	Remarks
Pulse / DIR		
Pulse	Y2	
DIR	Y4	
Config Registers	MW0100	Config value = 7
Pulse enable flag	M01016	Output is enabled when ON
Frequency setting register	MW0102 MW0103	For Pulse: Data range: 1 to 10000 (DIR = Low) Data range: -10000 to –1 (DIR = High)
Frequency setting error flag	X01063	ON at error (Reset OFF automatically)

For Slot - 2

Function	Register/device	Remarks
CW Pulse	Y2	
CCW Pulse	Y4	
Config Registers	MW0200	Config value = 3
Pulse enable flag	M02016	Output is enabled when ON
Frequency setting register	MW0202 MW0203	For CW: Data range: 1 to 10000 For CCW: Data range: -10000 to –1
Frequency setting error flag	X02063	ON at error (Reset OFF automatically)

Function	Register/device	Remarks
Pulse / DIR		
Pulse	Y2	
DIR	Y4	
Config Registers	MW0200	Config value = 7
Pulse enable flag	M02016	Output is enabled when ON
Frequency setting register	MW0202 MW0203	For Pulse: Data range: 1 to 10000 (DIR = Low) Data range: -10000 to –1 (DIR = High)
Frequency setting error flag	X02063	ON at error (Reset OFF automatically)

For Slot - 3

Function	Register/device	Remarks
CW Pulse	Y2	
CCW Pulse	Y4	
Config Registers	MW0300	Config value = 3
Pulse enable flag	M03016	Output is enabled when ON
Frequency setting register	MW0302 MW0303	For CW: Data range: 1 to 10000
		For CCW: Data range: -10000 to –1
Frequency setting error flag	X03063	ON at error (Reset OFF automatically)

Function	Register/device	Remarks
Pulse / DIR		
Pulse	Y2	
DIR	Y4	
Config Registers	MW0300	Config value = 7
Pulse enable flag	M03016	Output is enabled when ON
Frequency setting register	MW0302 MW0303	For Pulse: Data range: 1 to 10000 (DIR = Low)
		Data range: -10000 to –1 (DIR = High)
Frequency setting error flag	X03063	ON at error (Reset OFF automatically)

For Slot - 4

Function	Register/device	Remarks
CW Pulse	Y2	
CCW Pulse	Y4	
Config Registers	MW0400	Config value = 3
Pulse enable flag	M04016	Output is enabled when ON
Frequency setting register	MW0402 MW0403	For CW: Data range: 1 to 10000
		For CCW: Data range: -10000 to –1
Frequency setting error flag	X04063	ON at error (Reset OFF automatically)

Function	Register/device	Remarks
Pulse / DIR		
Pulse	Y2	
DIR	Y4	
Config Registers	MW0400	Config value = 7
Pulse enable flag	M04016	Output is enabled when ON
Frequency setting register	MW0402 MW0403	For Pulse: Data range: 1 to 10000 (DIR = Low)
		Data range: -10000 to –1 (DIR = High)
Frequency setting error flag	X04063	ON at error (Reset OFF automatically)

For Slot - 5

Function	Register/device	Remarks
CW Pulse	Y2	
CCW Pulse	Y4	
Config Registers	MW0500	Config value = 3
Pulse enable flag	M05016	Output is enabled when ON
Frequency setting register	MW0502 MW0503	For CW: Data range: 1 to 10000
		For CCW: Data range: -10000 to –1
Frequency setting error flag	X05063	ON at error (Reset OFF automatically)

Function	Register/device	Remarks
Pulse / DIR		
Pulse	Y2	
DIR	Y4	
Config Registers	MW0500	Config value = 7
Pulse enable flag	M05016	Output is enabled when ON
Frequency setting register	MW0502 MW0503	For Pulse: Data range: 1 to 10000 (DIR = Low)
		Data range: -10000 to –1 (DIR = High)
Frequency setting error flag	X05063	ON at error (Reset OFF automatically)

For Slot - 6

Function	Register/device	Remarks
CW Pulse	Y2	
CCW Pulse	Y4	
Config Registers	MW0600	Config value = 3
Pulse enable flag	M06016	Output is enabled when ON
Frequency setting register	MW0602 MW0603	For CW: Data range: 1 to 10000 For CCW: Data range: -10000 to –1
Frequency setting error flag	X06063	ON at error (Reset OFF automatically)

Function	Register/device	Remarks
Pulse / DIR		
Pulse	Y2	
DIR	Y4	
Config Registers	MW0600	Config value = 7
Pulse enable flag	M06016	Output is enabled when ON
Frequency setting register	MW0602 MW0603	For Pulse: Data range: 1 to 10000 (DIR = Low) Data range: -10000 to –1 (DIR = High)
Frequency setting error flag	X06063	ON at error (Reset OFF automatically)

For Slot - 7

Function	Register/device	Remarks
CW Pulse	Y2	
CCW Pulse	Y4	
Config Registers	MW0700	Config value = 3
Pulse enable flag	M07016	Output is enabled when ON
Frequency setting register	MW0702 MW0703	For CW: Data range: 1 to 10000 For CCW: Data range: -10000 to –1
Frequency setting error flag	X07063	ON at error (Reset OFF automatically)

Function	Register/device	Remarks
Pulse / DIR		
Pulse	Y2	
DIR	Y4	
Config Registers	MW0700	Config value = 7
Pulse enable flag	M07016	Output is enabled when ON
Frequency setting register	MW0702 MW0703	For Pulse: Data range: 1 to 10000 (DIR = Low) Data range: -10000 to –1 (DIR = High)
Frequency setting error flag	X07063	ON at error (Reset OFF automatically)

For Slot - 8

Function	Register/device	Remarks
CW Pulse	Y2	
CCW Pulse	Y4	
Config Registers	MW0800	Config value = 3
Pulse enable flag	M08016	Output is enabled when ON
Frequency setting register	MW0802 MW0803	For CW: Data range: 1 to 10000 For CCW: Data range: -10000 to –1
Frequency setting error flag	X08063	ON at error (Reset OFF automatically)

Function	Register/device	Remarks
Pulse / DIR		
Pulse	Y2	
DIR	Y4	
Config Registers	MW0800	Config value = 7
Pulse enable flag	M08016	Output is enabled when ON
Frequency setting register	MW0802 MW0803	For Pulse: Data range: 1 to 10000 (DIR = Low) Data range: -10000 to –1 (DIR = High)
Frequency setting error flag	X08063	ON at error (Reset OFF automatically)

5.2.7   PWM Output Function

This function is used to output a variable duty cycle pulse train. The controllable duty cycle is 0 to 100 % (1 % units). The PWM output is enabled when the pulse enable flag is ON. While the pulse enable flag is ON, the duty cycle (ON duty) can be changed by changing the duty setting value (0 to 100). The frequency setting is available in the range of 0 to 5000 Hz (1 Hz units) before turning ON the pulse enable flag. The frequency changing is not allowed while the pulse enable is ON. Note that the minimum ON/OFF pulse duration is 100 microsec. Therefore, the controllable ON duty range is limited depending on the frequency setting as follows. If the ON duty setting value is not available (within 0 to 100), the pulse width error flag comes ON. (PWM output operation is continued but the duty cycle is not guaranteed)

For Base model:
The function selection is done through configuration register2

Function	Register/device	Remarks
PWM pulse	Y0	
Pulse enable flag	M336	Output is enabled when ON
Frequency setting register	MW22 – MW23	Data range: 0 to 5000
		For FL011 & FL011-S3: Data range: 0 to 10000
ON duty setting register	MW24 –MW25	Data range: 0 to 100
Pulse width error flag	M189	ON at error (reset OFF automatically)
ON duty setting error flag	M190	ON at error (reset OFF automatically)
Frequency setting error flag	M191	ON at error (reset OFF automatically)

The Buffer is updated at each scan, so that the PWM frequency and duty cycle will be changed after each scan.

For High Speed Expansion Models:

PWM Output mode: [MWssrr Mode Select Bits =0x01]
Slot 1:

Function			Remarks
PWM pulse	Y2	Y4	
Config Register	MW0100	MW0126	Config value =1
Pulse enable flag	M01016	M01018	Output is enabled when ON
Frequency setting register	MW0102 MW0103	MW0102 MW0103	Data range: 1 to 10000
ON duty setting register	MW0104 MW0105	MW0127 MW0128	Data range: 0 to 100
ON duty setting error flag	X01062	X01061	at error (reset OFF automatically)
Frequency setting error flag	X01063	X01063	at error (reset OFF automatically)

Slot 2:

Function			Remarks
PWM pulse	Y2	Y4	
Config Register	MW0200	MW0226	Config value =1
Pulse enable flag	M02016	M02018	Output is enabled when ON
Frequency setting register	MW0202 MW0203	MW0202 MW0203	Data range: 1 to 10000
ON duty setting register	MW0204 MW0205	MW0227 MW0228	Data range: 0 to 100
ON duty setting error flag	X02062	X02061	at error (reset OFF automatically)
Frequency setting error flag	X02063	X02063	at error (reset OFF automatically)

Slot 3:

Function			Remarks
PWM pulse	Y2	Y4	
Config Register	MW0300	MW0326	Config value =1
Pulse enable flag	M03016	M03018	Output is enabled when ON
Frequency setting register	MW0302 MW0303	MW0302 MW0303	Data range: 1 to 10000
ON duty setting register	MW0304 MW0305	MW0327 MW0328	Data range: 0 to 100
ON duty setting error flag	X03062	X03061	at error (reset OFF automatically)
Frequency setting error flag	X03063	X03063	at error (reset OFF automatically)

Slot 4:

Function			Remarks
PWM pulse	Y2	Y4	
Config Register	MW0400	MW0426	Config value =1
Pulse enable flag	M04016	M04018	Output is enabled when ON
Frequency setting register	MW0402 MW0403	MW0402 MW0403	Data range: 1 to 10000
ON duty setting register	MW0404 MW0405	MW0427 MW0428	Data range: 0 to 100
ON duty setting error flag	X04062	X04061	at error (reset OFF automatically)
Frequency setting error flag	X04063	X04063	at error (reset OFF automatically)

Slot 5:

Function			Remarks
PWM pulse	Y2	Y4	
Config Register	MW0500	MW0526	Config value =1
Pulse enable flag	M05016	M05018	Output is enabled when ON
Frequency setting register	MW0502 MW0503	MW0502 MW0503	Data range: 1 to 10000
ON duty setting register	MW0504 MW0505	MW0527 MW0528	Data range: 0 to 100
ON duty setting error flag	X05062	X05061	at error (reset OFF automatically)
Frequency setting error flag	X05063	X05063	at error (reset OFF automatically)

Slot 6:

Function			Remarks
PWM pulse	Y2	Y4	
Config Register	MW0600	MW0626	Config value =1
Pulse enable flag	M06016	M06018	Output is enabled when ON
Frequency setting register	MW0602 MW0603	MW0602 MW0603	Data range: 1 to 10000
ON duty setting register	MW0604 MW0605	MW0627 MW0628	Data range: 0 to 100
ON duty setting error flag	X06062	X06061	at error (reset OFF automatically)
Frequency setting error flag	X06063	X06063	at error (reset OFF automatically)

Slot 7:

Function			Remarks
PWM pulse	Y2	Y4	
Config Register	MW0700	MW0726	Config value =1
Pulse enable flag	M07016	M07018	Output is enabled when ON
Frequency setting register	MW0702 MW0703	MW0702 MW0703	Data range: 1 to 10000
ON duty setting register	MW0704 MW0705	MW0727 MW0728	Data range: 0 to 100
ON duty setting error flag	X07062	X07061	at error (reset OFF automatically)
Frequency setting error flag	X07063	X07063	at error (reset OFF automatically)

Slot 8:

Function			Remarks
PWM pulse	Y2	Y4	
Config Register	MW0800	MW0826	Config value =1
Pulse enable flag	M08016	M08018	Output is enabled when ON
Frequency setting register	MW0802 MW0803	MW0802 MW0803	Data range: 1 to 10000
ON duty setting register	MW0804 MW0805	MW0827 MW0828	Data range: 0 to 100
ON duty setting error flag	X08062	X08061	at error (reset OFF automatically)
Frequency setting error flag	X08063	X08063	at error (reset OFF automatically)

5.2.8   Fixed Pulse Output Function

In this mode, fixed number of pulses can be output on the Y0 of Base transistor outputs of the unit according to the specified parameter and Y1 is used as direction output.
This function can be used for the position control / trapezoidal control.
The function selection is done using Configuration register MW0011.
Description:
When the corresponding control flag is off and the execution condition (trigger) is in the on state, a pulse is output from the specified output (Y0).
The control code, minimum frequency, maximum frequency, acceleration time, deceleration time and total number of pulses are specified by a user program as shown here.
The frequency is switched by the acceleration/deceleration time specified for changing from the initial speed to the maximum speed. The acceleration and deceleration is normally done in 30 steps.

$$\Delta f = (7000 - 1000) \div 30 \text{ steps} = 200(Hz)$$
$$\Delta t = 300ms \div 30 \text{ steps} = 10ms$$
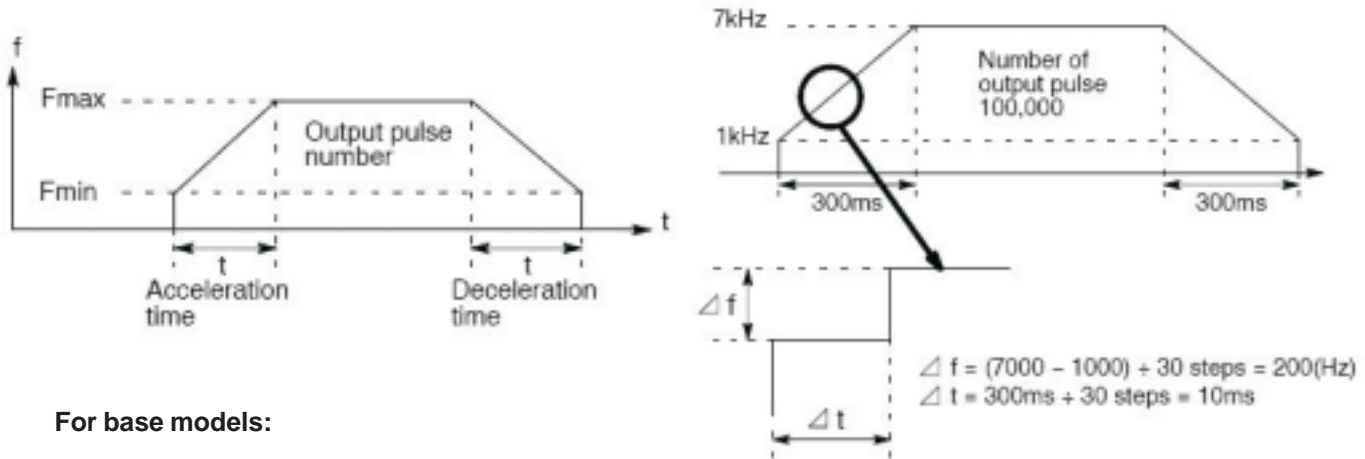
For base models:

Configuration registers and coils used for setting the parameters of Fixed Pulse Output Mode:
Channel 1 Registers:

Function	Register / device	Remarks
PWM pulse CH1	Y0	Base Y0
Direction CH1	Y1	Base Y1
Pulse enable flag CH1	M336	Output is enabled when ON
Direction Marker CH1	M337	Direction Marker Flag (M337coil)
		0: DIR off 1: DIR on
MIN Freq CH1	MW22 –	Data range: 0 to 5000
	MW23	For FL011 & FL011-S3, data range: 0 to 10000
MAX Freq CH1	MW24 –	Data range: 1 to 5000
	MW25	For FL011 & FL011-S3, data range: 1 to 10000
Acceleration Time CH1	MW0040	0 to 32767 (in mSec)
Deceleration Time CH1	MW0041	0 to 32767 (in mSec)
Total Pulse CH1	MW48 –	0 to + 2147483647
	MW49	
Elapsed value CH1	MW52 –	0 to + 2147483647(Read / Write)
	MW53	
Total Pulse Done Flag CH2	M0185	Turns ON after total pulses are out.
		(Bit '9' of MW0011 register)
Pulse Counts Total Range Error	M0186	Turns ON at error
		(Bit 'A' of MW0011 register)
Deceleration Time Range Error	M0187	Turns ON at error
		(Bit 'B' of MW0011 register)
Acceleration Time Range Error	M0188	Turns ON at error
		(Bit 'C' of MW0011 register)
Frequency setting error flag	M0191	ON at error (reset OFF automatically)

Fixed Pulse Output Function for High Speed Expansion models (FLD-HS-0808N)

MW Register Table for Slot-1:

Function	Register/device	Remarks
PWM pulse	Y2	
Configuration Register	MW0100	Config value = 9
Pulse Out Enable	MW0101_0 (M01016)	Bit '0' is used for enable High speed output.
MIN Freq	MW0102 MW0103	Data range: 1 to 10000
MAX Freq	MW0104 MW0105	Data range: 1 to 10000
Acceleration Time	MW0106	0 to 32767 (in mSec)
Deceleration Time	MW0107	0 to 32767 (in mSec)
Total Pulse	MW0108 MW0109	0 to 2147483647
Elapsed value	XW0101 XW0102	0 to 2147483647 (Read / Write)
Frequency Setting Error Flag	XW0103_15 (X01063)	Turns ON at error
Acceleration Time Setting error flag	XW0103_12 (X01060)	Turns ON at error
Deceleration Time Setting error flag	XW0103_11 (X01059)	Turns ON at error
No of Total Pulses Setting error flag	XW0103_10 (X01058)	Turns ON at error
End of total pulses flag	XW0103_9 (X01057)	Turns ON when total pulses elapse.

MW Register Table for Slot-2:

Function	Register/device	Remarks
PWM pulse	Y2	
Configuration Register	MW0200	Config value = 9
Pulse Out Enable	MW0201_0 (M02016)	Bit '0' is used for enable High speed output.
MIN Freq	MW0202 MW0203	Data range: 1 to 10000
MAX Freq	MW0204 MW0205	Data range: 1 to 10000
Acceleration Time	MW0206	0 to 32767 (in mSec)
Deceleration Time	MW0207	0 to 32767 (in mSec)
Total Pulse	MW0208 MW0209	0 to 2147483647
Elapsed value	XW0201 XW0202	0 to 2147483647 (Read / Write)
Frequency Setting Error Flag	XW0203_15 (X02063)	Turns ON at error
Acceleration Time Setting error flag	XW0203_12 (X02060)	Turns ON at error
Deceleration Time Setting error flag	XW0203_11 (X02059)	Turns ON at error
No of Total Pulses Setting error flag	XW0203_10 (X02058)	Turns ON at error
End of total pulses flag	XW0203_9 (X02057)	Turns ON when total pulses elapse.

MW Register Table for Slot-3:

Function	Register/device	Remarks
PWM pulse	Y2	
Configuration Register	MW0300	Config value = 9
Pulse Out Enable	MW0301_0 (M03016)	Bit '0' is used for enable High speed output.
MIN Freq	MW0302 MW0303	Data range: 1 to 10000
MAX Freq	MW0304 MW0305	Data range: 1 to 10000
Acceleration Time	MW0306	0 to 32767 (in mSec)
Deceleration Time	MW0307	0 to 32767 (in mSec)
Total Pulse	MW0308 MW0309	0 to 2147483647
Elapsed value	XW0301 XW0302	0 to 2147483647 (Read / Write)
Frequency Setting Error Flag	XW0303_15 (X03063)	Turns ON at error
Acceleration Time Setting error flag	XW0303_12 (X03060)	Turns ON at error
Deceleration Time Setting error flag	XW0303_11 (X03059)	Turns ON at error
No of Total Pulses Setting error flag	XW0303_10 (X03058)	Turns ON at error
End of total pulses flag	XW0303_9 (X03057)	Turns ON when total pulses elapse.

MW Register Table for Slot-4:

Function	Register/device	Remarks
PWM pulse	Y2	
Configuration Register	MW0400	Config value = 9
Pulse Out Enable	MW0401_0 (M04016)	Bit '0' is used for enable High speed output.
MIN Freq	MW0402 MW0403	Data range: 1 to 10000
MAX Freq	MW0404 MW0405	Data range: 1 to 10000
Acceleration Time	MW0406	0 to 32767 (in mSec)
Deceleration Time	MW0407	0 to 32767 (in mSec)
Total Pulse	MW0408 MW0409	0 to 2147483647
Elapsed value	XW0401 XW0402	0 to 2147483647 (Read / Write)
Frequency Setting Error Flag	XW0403_15 (X04063)	Turns ON at error
Acceleration Time Setting error flag	XW0403_12 (X04060)	Turns ON at error
Deceleration Time Setting error flag	XW0403_11 (X04059)	Turns ON at error
No of Total Pulses Setting error flag	XW0403_10 (X04058)	Turns ON at error
End of total pulses flag	XW0403_9 (X04057)	Turns ON when total pulses elapse.

MW Register Table for Slot-5:

Function	Register/device	Remarks
PWM pulse	Y2	
Configuration Register	MW0500	Config value = 9
Pulse Out Enable	MW0501_0 (M05016)	Bit '0' is used for enable High speed output.
MIN Freq	MW0502 MW0503	Data range: 1 to 10000
MAX Freq	MW0504 MW0505	Data range: 1 to 10000
Acceleration Time	MW0506	0 to 32767 (in mSec)
Deceleration Time	MW0507	0 to 32767 (in mSec)
Total Pulse	MW0508 MW0509	0 to 2147483647
Elapsed value	XW0501 XW0502	0 to 2147483647 (Read / Write)
Frequency Setting Error Flag	XW0503_15 (X05063)	Turns ON at error
Acceleration Time Setting error flag	XW0503_12 (X05060)	Turns ON at error
Deceleration Time Setting error flag	XW0503_11 (X05059)	Turns ON at error
No of Total Pulses Setting error flag	XW0503_10 (X05058)	Turns ON at error
End of total pulses flag	XW0503_9 (X05057)	Turns ON when total pulses elapse.

MW Register Table for Slot-6:

Function	Register/device	Remarks
PWM pulse	Y2	
Configuration Register	MW0600	Config value = 9
Pulse Out Enable	MW0601_0 (M06016)	Bit '0' is used for enable High speed output.
MIN Freq	MW0602 MW0603	Data range: 1 to 10000
MAX Freq	MW0604 MW0605	Data range: 1 to 10000
Acceleration Time	MW0606	0 to 32767 (in mSec)
Deceleration Time	MW0607	0 to 32767 (in mSec)
Total Pulse	MW0608 MW0609	0 to 2147483647
Elapsed value	XW0601 XW0602	0 to 2147483647 (Read / Write)
Frequency Setting Error Flag	XW0603_15 (X06063)	Turns ON at error
Acceleration Time Setting error flag	XW0603_12 (X06060)	Turns ON at error
Deceleration Time Setting error flag	XW0603_11 (X06059)	Turns ON at error
No of Total Pulses Setting error flag	XW0603_10 (X06058)	Turns ON at error
End of total pulses flag	XW0603_9 (X06057)	Turns ON when total pulses elapse.

MW Register Table for Slot-7:

Function	Register/device	Remarks
PWM pulse	Y2	
Configuration Register	MW0700	Config value = 9
Pulse Out Enable	MW0701_0 (M07016)	Bit '0' is used for enable High speed output.
MIN Freq	MW0702 MW0703	Data range: 1 to 10000
MAX Freq	MW0704 MW0705	Data range: 1 to 10000
Acceleration Time	MW0706	0 to 32767 (in mSec)
Deceleration Time	MW0707	0 to 32767 (in mSec)
Total Pulse	MW0708 MW0709	0 to 2147483647
Elapsed value	XW0701 XW0702	0 to 2147483647 (Read / Write)
Frequency Setting Error Flag	XW0703_15 (X07063)	Turns ON at error
Acceleration Time Setting error flag	XW0703_12 (X07060)	Turns ON at error
Deceleration Time Setting error flag	XW0703_11 (X07059)	Turns ON at error
No of Total Pulses Setting error flag	XW0703_10 (X07058)	Turns ON at error
End of total pulses flag	XW0703_9 (X07057)	Turns ON when total pulses elapse.

MW Register Table for Slot-8:

Function	Register/device	Remarks
PWM pulse	Y2	
Configuration Register	MW0800	Config value = 9
Pulse Out Enable	MW0801_0 (M08016)	Bit '0' is used for enable High speed output.
MIN Freq	MW0802 MW0803	Data range: 1 to 10000
MAX Freq	MW0804 MW0805	Data range: 1 to 10000
Acceleration Time	MW0806	0 to 32767 (in mSec)
Deceleration Time	MW0807	0 to 32767 (in mSec)
Total Pulse	MW0808 MW0809	0 to 2147483647
Elapsed value	XW0801 XW0802	0 to 2147483647 (Read / Write)
Frequency Setting Error Flag	XW0803_15 (X08063)	Turns ON at error
Acceleration Time Setting error flag	XW0803_12 (X08060)	Turns ON at error
Deceleration Time Setting error flag	XW0803_11 (X08059)	Turns ON at error
No of Total Pulses Setting error flag	XW0803_10 (X08058)	Turns ON at error
End of total pulses flag	XW0803_9 (X08057)	Turns ON when total pulses elapse.

5.2.9 Configuring base model in Native Ladder Programming Environment: FL005 Series

Configuration Registers for High speed counter inputs:
High Speed Counter Design FL005 Native
High Speed inputs:2
Input Channels :X0,X1,X2,X3
Max Frequency : 200KHz

Single Phase Up Counter Channels: X0 (Make X1 channel logic high) [Ref. wiring diagram 1.4.2]
    X2(Make X3 channel logic high) [Ref. wiring diagram 1.4.2]
Single Phase Down Counter Channels: X0 (Make X1 channel logic low) [Ref. wiring diagram 1.4.2]
    X2(Make X3 channel logic low) [Ref. wiring diagram 1.4.2]
Quadrature Counter Channels :   X0-X1 pair
    X2-X3 pair
Physical reset input: 2 (X4, X5)
Configurable forced output: 2 (Y2, Y3)

Register Description	Register Number		Attribute	Value in Register/Range
	X0 (CH1)	X2(CH3)		
HSC Configuration register	MW0010	MW0040	Read/Write	"2 (Single Phase Counter)"387(4X Quadrature) *"
High Speed Counter (HSC) Register	MW0011	MW0041	Read Only	4294967296(32-bit data)
HSC Preset Register	MW0013	MW0043	Read/Write	4294967296(32-bit data)
HSC Enable Bit	M00240	M00720	Read/Write	Operation is enable when ON
HSC Reset Bit	M00241	M00721	Read/Write	Count Reset (ON/OFF)
HSC Preset Reached Bit	M00242	M00722	Read Only	ON/OFF

Note:
* The configuration Value depends on the different conditions in which HSC runs and can be evaluated using configuration register details.

Configuration registers details:
The Mode selection is done through two registers as below:
Configuration register (High speed input) : MWssrr
ss: Slot number
rr: Register number

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	FC	FO-C	Q	Q	R	R	E	C	C	C

Not Used

000: Normal
010: Ch HSC
011: Quadrature

0: Falling
1: Rising

HSC
00: Single Phase Up counter

Applicable if Quadrature mode
00: Reserved
01: Reserved
10: 4x Mode

00: Reset counter if, SW Reset bit or physical I/Preset bit goes from 0 to 1
01: reset counter if the sw reset bit goes from 0 to 1
10: reset counter if physical input reset bit goes from 0 to 1
1 1 : future use

1: Forced O/P enabled
0: Forced O/P disabled

Forced Output Configuration
0: Forced Output ON for Preset1
1: Forced Output will be ON when Enable and OFF when Preset1 is reached

PWM Design Native for FL005 Fixed IO series:
High Speed outputs: 2   Output Channels : Y0,Y1   Max. Pulse output Frequency : 100KHz

Normal PWM mode configuration:

Register Description	Register Number		Attribute	Value in Register/Range
	Y0 (CH1)	Y1(CH2)		
PWM Configure Reg	MW0059	MW0075	Read/Write	*Put value 1
Frequency/Min Freq Setting Reg	MW0060	MW0076	Read/Write	Data range: 1 to 100000
ON duty /Max Freq Setting Reg	MW0062	MW0078	Read/Write	Data range: 0 to 100
Pulse Enable Flag	M00816	M00832	Read/Write	Output is enabled when ON
ON duty setting error flag	M00818	M00834	Read Only	ON at error (reset OFF automatically)
Frequency Setting error flag	M00819	M00835	Read Only	ON at error (reset OFF automatically)

If user put config value 2: User can change frequecy even if pulse enable flag is ON

Pulse/DIR mode configuration: Y0: Pulse and Y1: Direction

Register Description	Register Number	Attribute	Value in Register/Range
	Y0 (CH1)		
PWM Configure Reg	MW0059	Read/Write	*Put value 7
Frequency/Min Freq Setting Reg	MW0060	Read/Write	Data range: -100000 to -1 and 1 to 100000
Pulse Enable Flag	M00816	Read/Write	Output is enabled when ON
Frequency Setting error flag	M00819	Read Only	ON at error (reset OFF automatically)

If user put config value 8: User can change frequecy even if pulse enable flag is ON

CW/CCW mode configuration: Y0: CW Pulse and Y1: CCW Pulse

Register Description	Register Number	Attribute	Value in Register/Range
	Y0 (CH1)		
PWM Configure Reg	MW0059	Read/Write	*Put value 3
Frequency/Min Freq Setting Reg	MW0060	Read/Write	Data range: -100000 to -1 and 1 to 100000
Pulse Enable Flag	M00816	Read/Write	Output is enabled when ON
Frequency Setting error flag	M00819	Read Only	ON at error (reset OFF automatically)

If user put config value 4: User can change frequecy even if pulse enable flag is ON

Fixed Pulse mode configuration:

Register Description	Register Number		Attribute	Value in Register/Range
	Y0 (CH1)	Y1(CH2)		
PWM Configure Reg	MW0059	MW0075	Read/Write	Put value 9
Frequency/Min Freq Setting Reg	MW0060	MW0076	Read/Write	Data range: 1 to 100000
ON duty /Max Freq Setting Reg	MW0062	MW0078	Read/Write	Data range: 1 to 100000
Pulse Enable Flag	M00816	M00832	Read/Write	Output is enabled when ON
Acceleration Time	MW0064	MW0080	Read/Write	0 to 65535 (x10mSec base)
Deceleration Time	MW0065	MW0081	Read/Write	0 to 65535 (x10mSec base)
Total Pulses	MW0066	MW0082	Read/Write	128 to 4294967296
Elapsed Value	MW0068	MW0084	Read Only	0 to 4294967296
Frequency Setting error flag	M00819	M00835	Read Only	ON at error (reset OFF automatically)
Acceleration Time Setting error flag	M00820	M00836	Read Only	Turns ON at error
Deceleration Time Setting error flag	M00821	M00837	Read Only	Turns ON at error
No of Total Pulses Setting error flag	M00822	M00838	Read Only	Turns ON at error
End of Total Pulses flag	M00823	M00839	Read Only	Turns ON at error
Trapezoidal Min.Pulse Count Register	MW0054	MW0056	Read Only	0 to 4294967296

PWM Design Native for FL005 Expandable IO series:
High Speed outputs: 2   Output Channels : Y0,Y1   Max. Pulse output Frequency : 200KHz

Normal PWM mode configuration:

Register Description	Register Number		Attribute	Value in Register/Range
	Y0 (CH1)	Y1(CH2)		
PWM Configure Reg	MW0059	MW0075	Read/Write	*Put value 1
Frequency/Min Freq Setting Reg	MW0060	MW0076	Read/Write	Data range: 1 to 200000
ON duty /Max Freq Setting Reg	MW0062	MW0078	Read/Write	Data range: 0 to 100
Pulse Enable Flag	M00816	M00832	Read/Write	Output is enabled when ON
ON duty setting error flag	M00818	M00834	Read Only	ON at error (reset OFF automatically)
Frequency Setting error flag	M00819	M00835	Read Only	ON at error (reset OFF automatically)

If user put config value 2: User can change frequecy even if pulse enable flag is ON

Pulse/DIR mode configuration:

Register Description	Register Number		Attribute	Value in Register/Range
	Y0 (CH1)	Y1(CH2)		
PWM Configure Reg	MW0059	MW0075	Read/Write	*Put value 7
Frequency/Min Freq Setting Reg	MW0060	MW0076	Read/Write	Data range: -200000 to -1 and 1 to 200000
Pulse Enable Flag	M00816	M00832	Read/Write	Output is enabled when ON
Frequency Setting error flag	M00819	M00835	Read Only	ON at error (reset OFF automatically)

If user put config value 8: User can change frequecy even if pulse enable flag is ON

CW/CCW mode configuration:

Register Description	Register Number		Attribute	Value in Register/Range
	Y0 (CH1)	Y1(CH2)		
PWM Configure Reg	MW0059	MW0075	Read/Write	*Put value 3
Frequency/Min Freq Setting Reg	MW0060	MW0076	Read/Write	Data range: -200000 to -1 and 1 to 200000
Pulse Enable Flag	M00816	M00832	Read/Write	Output is enabled when ON
Frequency Setting error flag	M00819	M00835	Read Only	ON at error (reset OFF automatically)

If user put config value 4: User can change frequecy even if pulse enable flag is ON

Fixed Pulse mode configuration:

Register Description	Register Number		Attribute	Value in Register/Range
	Y0 (CH1)	Y1(CH2)		
PWM Configure Reg	MW0059	MW0075	Read/Write	Put value 9
Frequency/Min Freq Setting Reg	MW0060	MW0076	Read/Write	Data range: 1 to 200000
ON duty /Max Freq Setting Reg	MW0062	MW0078	Read/Write	Data range: 1 to 200000
Pulse Enable Flag	M00816	M00832	Read/Write	Output is enabled when ON
Acceleration Time	MW0064	MW0080	Read/Write	0 to 65535 (x10mSec base)
Deceleration Time	MW0065	MW0081	Read/Write	0 to 65535 (x10mSec base)
Total Pulses	MW0066	MW0082	Read/Write	128 to 4294967296
Elapsed Value	MW0068	MW0084	Read Only	0 to 4294967296
Frequency Setting error flag	M00819	M00835	Read Only	ON at error (reset OFF automatically)
Acceleration Time Setting error flag	M00820	M00836	Read Only	Turns ON at error
Deceleration Time Setting error flag	M00821	M00837	Read Only	Turns ON at error
No of Total Pulses Setting error flag	M00822	M00838	Read Only	Turns ON at error
End of Total Pulses flag	M00823	M00839	Read Only	Turns ON at error
Trapezoidal Min.Pulse Count Register	MW0054	MW0056	Read Only	0 to 4294967296

Configuration Registers for Analog Inputs :

Analog Inputs :2
Input Channels:V1,V2,I1,I2

Register Description	Register Number		Attribute	Value in Register/Range
	CH0	CH1		
Analog Input Type	MW0071	MW0072	Read/Write	1: Voltage input 0-10V 6: Voltage input 0-5V 3: Current input 0-20mA 2: Current input 4-20mA
Analog Input Register	XW0001	XW0003	Read Only	Reads voltage/current input

Data Output Format for analog input:

For Voltage input (0 to 10V)

Voltage input	Count
0	0
2.5V	16000
5V	32000
7.5V	48000
10V	64000

For Voltage input (0 to 5V)

Voltage input	Count
0	0
1.25V	16000
2.5V	32000
3.75V	48000
5V	64000

For Current input(0 to 20mA)

Current input	Count
0	0
5mA	16000
10mA	32000
15mA	48000
20mA	64000

4 to 20mA

Current input	Count
4	0
8mA	16000
12mA	32000
16mA	48000
20mA	64000

Note:
Analog Input Under-range Count: 65000
Analog Input over-range Count: 65001

Configuration Registers for Analog Outputs:
Analog Output Design: Native
Analog Output :1
Output Channel:Iout

Register Description	Register Number CH0	Attribute	Value in Register/Range
Analog Output Type	MW0073	Read/Write	*2: Voltage output 0-10V 5: Current output 4-20mA
Analog Output Voltage Register	YW0001	Read/Write	0 to 4095
Analog Output Current Register	YW0002	Read/Write	0 to 4095

Data Entry for analog output:

For Current Output (4 to 20 mA)

Entered count	Current output
0	4 mA
1024	8 mA
2048	12 mA
3072	16 mA
4095	20 mA

For Voltage Output (0 to 10VDC)

Entered count	Current output
0	10V
1024	2.5V
2048	5V
3072	7.5V
4095	10V

Note: *: Applicable to FL005 expandable series.

Configuration Registers for Analog Inputs of model FL005-0808RP0402U:
Analog Inputs :4
Input Channels:IN1, IN2, IN3 and IN4

Register Description	Register Number				Attribute	Value in Register/Range
	IN1	IN2	IN3	IN4		
Analog Input Type	MW0071	MW0072	MW0087	MW0088	Read/Write	1: Voltage input 0-10V 6: Voltage input 0-5V 5: milivolt input 0-50mV 4: milivolt input 0-100mV 3: Current input 0-20mA 2: Current input 4-20mA 7: RTD input alpha1: (-200 to 850ºC) 8:RTD input alpha2: (-100 to 457ºC) 14: Thermocouple J:(-210 to 1200ºC) 15: Thermocouple K:(-200 to 1373ºC)
Analog Input Register	XW0001	XW0003	XW0005	XW0007	Read Only	Reads voltage/current input

Data Output Format for analog input:

For Voltage input (0 to 10V)

Voltage input	Count
0	0
2.5V	16000
5V	32000
7.5V	48000
10V	64000

For Voltage input (0 to 5V)

Voltage input	Count
0	0
1.25V	16000
2.5V	32000
3.75V	48000
5V	64000

For millivolt input (0 to 50mV)

Voltage input	Count
0	0
12.5mV	16000
25mV	32000
37.5mV	48000
50mV	64000

For Voltage input (0 to 100mV)

Voltage input	Count
0	0
25mV	16000
50mV	32000
75mV	48000
100mV	64000

For Current input(0 to 20mA)

Current input	Count
0	0
5mA	16000
10mA	32000
15mA	48000
20mA	64000

4 to 20mA

Current input	Count
4	0
8mA	16000
12mA	32000
16mA	48000
20mA	64000

RTD Type ,range and resolution table

Input Type	Temperature range
PT100 Alpha1	-200 to 850º C
PT100 Alpha2	-100 to 457º C
PT1000	-200 to 850º C

RTD PT100 Alpha1 constant: 0.00385
RTD PT100 Alpha2 constant: 0.00392

Thermocouple type ,range and resolution table

Input type	Temperature range
J	-210 to 1200º C
K	-200 to 1373º C

Note:
Analog Input Under-range Count: 65000
Analog Input over-range Count: 65001

Configuration Registers for Analog Outputs of model FL005-0808RP0402U:
Analog Output Design: Native
Analog Output :2
Output Channel: VO1, IO1, VO2, IO2

Register Description	Register Number		Attribute	Value in Register/Range
	VO1/IO1	VO2/IO2		
Analog Output Type	MW0073	MW0089	Read/Write	2: Voltage output 0-10V 5: Current output 4-20mA
Analog Output Voltage Register	YW0001	YW0003	Read/Write	0 to 4095
Analog Output Current Register	YW0002	YW0004	Read/Write	0 to 4095

Data Entry for analog output:
For Current Output (4 to 20 mA)

Entered count	Current output
0	4 mA
1024	8 mA
2048	12 mA
3072	16 mA
4095	20 mA

For Voltage Output (0 to 10VDC)

Entered count	Current output
0	0V
1024	2.5V
2048	5V
3072	7.5V
4095	10V

Configuration Registers for Analog Outputs of model FL005-0808RP0402U:

5.2.10   Configuring base model in IEC6113-3 Ladder Programming Environment: FL005

High Speed Counter Design FL005 IEC
High Speed inputs:4
Input Channels :X0,X1,X2,X3
Maximum Input Frequency : 200Khz

Single Phase Up Counter Channels:	X0 (Make X1 channel logic high [Ref. wiring diagram 1.4.2]
	X2(Make X3 channel logic high [Ref. wiring diagram 1.4.2]
Single Phase Down Counter Channels:	X0 (Make X1 channel logic low [Ref. wiring diagram 1.4.2]
	X2(Make X3 channel logic low [Ref. wiring diagram 1.4.2]
Quadrature Counter Channels :	X0-X1 pair
	X2-X3 pair
Physical reset input:	2 (X4, X5)
Configurable forced output:	2 (Y2, Y3)

Configuration Registers for High speed counter inputs:

Input Channel	Register Description	DataType	Attribute	Value in Register/Range
X0(CH1)	HSC_Configuration_ register_CH1	WORD	Read/Write	"2 (Single Phase Counter) 387(4X Quadrature) "
	High_ Speed_ Counter_HSC_ Register_CH1	DWORD	Read Only	4294967296(32-bit data)
	HSC_ Preset_ Register_CH1	DWORD	Read/Write	4294967296(32-bit data)
	HSC_ Enable_ Bit_CH1	BOOL	Read/Write	Operation is enable when ON
	HSC_ Reset_ Bit_CH1	BOOL	Read/Write	Count Reset (ON/OFF)
	HSC_ Preset_ Reached_ Bit_CH3	BOOL	Read Only	ON/OFF
X2(CH3)	HSC_Configuration_ register_CH3	WORD	Read/Write	2 (Single Phase Counter) 387(4X Quadrature)
	High_ Speed_ Counter_HSC_ Register_CH3	DWORD	Read Only	4294967296(32-bit data)
	HSC_ Preset_ Register_CH3	DWORD	Read/Write	4294967296(32-bit data)
	HSC_ Enable_ Bit_CH3	BOOL	Read/Write	Operation is enable when ON
	HSC_ Reset_ Bit_CH3	BOOL	Read/Write	Count Reset (ON/OFF)
	HSC_ Preset_ Reached_ Bit_CH3	BOOL	Read Only	ON/OFF

Configuration Registers for PWM Outputs for FL005 Fixed I/O Series:

High Speed outputs: 2   Output Channels : Y0,Y1   Max. Pulse output frequency :100Khz

Normal PWM mode configuration:

Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y0(CH1)	PWM_Configure_ Reg_CH1	WORD	Read/Write	*Put value 1
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH1	DINT	Read/Write	Data range: 1 to 100000
	ON duty_OR_Max_ Freq_ Setting_ Reg_CH1	DWORD	Read/Write	Data range: 0 to 100
	Pulse_ Enable_ Flag_CH1	BOOL	Read/Write	Output is enabled when ON
	ON_ duty) setting_ error_ flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)
	Frequency_ Setting_ error_ flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)
Y1CH2)	PWM_Configure_ Reg_CH2	WORD	Read/Write	Put value 1
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH2	DINT	Read/Write	Data range: 1 to 100000
	ON duty_OR_Max_ Freq_ Setting_ Reg_CH2	DWORD	Read/Write	Data range: 0 to 100
	Pulse_ Enable_ Flag_CH2	BOOL	Read/Write	Output is enabled when ON
	ON_ duty) setting_ error_ flag_CH2	BOOL	Read Only	ON at error (reset OFF automatically)
	Frequency_ Setting_ error_ flag_CH2	BOOL	Read Only	ON at error (reset OFF automatically)

If user put config value 2: User can change frequecy even if pulse enable flag is ON.

CW/CCW mode configuration: Y0: CW Pulse and Y1: CCW Pulse

Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y0(CH1)	PWM_ Configure_ Reg_CH1	WORD	Read/Write	*Put value 3
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH1	DINT	Read/Write	Data range: -100000 to -1 and 1 to 100000
	Pulse_ Enable_ Flag_CH1	BOOL	Read/Write	Output is enabled when ON
	Frequency_ Setting_ error_ flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)

If user put config value 4: User can change frequecy even if pulse enable flag is ON

Pulse/DIR mode configuration: Y0: Pulse and Y1: Direction

Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y0(CH1)	PWM_ Configure_ Reg_CH1	WORD	Read/Write	*Put value 7
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH1	DINT	Read/Write	Data range: -100000 to -1 and 1 to 100000
	Pulse_ Enable_ Flag_CH1	BOOL	Read/Write	Output is enabled when ON
	Frequency_ Setting_ error_ flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)

If user put config value 8: User can change frequecy even if pulse enable flag is ON

Fixed Pulse mode configuration:

Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y0(CH1)	PWM_ Configure_ Reg_CH1	WORD	Read/Write	Put value 9
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH1	DINT	Read/Write	Data range: 1 to 100000
	ON duty_OR_Max_ Freq_ Setting_ Reg_CH1	DWORD	Read/Write	Data range: 1 to 100000
	Pulse_ Enable_ Flag_CH1	BOOL	Read/Write	Output is enabled when ON
	Acceleration_ Time_CH1	WORD	Read/Write	0 to 65535 (x10mSec base)
	Deceleration_ Time_CH1	WORD	Read/Write	0 to 65535 (x10mSec base)
	Total_ Pulses_CH1	DWORD	Read/Write	128 to 4294967296
	Elapsed_ Value_CH1	DWORD	Read Only	0 to 4294967296
	Frequency_ Setting_ error_ flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)
	Acceleration_ Time_ Setting_ error_ flag_CH1	BOOL	Read Only	Turns ON at error
	Deceleration_ Time_ Setting_ error_ flag_CH1	BOOL	Read Only	Turns ON at error
	No_of_Total_ Pulses_ Setting_ error_ flag_CH1	BOOL	Read Only	Turns ON at error
	End _of_ Total_ Pulses_ flag_CH1	BOOL	Read Only	Turns ON at error
	Trapezoidal_Min_.Pulse_Count_Register_CH1	DWORD	Read Only	0 to 4294967296

Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y1CH2)	PWM_Configure_Reg_CH2	WORD	Read/Write	Put value 9
	Frequency_OR_Min_Freq_Setting_Reg_CH2	DINT	Read/Write	Data range: 1 to 100000
	ON duty_OR_Max_Freq_Setting_Reg_CH2	DWORD	Read/Write	Data range: 1 to 100000
	Pulse_Enable_Flag_CH2	BOOL	Read/Write	Output is enabled when ON
	Acceleration_Time_CH2	WORD	Read/Write	0 to 65535 (x10mSec base)
	Deceleration_Time_CH2	WORD	Read/Write	0 to 65535 (x10mSec base)
	Total_Pulses_CH2	DWORD	Read/Write	128 to 4294967296
	Elapsed_Value_CH2	DWORD	Read/Write	0 to 4294967296
	Frequency_Setting_error_flag_CH2	BOOL	Read Only	ON at error (reset OFF automatically)
	Acceleration_Time_Setting_error_flag_CH2	BOOL	Read Only	Turns ON at error
	Deceleration_Time_Setting_error_flag_CH2	BOOL	Read Only	Turns ON at error
	No_of_Total_Pulses_Setting_error_flag_CH2	BOOL	Read Only	Turns ON at error
	End_of_Total_Pulses_flag_CH2	BOOL	Read Only	Turns ON at error
	Trapezoidal_Min_.Pulse_Count_Register_CH2	DWORD	Read Only	0 to 4294967296

Configuration Registers for PWM Outputs for FL005 Expandable Series:

High Speed outputs: 2   Output Channels : Y0,Y1   Max. Pulse output frequency :200Khz

Normal PWM mode configuration:

Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y0(CH1)	PWM_Configure_Reg_CH1	WORD	Read/Write	*Put value 1
	Frequency_OR_Min_Freq_Setting_Reg_CH1	DINT	Read/Write	Data range: 1 to 200000
	ON duty_OR_Max_Freq_Setting_Reg_CH1	DWORD	Read/Write	Data range: 0 to 100
	Pulse_Enable_Flag_CH1	BOOL	Read/Write	Output is enabled when ON
	ON_duty) setting_error_flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)
	Frequency_Setting_error_flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)
Y1CH2)	PWM_Configure_Reg_CH2	WORD	Read/Write	Put value 1
	Frequency_OR_Min_Freq_Setting_Reg_CH2	DINT	Read/Write	Data range: 1 to 200000
	ON duty_OR_Max_Freq_Setting_Reg_CH2	DWORD	Read/Write	Data range: 0 to 100
	Pulse_Enable_Flag_CH2	BOOL	Read/Write	Output is enabled when ON
	ON_duty) setting_error_flag_CH2	BOOL	Read Only	ON at error (reset OFF automatically)
	Frequency_Setting_error_flag_CH2	BOOL	Read Only	ON at error (reset OFF automatically)

If user put config value 2: User can change frequecy even if pulse enable flag is ON.

CW/CCW mode configuration: Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y0(CH1)	PWM_Configure_Reg_CH1	WORD	Read/Write	*Put value 3
	Frequency_OR_Min_Freq_Setting_Reg_CH1	DINT	Read/Write	Data range: -200000 to -1 and 1 to 200000
	Pulse_Enable_Flag_CH1	BOOL	Read/Write	Output is enabled when ON
	Frequency_Setting_error_flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)
Y1CH2)	PWM_Configure_Reg_CH2	WORD	Read/Write	*Put value 3
	Frequency_OR_Min_Freq_Setting_Reg_CH2	DINT	Read/Write	Data range: -200000 to -1 and 1 to 200000
	Pulse_Enable_Flag_CH2	BOOL	Read/Write	Output is enabled when ON
	Frequency_Setting_error_flag_CH2	BOOL	Read Only	ON at error (reset OFF automatically)

If user put config value 3: User can change frequecy even if pulse enable flag is ON

CW/CCW mode configuration:

Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y0(CH1)	PWM_ Configure_ Reg_CH1	WORD	Read/Write	*Put value 3
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH1	DINT	Read/Write	Data range: -200000 to -1 and 1 to 200000
	Pulse_ Enable_ Flag_CH1	BOOL	Read/Write	Output is enabled when ON
	Frequency_ Setting_ error_ flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)
Y1CH2)	PWM_ Configure_ Reg_CH2	WORD	Read/Write	*Put value 3
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH2	DINT	Read/Write	Data range: -200000 to -1 and 1 to 200000
	Pulse_ Enable_ Flag_CH2	BOOL	Read/Write	Output is enabled when ON
	Frequency_ Setting_ error_ flag_CH2	BOOL	Read Only	ON at error (reset OFF automatically)

If user put config value 3: User can change frequecy even if pulse enable flag is ON

Pulse/DIR mode configuration:

Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y0(CH1)	PWM_ Configure_ Reg_CH1	WORD	Read/Write	*Put value 7
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH1	DINT	Read/Write	Data range: -200000 to -1 and 1 to 200000
	Pulse_ Enable_ Flag_CH1	BOOL	Read/Write	Output is enabled when ON
	Frequency_ Setting_ error_ flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)
Y1CH2)	PWM_ Configure_ Reg_CH2	WORD	Read/Write	*Put value 7
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH2	DINT	Read/Write	Data range: -200000 to -1 and 1 to 200000
	Pulse_ Enable_ Flag_CH2	BOOL	Read/Write	Output is enabled when ON
	Frequency_ Setting_ error_ flag_CH2	BOOL	Read Only	ON at error (reset OFF automatically)

If user put config value 8: User can change frequecy even if pulse enable flag is ON

Fixed Pulse mode configuration:

Output Channel	Register Description	DataType	Attribute	Value in Register/Range
Y0(CH1)	PWM_ Configure_ Reg_CH1	WORD	Read/Write	Put value 9
	Frequency_OR_Min_ Freq_ Setting_ Reg_CH1	DINT	Read/Write	Data range: 1 to 200000
	ON duty_OR_Max_ Freq_ Setting_ Reg_CH1	DWORD	Read/Write	Data range: 1 to 200000
	Pulse_ Enable_ Flag_CH1	BOOL	Read/Write	Output is enabled when ON
	Acceleration_ Time_CH1	WORD	Read/Write	0 to 65535 (x10mSec base)
	Deceleration_ Time_CH1	WORD	Read/Write	0 to 65535 (x10mSec base)
	Total_ Pulses_CH1	DWORD	Read/Write	128 to 4294967296
	Elapsed_ Value_CH1	DWORD	Read Only	0 to 4294967296
	Frequency_ Setting_ error_ flag_CH1	BOOL	Read Only	ON at error (reset OFF automatically)
	Acceleration_ Time_ Setting_ error_ flag_CH1	BOOL	Read Only	Turns ON at error
	Deceleration_ Time_ Setting_ error_ flag_CH1	BOOL	Read Only	Turns ON at error
	No_of_Total_ Pulses_ Setting_ error_ flag_CH1	BOOL	Read Only	Turns ON at error
	End _of_ Total_ Pulses_ flag_CH1	BOOL	Read Only	Turns ON at error
	Trapezoidal_Min_.Pulse_Count_Register_CH1	DWORD	Read Only	0 to 4294967296

Configuration Registers for Analog Inputs:

Analog Input Design: IEC
Analog Inputs :2
Input Channels:V1,V2,I1,I2

Channel	Register Description	DataType	Attribute	Value in Register/Range
V1/I1	Analog Input_CH0_ Type	WORD	Read/Write	1: Voltage input 0-10V 6: Voltage input 0-5V 3: Current input 0-20mA 2: Current input 4-20mA"
	Analog_ Input_CH0_ Register	DINT	Read Only	Reads voltage/current input
V2/I2	Analog Input_CH1_ Type	WORD	Same as CH1	
	Analog_ Input_CH1_ Register	DINT		

Configuration Registers for Analog Outputs:

Analog Output Design: IEC
Analog Output :1
Output Channel:Iout

Channel	Register Description	DataType	Attribute	Value in Register/Range
Iout	Analog_ Output_CH0_ Type	WORD	Read/Write	5: Current output 4-20mA
	Analog _Output_ CH0_Current_ Register	WORD	Read/Write	0 to 4095

Channel	Register Description	DataType	Attribute	Value in Register/Range
Vout	Analog_ Output_CH0_ Type	WORD	Read/Write	2: Voltage output 0-10V
	Analog _Output_ CH0_Voltage_ Register	WORD	Read/Write	0 to 4095

Note: *: Applicable to FL005 expandable series.

Configuration Registers for Analog Inputs for model FL005-0808RP0402U:
Analog Input Design: IEC
Analog Inputs :4
Input Channels:IN1, IN2, IN3, IN4

Channel	Register Description	DataType	Attribute	Value in Register/Range
IN1	Analog Input_CH0_ Type	WORD	Read/Write	1: Voltage input 0-10V 6: Voltage input 0-5V 5: milivolt input 0-50mV 4: milivolt input 0-100mV 3: Current input 0-20mA 2: Current input 4-20mA 7: RTD input alpha1:(-200 to 850ºC) 8: RTD input alpha2:(-100 to 457ºC) 14: Thermocouple J:(-210 to 1200ºC) 15: Thermocouple K:(-200 to 1373ºC)
	Analog_ Input_CH0_ Register	DINT	Read Only	Reads voltage / current input
IN2	Analog Input_CH1_ Type	WORD	Same as CH1	
	Analog_ Input_CH1_ Register	DINT		
IN3	Analog Input_CH1_ Type	WORD	Same as CH1	
	Analog_ Input_CH1_ Register	DINT		
IN4	Analog Input_CH1_ Type	WORD	Same as CH1	
	Analog_ Input_CH1_ Register	DINT		

Configuration Registers for Analog Outputs:

Analog Output Design: IEC
Analog Output : 2
Output Channel: VO1,IO1,VO2,IO2

Channel	Register Description	DataType	Attribute	Value in Register/Range
VO1/IO1	Analog_ Output_CH0_ Type	WORD	Read/Write	5: Current output 4-20mA 2: Voltage output 0-10V
	Analog _Output_ CH0_Current_ Register	WORD	Read/Write	0 to 4095
	Analog _Output_ CH0_Voltage_ Register	WORD	Read/Write	0 to 4095
VO2/IO2	Analog_ Output_CH0_ Type	WORD	Read/Write	5: Current output 4-20mA 2: Voltage output 0-10V
	Analog _Output_ CH0_Current_ Register	WORD	Read/Write	0 to 4095
	Analog _Output_ CH0_Voltage_ Register	WORD	Read/Write	0 to 4095

OPERATING SYSTEMS OVERVIEW

In this chapter. . . .

♦ Operating Modes

6.1 Operating System Overview

The FlexiLogics® base models has three basic operation modes, the RUN mode, the HALT mode and the ERROR mode. It also has the HOLD and RUN-F modes mainly for system checking.

RUN: The RUN mode is a normal control-operation mode.
In this mode, the FlexiLogics® base model reads input signals, executes the user program, and updates the output devices according to the user program. In the RUN mode, FlexiLogics® unit executes the user's ladder program logic, which is the basic operation of a PLC. In this mode task defined in the application are also executed.
EEPROM write are possible while the FlexiLogics® base is in the RUN mode.

HALT: The HALT mode is a STOP mode.
In this mode, user program execution is stopped and all outputs are brought to zero (0).
Program loading into the FlexiLogics® base unit is possible in the HALT mode.

ERROR: The ERROR mode is a shutdown mode as a result of self-diagnosis.
The FlexiLogics® base model enters the ERROR mode if internal error is detected by self-diagnosis. In this mode, program execution is stopped and all outputs are brought to "Error State Output Condition" defined in the application. The cause of the shutdown can be confirmed by connecting the programming tool.
To exit from the ERROR mode, execute the Error Reset command from the programming tool, or cycle power off and then on again.

HOLD: The HOLD mode is provided mainly for checking the external I/O signals.
In this mode, user program execution is stopped, with input and output updating is executed. It is therefore possible to suspend program execution while holding the output state. Moreover, a desired output state can be established by setting any data by using the programming tool.

RUN-F: The RUN-F mode is a forced RUN mode provided for program checking.
This mode is effective when using the expansion I/Os.
Different from the normal RUN mode, the RUN-F mode allows operation even if the registered I/O modules are not actually mounted.
In this mode the physical outputs are not updated; only the registers are updated.

The operation modes are switched by the mode control switch provided on the FlexiLogics® base model and the mode control commands issued from the programming tool.

The mode transition conditions are shown below:
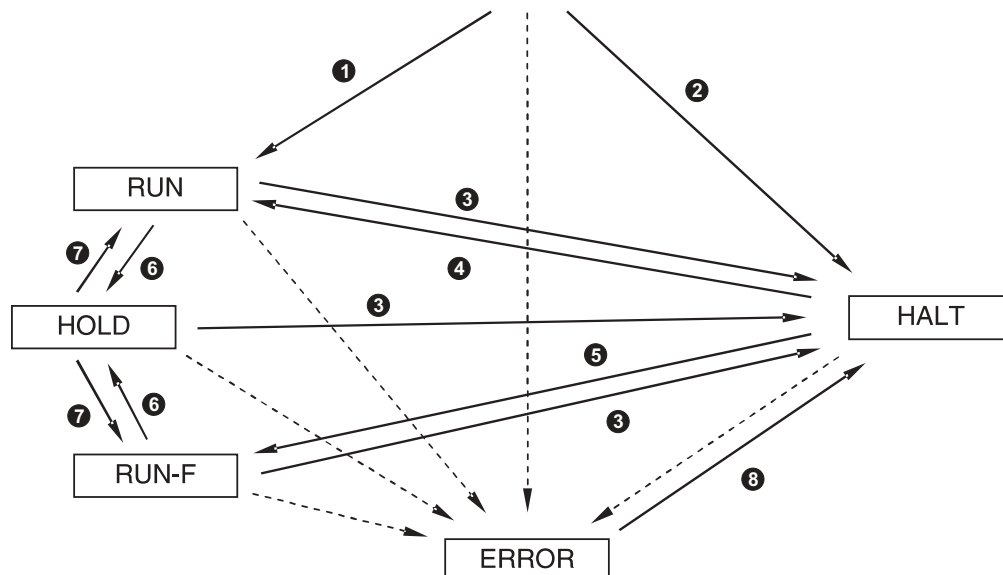
❶   Mode control switch is in R (RUN) side.

❷   Mode control switch is in H (HALT) side.

❸   Mode control switch is turned to H (HALT) side, or HALT command is issued from the programming tool.

❹   Mode control switch is turned to R (RUN) side, or RUN command is issued from the programming tool.

❺   Force RUN (RUN-F) command is issued from the programming tool.

❻   HOLD command is issued from the programming tool.

❼   HOLD Cancel command is issued from the programming tool.

❽   Error Reset command is issued from the programming tool.

– – –> (dotted line) Error is detected by self-diagnosis.

Note:
The commands from the programming tool are available when the mode control switch is in R (RUN) side.

PROGRAMMING INFORMATION

In this chapter. . . .

♦ Devices and registers

♦ Memory allocation of XW, YW and MW

♦ Index modifications

♦ Real-time clock/calendar

♦ User Program

♦ Pragramming Language

♦ Program execution Sequence

7.1   Devices Registers

Broadly two types of registers are present in PLC register database:

1. Internal PLC Registers: Implemented through buffers present in RAM of Base module.

Data Registers (D).
Auxillary Registers (BW/B).
System Registers (SW).
System coil (S).
Timer Registers (T).
Counter Registers (C).
Base module configuration Registers (MW/M) (Coils and registers are mapped)
I/O Registers of Base Module (XW/X, YW/Y) (Coils and registers are mapped)
Timer devices (T.)
Counter devices (C.)

2. Expansion and Serial I/O Registers: These are external to the unit and can be accessed by communicating with external module over SPI or serial:

I/O Registers of expansion module and serial module (XW/X, YW/Y).
Configuration Registers (MW/M).

XW, YW, MW, X, Y, M register types of both the register types; viz: base, expansion and serial are encoded with the following addressing scheme:

XWssrr	
YWssrr	ss: Slot Number
MWssrr	rr: register number in slot ss
Xssccc	
Yssccc	ss: Slot Number
Mssccc	ccc: coil number in slot ss

Note:
"0" (Zero) is the slot number of base module.

You can allot "ss" (slot number) from "Project Information" docker window; "IO Allocation\Local" section as shown below:
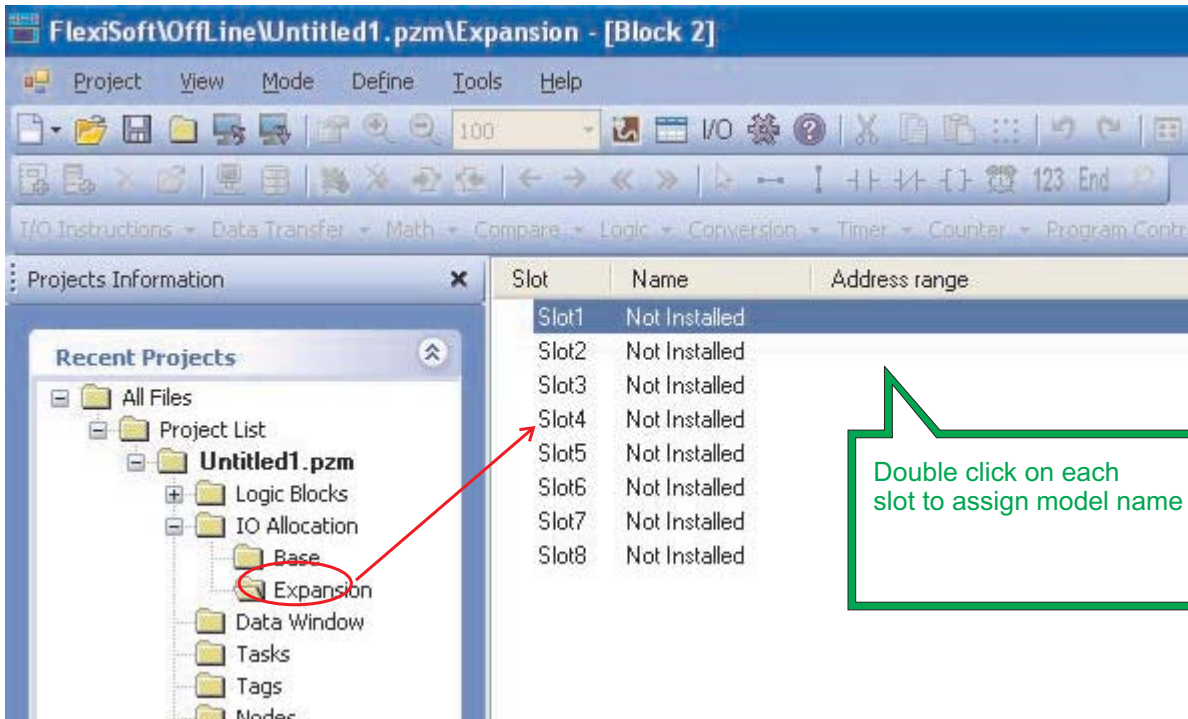
When you double click on the highlighted slot section; below shown window will appear:
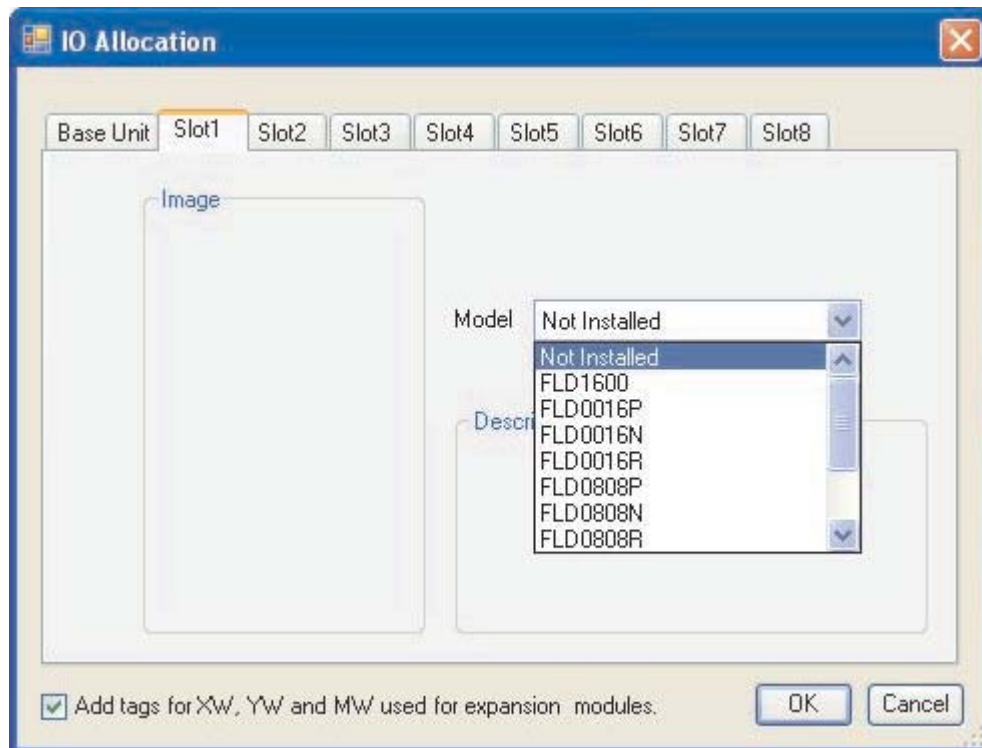
Note: Here you have to allot slots seriallly only and if you tried to allott randomly; it will show an error as "Expansion Modules for PLC are sequential hence, previous slot can not be empty"

Thus, you can assign the expansion models as per your requirement as follows:

Slot	Name	Address range	Description
Slot1	FLD0016P	Y [01000 - 01015] , [YW0100]	16 PNP type transistor output digital module
Slot2	FLD0016P	Y [02000 - 02015] , [YW0200]	16 PNP type transistor output digital module
Slot3	FLD1600	X [03000 - 03015] , [XW0300]	16 Input Digital Module
Slot4	FLD0808N	X [04000 - 04007] , Y [04000 - 04007]...	8 Digital input, 8 NPN transistor output digital module
Slot5	Not Installed		
Slot6	Not Installed		
Slot7	Not Installed		
Slot8	Not Installed		

(Project list panel: Untitled1.pzm, Logic Blocks, IO Allocation, Base, Expansion, Data Window)

In the above shown screen, you can observe that the address range for the expansion models assign for Slot 1 through Slot 4, it has taken first two digit as 01, 02, 03 & 04 serially.
And last three digits will indiacate the register numbers.

The external input signals are allocated to the external input devices/registers (X/XW).
The external output signals are allocated to the external output devices/registers (Y/YW).
The register numbers of the external input and output registers are consecutive. Thus one register number can be assigned for either input or output.

X01000 – – – – – – – – – X01007

FLDD0808

Y01000 – – – – – – – – – Y01007

X 0 1 0 0 0
— X: Input
— Slot Number (Slot 1)
— Input: 8 Nos. (000 to 0007)

Y 0 1 0 0 0
— Y: Output
— Slot Number (Slot 1)
— Output: 8 Nos. (000 to 007)

Similarly.....

X02000 – – – – – – – – – X01003

FLD0404

Y02000 – – – – – – – – – Y01003

X 0 2 0 0 0
— X: Input
— Slot Number (Slot 2)
— Input: 4 Nos. (000 to 0003)

Y 0 2 0 0 0
— Y: Output
— Slot Number (Slot 2)
— Output: 4 Nos. (000 to 003)

System Register for Special Function Inputs and PWM outputs:

Register Description	Register Number
Configuration Register for Special inputs	MW10
Configuration Register for PWM output	MW11
Single Phase Counter Set Value Channel 1 Channel 2	 MW12, MW13 MW14, MW15
Count Value Channel 1 Channel 2	 MW16, MW17 MW18, MW19
Soft Gate (Device) Channel 1 Channel 2 Interrupt Enable (Device) Channel 1 Channel 2 Count Preset (Device) Channel 1 Channel 2	 M 320 M 328 M 322 M330 M323 M331

Register Description	Register Number
Single Phase Speed Counter	
Sampling Time	
Channel 1	MW12
Channel 2	MW14
Hold Value	
Channel 1	MW16, MW17
Channel 2	MW18, MW19
Soft Gate (Device)	
Channel 1	M 320
Channel 2	M 328
Quadrature Bi Pulse	
Comparision Value1	MW12, MW13
Comparision Value2	MW14, MW15
Count Value	MW16, MW17
Soft Gate (Device)	M320
Interrupt Enable1 (Device)	M322
Count Preset 1 (Device)	M324
Interrupt Enable 2 (Device)	M323
Count Preset 2 (Device)	M325
Pulse Output Function	
Pulse Enable Flag (Device)	M336
Frequency Setting Register	MW22, MW23
Frequency Setting Error Flag (Device)	M191
PWM Output Function	
Pulse Enable Flag (Device)	M336
Frequency Setting Register	MW22, MW23
ON duty setting register	MW24, MW25
pulse width error flag	M189
On duty setting error flag	M190
Frequency Setting Error Flag (Device)	M191

System Coil for Debug Function

Register Description	Register Number
S0000	Carry bit
S0021	Communication recover enable bit for port1
S0022	Communication recover enable bit for port2
S0034	Instruction error flag

No	"Device/"register"	Name	Function
1	M0016	CPU error (down)	ON at error state
2	M0017	I/O error	ON at error state
3	M0018	Program error (down)	ON at error state
4	M0019	Not Used	
5	M0020	Not Used	
6	M0021	"Clock/calendar error"(alarm)"	ON when clock/calendar data is illegal
7	M0022	"Retentive data invalid"(alarm)"	ON when retentive data in RAM are invalid
8	M0023	Not Used	
9	M0024	Not Used	
10	M0025	Not Used	
11	M0026	Not Used	
12	M0027	"Watchdog timer error"(down)"	ON at error state
13	M0028	Not Used	
14	M0029	I/O mismatch (down)	ON at error state
15	M0030	Analog Power Fail (Alarm)	ON at error state
16	M0031	BCC error (down)	ON at error state
17	M0032	Not Used	
18	M0033	Scan time over (down)	ON when the scan time exceeds 200 ms
19	M0034	Not Used	
20	M0035	Not Used	
21	M0036	Not Used	
22	M0037	Not Used	
23	M0480	System timer coil for 0.1 sec interval	
24	M0481	System timer coil for 0.2 sec interval	
25	M0482	System timer coil for 0.4 sec interval	
26	M0483	System timer coil for 0.8 sec interval	
27	M0484	System timer coil for 1 sec interval	
28	M0485	System timer coil for 2 sec interval	
29	M0486	System timer coil for 4 sec interval	
30	M0487	System timer coil for 8 sec interval	
31	M0496	Timer interrupt execution status	ON when Timer program is executing
32	M0497	IO1 interrupt execution status	ON when IO1 program is executing
33	M0498	IO2 interrupt execution status	ON when IO2 program is executing
34	M0504	Hold mode status	On when PLC is in hold mode.
35	M0512	ALWAYS ON	
36	M0513	ALWAYS OFF	

When COM ports are configured as Modbus slaves, the internal PLC tags are mapped to the modbus addresses as given in the following table:

PLC Tag description	Reg. Addressing	Bit Addressing	Modbus address
I/O register	XW(400)	X (6400)	440001 - 440400
	YW(400)	Y (6400)	441001 - 441400
Auxiliary registers	BW00-BW255	B0000 to B4095	442001 - 442256
System Registers	SW00-SW256	Not Mapped	420001 - 420256
Timer Registers	T00-T255	Not Mapped	400001 - 400256
Counter Register	C00-C255	Not Mapped	410001 - 410256
Data Registers	D0000-D4095	Not Mapped	450001 - 454096
Retentive Registers	Not Mapped	430001 - 431400	
Index Register (I,J,K)	I	Not Mapped	443001
	J	Not Mapped	443002
	K	Not Mapped	443003
Configuration MW registers	MW(1600)	M(25600)	460001-461600

COILS:

		TR0- TR15	
Input Coil (R)		X (6400)	000001 - 006400
Output Coil (R/W)		Y (6400)	010001 - 016400
System Coil (R/W)		S 0000 to S 0099	020001 - 020100
Internal Coil (R/W)		B 0000 to B 1023	030001 - 034096
Timer Devices (256 bits = 16 words)		T. 000 to T. 255	021001 - 021256
Counter Devices (256 bits = 16 words)		C. 000 to C. 255	022001 - 022256
Configuration MW coils		M(25600)	035001 - 060600

7.2 Memory Allocation of XW, YW and MW

Memory for XW, YW and MW registers for particular model is allocated by software at the time of I/O allocation. The number of XW, YW and MW for the particular model is as per the table given below:

Sr. No.	Model Name	Description	XW	YW	MW	X	Y
1	FL010	FlexiLogics® Base Model	1	1	60	8	8
2	FL050	FlexiLogics® Base Module with Ethernet	0	0	60	0	0
3	FLD1600	16 Input Digital Module	1	0	0	16	0
4	FLD0016P	16 PNP type transistor output digital module	0	1	0	0	16
5	FLD0016N	16 NPN type transistor output digital module	0	1	0	0	16
6	FLD0016R	16 Relay type output digital module	0	1	0	0	16
7	FLD0808P	8 Digital input, 8 PNP type transistor output digital module	1	1	0	8	8
8	FLD0808N	8 Digital input, 8 NPN type transistor output digital module	1	1	0	8	8
9	FLD0808R	8 Digital input, 8 Relay type output digital module	1	1	0	8	8
10	FLA0800L	0-10 VDC or 4-20 mA (16 Bit) 8 channel input model	8	0	50	0	0
11	FLA0004	0-10 VDC or 4-20 mA (16 Bit) 4 channel output model	0	4	30	0	0
12	FLA0402U	4 Universal Analog Inputs (RTD, TC, 4-20 mA, 0-20mA,0-50mV, 0-100mV, 0-10VDC) (16 Bit), 2 channel Voltage/Current (16 Bit) outputs.	4	2	40	0	0

The allocation is sequential. If any particular model does not have XW / YW / MW defined then the memory is not allocated in the array for that model. This array is sequentially mapped to Modbus registers.

Consider the example that user has configured the models as below:

Slot 0	:	FL010	:	XW : 1,	YW : 1,	MW : 60
Slot 1	:	FLD0808R	:	XW : 1,	YW : 1,	MW : 0
Slot 2	:	FLD0016R	:	XW : 0,	YW : 1,	MW : 0
Slot 3	:	FLD0808N	:	XW : 1,	YW : 1,	MW : 0
Slot 4	:	FLD1600	:	XW : 1,	YW : 0,	MW : 0
Slot 5	:	FLA0800L	:	XW : 8,	YW : 0,	MW : 50

Then the array of XW, YW and MW will be as follows:

XW	Allocated for register	Modbus Slave register address
0	FL010 (XW0000)	440001
1	FLD0808R (XW0100)	440002
2	FLD0808N (XW0300)	440003
3	FLD1600 (XW0400)	440004
4	FLD1600 (XW0401)	440005
5	FLA0800L (XW0500)	440006
6	FLA0800L (XW0501)	440007
7	FLA0800L (XW0502)	440008
8	FLA0800L (XW0503)	440009
9	FLA0800L (XW0504)	440010
10	FLA0800L (XW0505)	440011
11	FLA0800L (XW0506)	440012
12	FLA0800L (XW0507)	440013
13	Not used	
….	Not used	
399	Not used	

YW	Allocated for register	Modbus Slave register address
0	FL010 (YW0000)	441001
1	FLD0808R (YW0100)	441002
2	FLD0016R (YW0200)	441003
3	FLD0808N (YW0300)	441004
4	Not used	
….	Not used	
….	Not used	
399	Not used	

MW	Allocated for register	Modbus Slave register address
0 to 59	FL010 (MW0000 to MW0059)	460001 to 460060
60 to 109	FLA0800L (MW0500 to MW0549)	460061 to 460110
110	Not used	
….	Not used	
….	Not used	
1599	Not used	

7.3   Index Modification

When registers are used as operands of instructions, the method of directly designating the register address as shown in Example 1) below is called 'direct addressing'.

As opposed to this, the method of indirectly designating the register by combination with the contents of the index register (I, J, or K) as shown in Example 2) below is called 'indirect addressing'. In particular, in this case, since the address is modified using an index register, this is called 'index modification'.

Example - 1)

```
  BW0010            D01000
  T-BW10   MOV-W    T-D1000
```
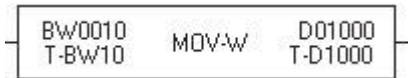
Data transfer instruction
Transfer data of BW010 to D1000

Example - 2)

```
  BW0010 + I            D00000 + J
    T-BW10   MOV-W        T-D0
```

Data transfer instruction (with index modification)
Transfer data of BW(10 + I) to D(0000 + J)
(If I = 3 and J = 200, the data of BW13 is transferred to D0200).

There are 3 types of index register, I, J and K. Each type processes 16-bit integers (-32768 to 32767). There are no particular differences in function between these 3 types of index registers.

There is no special instruction for substituting values in these index registers. These are designated as destination of data transfer instructions, etc.

```
┌─────────────────────────────┐
│   64      MOV-W    I00000    │     (substitutes 64 in index register I)
│                   T-I0      │
└─────────────────────────────┘

┌─────────────────────────────┐
│   35      MOV-W    J00000    │     (substitutes the data of D0035 in index register J)
│                   T-J0      │
└─────────────────────────────┘

┌─────────────────────────────┐
│ BW0020 (T-BW20)             │     (substitutes the result of addition in index register K)
│             ADD-W   K00000  │
│ 30                  (T-K0)  │
└─────────────────────────────┘
```

> Note:
> (1) The index modification is available for RW, T, C and D registers.
> (2) If index registers are used as a double-length register, only the combinations J×I and K×J
>   are allowed.

The followings are examples of index modifications:

```
BW0010 + I
  T-BW10
```
⟵ - - - - ⟍ When I = 0, it designates BW10.
              When I = 1, it designates BW11.
              When I = -1, it designates BW09.
              When I = 10, it designates BW20.
              When I = -10, it designates BW00.

```
┌─────────────────────────┐
│ D00200 + J   MOV-DW      │
│   T-D200                 │
└─────────────────────────┘
```
⟵ - - ⟍ When J = 0, it designates D0201×D0200.
          When J = 1, it designates D0202×D0201.
          When J = 2, it designates D0203×D0202.
          When J = -1, it designates D0200×D0199.
          When J = -2, it designates D0199×D0198.

> Note:
> Be careful that the registers do not exceed the address range by the index modification.
> The address range is not checked by the FlexiLogics® unit.
>
> Substitutions of values into index registers and index modifications can be used any times
> in a program. Normally, the program will be easier to see if a value substitution into an index
> register is positioned immediately before the index modification.

7.4   Real-time clock / calendar

The FlexiLogics® base unit is equipped with the real-time clock/calendar for day of the month, month, year, hour, minute, second and day of week. This data is stored in the special registers SW10 to SW16 by unsigned integer format as follows:

	F	8 7	8	
D0050	00	Day of month	00 to 99 (2000 - 2099)	
D0051	00	Month	01 to 12	
D0052	00	Year	01 to 31	Calendar
D0053	00	Hour	00 to 23	LSI
D0054	00	Minute	00 to 59	
D0055	00	Second	00 to 59	
D0056	00	Day of week	00 to 06	
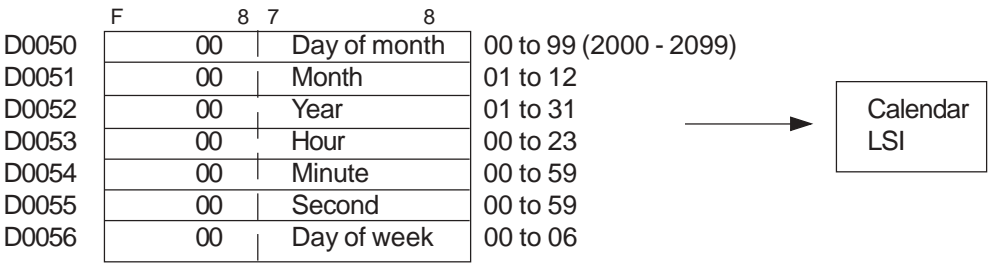
Note:
The day of the week is automatically,
Sunday = 0, Monday = 1, Tuesday = 2............. Saturday = 6

Program example:
In the following circuit, output Y007 turns ON for 1 minute at every Sunday 6 pm.

```
  ┌─────────┐   ┌─────────┐   ┌─────────┐            Y00007
1 │ SW0016  │   │ SW0013  │   │ SW0014  │             [ ]
  │ T-SW16  = 0 │ T-SW13  = 24│ T-SW14  = 0 │         T-Y7
  └─────────┘   └─────────┘   └─────────┘
```
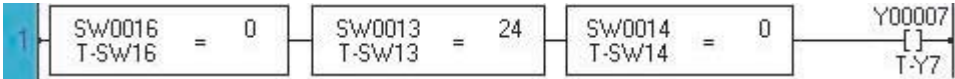
Clock/calendar back-up:
The clock / calender continues to update using internal battery backup even if the external 24 VDC power to FlexiLogics® is switched OFF. It's backtime period is as follows:

Model name	Backlife
FL010,FL050	10 Years
FL011,FL051,FL011-S1	4 Years

Setting the clock/calendar:
You can set the clock/calendar data, by using the Calendar Set instruction (CLND) in the user program.

7.5   User program

The user program is stored by each program types as shown in the following diagram and is managed by units called blocks in each program types.

User program configuration
(Program types)

Program type internal configuration
(Blocks)

Main program
Sub-program #1
Timer interrupt
I/O interrupt #1
I/O interrupt #2
Subroutine

Block 1
Block 2
Block 10
Block N (N = max. 256)
Block 1
⋮
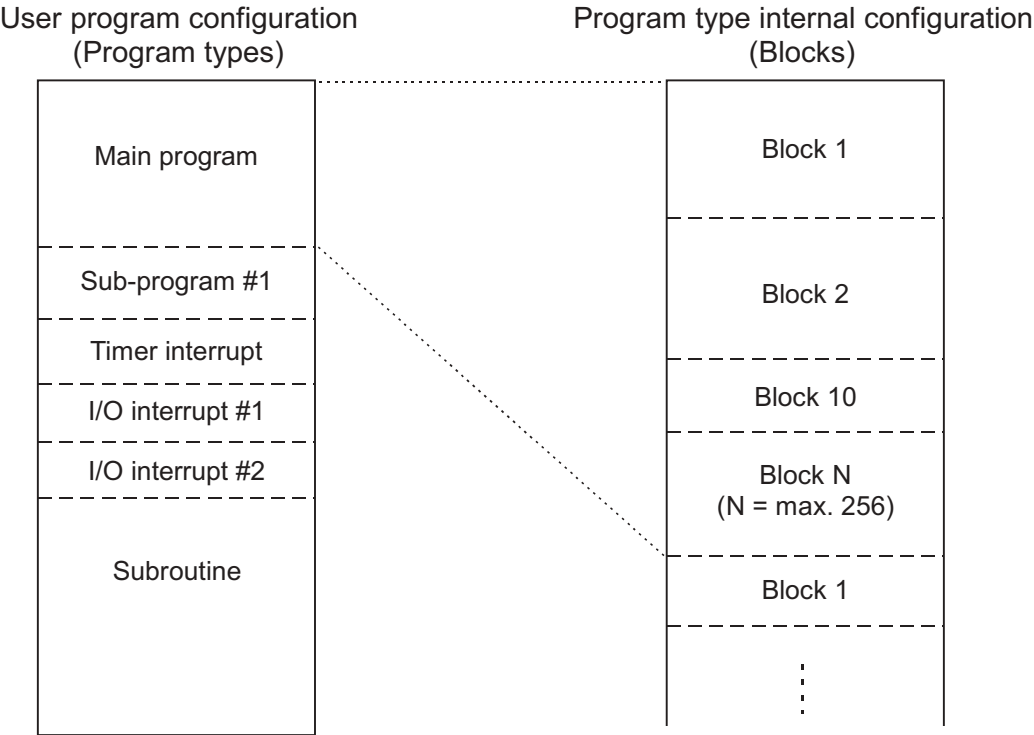
In the user program, the main program is the core. The scan operation explained is for the main program. The operation of other program types are explained in the following sections:

The following 6 program types are supported by the FlexiLogics® unit.

(1)   Main program
(2)   Sub-program #1
(3)   Timer interrupt program
(4)   I/O interrupt program #1
(5)   I/O interrupt program #2
(6)   Subroutine

The blocks are just separators of the program, and have no effect on the program execution. However, by dividing the user program into some blocks, the program becomes easy to understand. The block numbers need not be consecutive. In each program type and block, there is no limit of program capacity. The only limit is the total capacity.

7.5.1   Main Program

The main program is the core of the user program. It is executed once in each scan.

1 scan time

Mode	I/O	Timer	Main program

Mode	I/O	Timer	Main program
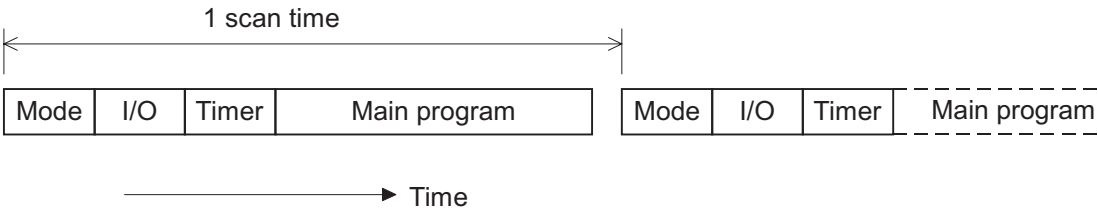
→ Time

In the above figure,

Mode means the mode control operation
I/O means the I/O update processing
Timer means the timer up date processing
Main program means the main program execution
the self-diagnostic check and peripheral support are omitted in this figure.

The end of the main program is recognized by the END instruction. Although instructions may be present after the END instruction, that portion will not be executed.

7.5.2   Sub-program # 1

If the sub-program #1 is programmed, it is executed once at the beginning of the first scan (before main program execution). Therefore, the sub-program #1 can be used to set the initial value into the registers. The sub-program #1 is called the initial program.

The figure below shows the first scan operation.

RUN mode
transition   1st scan   2nd scan

| I/O | Timer | Sub#1 | Main program | | Mode | I/O | Timer | Main program |
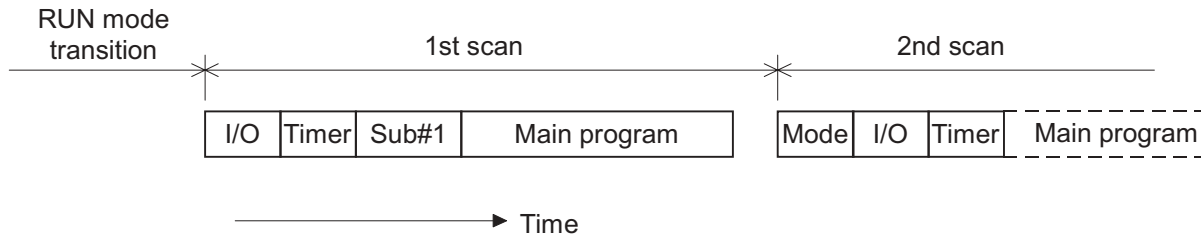
→ Time

The end of the sub-program #1 is recognized by the END instruction.

7.5.3   Timer interrupt program

The timer interrupt is the highest priority task. It is executed cyclically with a user specified interval, while suspending other operation.
The operations interval is set in the system information. (1 to 1000 ms).

| 1 scan | 1 scan | 1 scan | 1 scan |

Scan

Timer interrupt

Timer interrupt
interval

Timer interrupt
interval
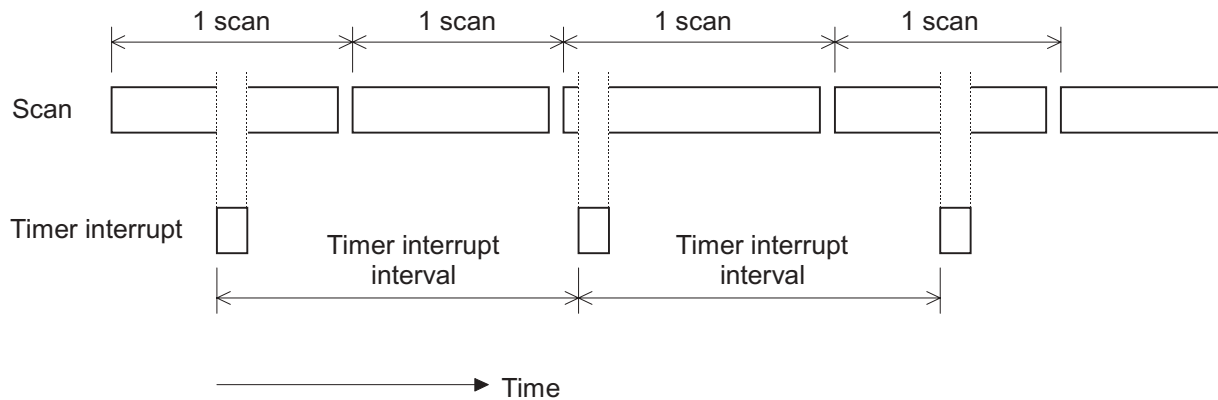
→ Time

The end of the timer interrupt is recognized by the IRET instruction.

7.5.4   I/O interrupt program

The I/O interrupt program is also the highest priority task. It is executed immediately when the interrupt factor is generated, while suspending other operations.
The following 2 types I/O interrupt programs are supported in the FlexiLogics® unit.
(1)   I/O interrupt #1
        The I/O interrupt #1 is used with the high speed counter function. When the count value reaches the preset value, etc., the I/O interrupt #1 is activated immediately with suspending other operation. The end of the I/O interrupt #1 is recognized by the IRET instruction.
(2)   I/O interrupt #2
        The I/O interrupt #2 is also used with the high speed counter function.

If an interrupt factor is generated while other interrupt program is executing (including the timer interrupt), the interrupt factor is hold. Then it will be activated after finishing the other interrupt program execution.

If two or more interrupt factors are generated at the same time, the priority is as follows:
Timer > I/O #1 > I/O #2

7.5.5   Subroutines

In the program type 'Subroutine' total 256 numbers of subroutines can be programmed.
The subroutine is not an independent program. It is called from other program types (main program, sub-program, interrupt program) and from other subroutines.

One subroutine is started with the CALL instruction, and ended by the RET instruction.
It is necessary to assign a subroutine number to the CALL instruction.
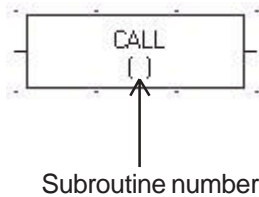
Subroutine number

The RET instruction has no subroutine number.
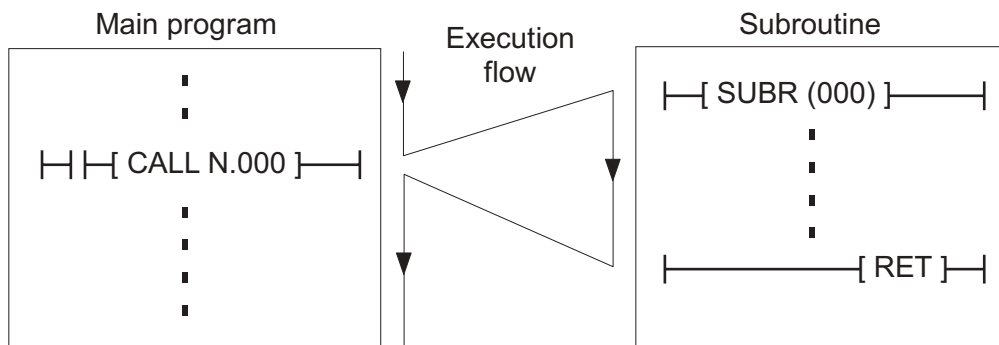
Note: (1) Multiple subroutines can be programmed in a block. However, one subroutine in one block is recommended.

7.6 Programming Language

The programming language of the FlexiLogics® unit is 'ladder diagram'. Ladder diagram is a language which composes program using relay symbols as a base in an image similar to a hard-wired relay sequence. In the FlexiLogics® unit, in order to achieve an efficient data-processing program, ladder diagram which are combinations of relay symbols and function blocks are used.

The ladder diagram program is constructed by units called 'rung'. A rung is defined as one network which is connected to each other.
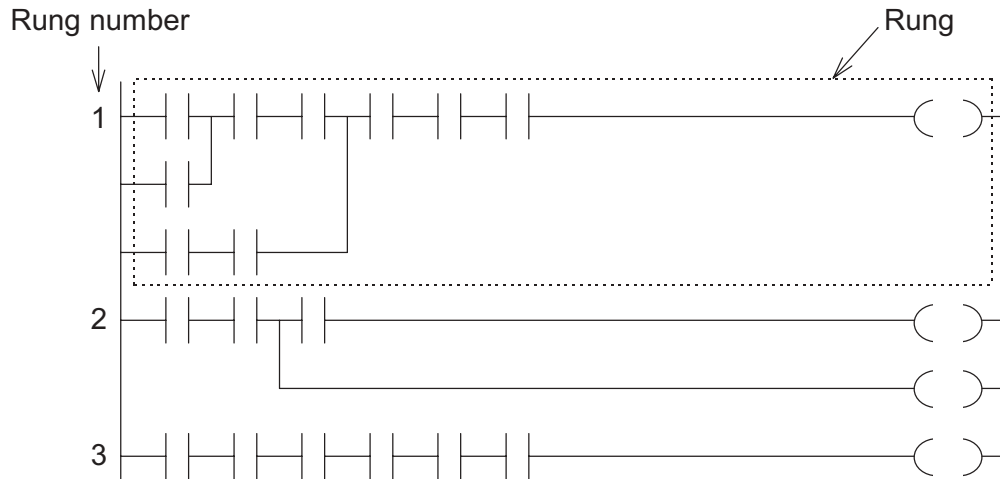
The rung numbers are a series of numbers (decimal number) starting from 1, and cannot be skipped. There is no limit to the number of rungs.
The size of any one rung is limited to 50 lines X 11 columns.
A example of a ladder diagram program is shown below.
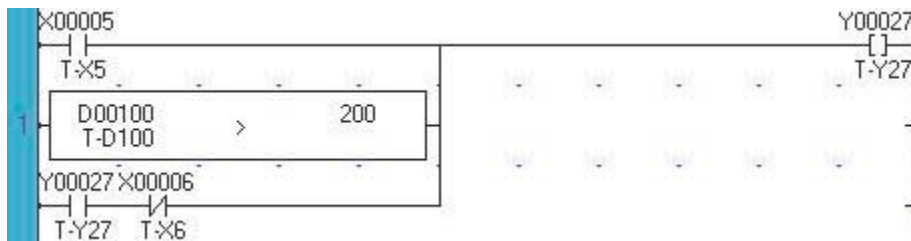
When X005 is ON or the data of D0100 is greater than 200, Y027 comes ON. Y027 stays ON even if X005 is OFF and the data of D0100 is 200 or less.
Y027 will come OFF when X006 comes ON.

7.7   Program execution sequence

The instructions execution sequence is shown below.
(1) They are executed in the sequence from block 1 through the final block which contains the END instruction (or IRET in an interrupt program).

(2) They are executed in the sequence from rung 1 through the final rung in a block (or the END instruction).

(3) They are executed according to the following rules in any one rung.

① When there is no vertical connection, they are executed from left to right.

② When there is an OR connection, the OR logic portion is executed first.
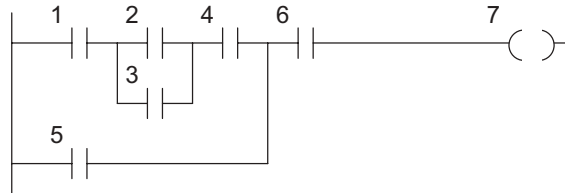
③ When there is a branch, they are executed in the order from the upper line to the lower line.
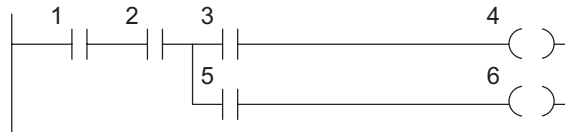
④ A combination of ② and ③ above.
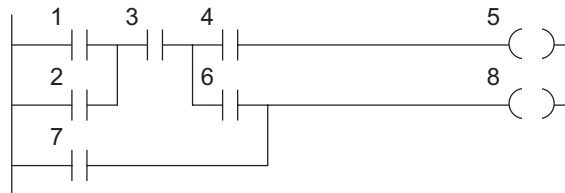
The instructions execution sequence in which function instructions are included also follows the above rules. However, for program execution control instructions, such as jumps (JCS), loops (FOR-NEXT), subroutines (CALL-SUBR-RET), it will depend on the specifications of each instruction.

<u>TROUBLESHOOTING</u>

In this chapter. . . .

♦   Troubleshooting Procedure

♦   Self Diagnostic Item

8.1 Troubleshooting Procedure

⚠ CAUTION	1. Pay special attention during the troubleshooting to minimize the risk of electrical shock.
	2. Turn off power immediately if the FlexiLogics® unit or related equipment is emitting smoke or odor. Operation under such situation can cause fire or electrical shock.
	3. Turn off power before removing or replacing units, modules, terminal blocks or wires. Failure to do so can cause electrical shock or damage to the PLC and related equipment.
	4. Contact REPL for repairing if the FlexiLogics® basic unit or related equipment is failed. REPL will not guarantee proper operation nor safety for unauthorized repairing.

If a trouble occurs, determine whether the cause lies in the mechanical side or in the control system (PLC) side. A problem may cause a secondary problem, therefore, try to determine the cause of trouble by considering the whole system.

If the problem is found in the FlexiLogics® base PLC model, check the following points:

PWR (power) LED	— Not lit →	Follow the procedure in Power supply check
↓ Lit		
RUN LED	— Not lit →	Follow the procedure in CPU check
↓ Lit		
User program	— Not normal →	Follow the procedure in Program check
↓ Normal operation		
Input operation	— Not normal →	Follow the procedure in Input check
↓ Normal operation		
Output operation	— Not normal →	Follow the procedure in Output check
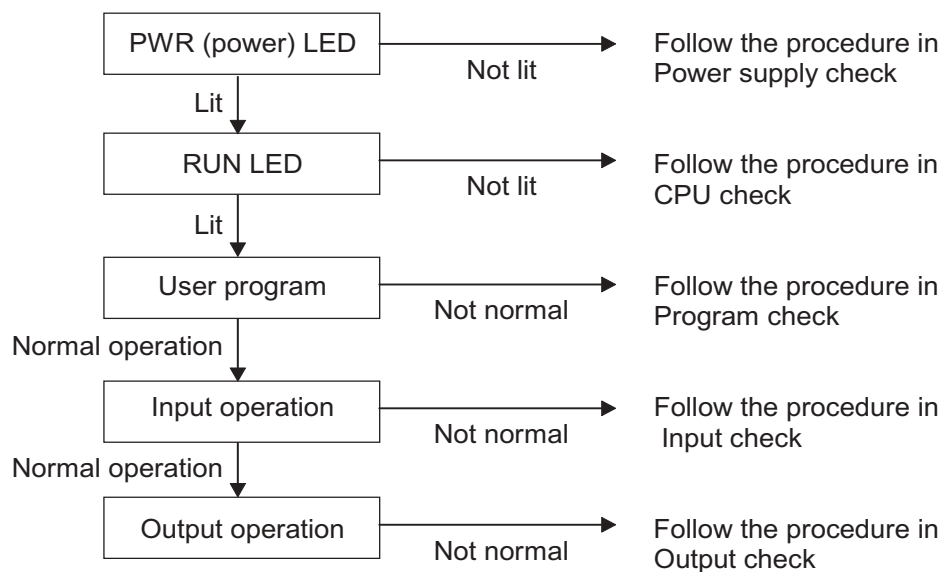
8.1.1 Power Supply Check

If the PWR (power) LED is not lit after power on, check the following points.

```
┌──────────────────────────────┐
│  Check the power connection  │·················· Connection terminals are correct.
└──────────────────────────────┘                   The terminal screws are not loose.
              Correct                               The terminal block is installed securely.
               ↓
┌──────────────────────────────┐
│    Check the power voltage    │·················· 24 VDC; +/- 15%
│      at the FL®'s terminal    │
└──────────────────────────────┘
              Normal
               ↓
┌──────────────────────────────┐
│    Remove the programmer      │·················· If the PWR LED becomes normal, the
│        port connector         │                   internal supply may be shorted in the
└──────────────────────────────┘                   external connections of this port.
            Still unlit
               ↓
┌──────────────────────────────┐
│      Remove the expansion     │·················· If the PWR LED is still OFF, the FL®
│             Unit              │                    basic unit may be faulty. Replace the unit.
└──────────────────────────────┘
               Lit
               ↓
┌──────────────────────────────┐
│  Insert the removed expansion │··················         Replace the faulty expansion unit.
│   Unit one by one to pinpoint │
│      the faulty expansion     │
└──────────────────────────────┘
```

8.1.2 CPU Check

If the RUN LED is not lit after power on, check the following points.

```
┌──────────────────────────────┐
│    Check the position of the  │·················· If it is not in R (RUN) position, turn the
│       mode control switch     │                   switch to R (RUN) position.
└──────────────────────────────┘
               ↓
┌──────────────────────────────┐
│   Check the ERR (error) LED   │··················  If the ERR LED is lit, the FL® base PLC model
└──────────────────────────────┘                   is in the ERROR mode. Confirm the error
               ↓                                    message by connecting the programming
               ↓                                    Tool.
               ↓                                    If only ERR LED is blinking either ladder or
               ↓                                    application is invalid. Download the program
               ↓                                    again.
┌──────────────────────────────┐
│  Is the RUN & ERR LED blinking ? │················ Firmware is invalid. Download the firmware again.
└──────────────────────────────┘
```

8.1.3 Program Check

Check the user program based on the following points if it is running but the operation does not work as intended.

1. Whether duplicated coils are not programmed.
2. Whether a coil device and a destination of a function instruction are not overlapping.
3. Whether the ON/OFF duration of an external input signal is not shorter than the unit's scan time.
4. Whether a register/device which is used in the main program is not operated erroneously in the interrupt program.

8.1.4 Input Check

If the program is running but the external input signal is not read normally, check the following points:

Is the input status LED changed ON/OFF according to the corresponding input device operation ?	If not, check the input voltage at the FL®'s input terminals. If the voltage is not normal, check the input device and the cable. If the voltage is normal, the FL®'s input circuit may be faulty.

Yes

Connect the programming tool, and monitor the corresponding X device state in RUN mode	If the monitored X device state is identical to the state of the input status LED, the cause may lie in the user program or in the environment.

Not normal

Check whether the X device is forced or not	If it is forced, release the force designation then execute the EEPROM write operation.

Not forced

Check whether the I/O allocation table is identical to the actual I/O configuration	In force run mode physical inputs and outputs are not updated.

Not identical

Execute the automatic I/O allocation, and check whether the I/O allocation table is now identical to the actual I/O configuration	Download the application now and execute ladder.

No

Check the expansion unit Hardware one by one the expansion rack ?	Replace the faulty unit or else the FL® basic unit may be faulty.

8.1.5   Output Check

If the output status monitored on the programming tool is normal but the external output device (load) is not operated normally, check the following points:

```
        ┌──────────────────────────┐
        │  Is the output status LED │
  No    │  changed ON/OFF according │
 ◄──────│  to the program execution?│
        └──────────────────────────┘
                    │ Yes
                    ▼
        ┌──────────────────────────┐
        │  Check the voltage between│
        │  the output terminal and  │
        │  its common terminal.     │
        └──────────────────────────┘
                    │ Normal
                    ▼
        ┌──────────────────────────┐        If it is not normal, check the output cable
        │  Check the voltage at the │ ······ connections.
        │  load                     │        If it is normal, check the specification of
        └──────────────────────────┘        the load, also check environmental factors.

                    ▼
        ┌──────────────────────────┐
        │  Check the I/O allocation │        In force run mode, physical inputs and
        │  table is identical to    │ ······ outputs are not updated.
        │  the actual I/O config    │
        └──────────────────────────┘
                    │ Not identical
                    ▼
        ┌──────────────────────────┐
        │  Execute the automatic I/O│
        │  allocation, and check    │        Download the application now and
        │  whether the I/O          │ ······ execute the ladder.
        │  allocation table is now  │
        │  identical to the actual  │
        │  I/O configuration        │
        └──────────────────────────┘
                    │ No
                    ▼
        ┌──────────────────────────┐
        │  Check for faulty         │        Replace the faulty expansion unit.
        │  expansion unit one by one│ ······
        └──────────────────────────┘
```

8.1.6   Environmental Problem

If the following improper operations occur in the controlled system, check possible environmental factors.

      (1)   If an improper operation occurs synchronously with the operation of I/O devices:
The noise generated at ON/OFF of the output device (load) may be the cause of the problem. Take necessary measures mentioned in section Precaution.

      (2)   If an improper operation occurs synchronously with the operation of surrounding equipment or high-frequency equipment:
The noise induced in I/O signal lines may be the cause of the problem. The surge voltage, voltage fluctuations, or differences of grounding potentials may cause the problem, depending on the power supply system or the grounding system. Check the operation in accordance with the precautions as maintioned. For some cases, isolation from the ground may lead to the stable operation.

      (3)   If an improper operation occurs synchronously with the operation of machinery:
The vibration of the equipment may cause the problem. Check that the installation status of the units and take necessary measures.

      (4)   If a similar failure is repeated after the unit is replaced:
Check that no metal debris or water drops has been entered into the unit/module. Apart from the above points, consider climatic conditions. If the ambient temperature is beyond the specified range, stable operation of the system is not guaranteed.

8.1.7   Force Download Mode

In case the PLC is not responding for the firmware download command and when it does not allow the further download in the unit, PLC can be driven in the Force download mode. Follow the following step to enter the force download mode.

1. Power off the unit
2. Remove all communication cables. No need to remove USB cable.
3. Short the pin 2 and 8 of Com1 (RJ45). (Prepare the special RJ cable for this).
4. Turn the Run/Halt switch to halt position.
4. Power on the unit.
5. Wait for 10 Seconds.
6. Unit enters the Force download mode. The indication is that the Run and Error LEDs start blinking at 1 sec interval.
7. Remove the short of pin 2 and 8 of com1 RJ45.
8. Download the firmware first, using USB or Com1 RS232 cable.
9. The device remains in the "Force Download Mode" only for one minute. After one minute it exits from this mode and executes the firmware if it is valid. This is indicated by turning off Run and Error LEDs.

Pin 8: Reserved
Pin 7: RX-
Pin 6: TX-
Pin 5: RX+
Pin 4: TX+
Pin 3: GND
Pin 2: 232RXD
Pin 1: 232TXD
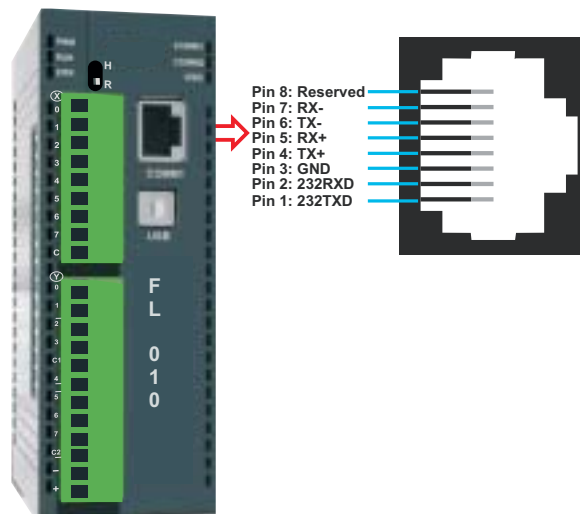
8.2 Self Diagnosis

ERROR Mode :-
The ERROR mode is a shut-down mode as a result of self-diagnosis. The PLC enters the ERROR mode if internal trouble is detected by self-diagnosis. In this mode, program execution is stopped and all outputs are switched off. The cause of the Error-down can be confirmed by connecting to FlexiSoft® software. To exit from the ERROR mode, execute the Error Reset command from the FlexiSoft®, or cycle power OFF and then ON again.

Self-Diagnosis :-
Checks the proper operation of the PLC itself. If an error has detected and cannot be recovered by re-tries, the FlexiLogics® moves into ERROR mode.
Self-Diagnosis is performed in firmware at two stages:
A) At initialization (Power ON)
    e.g. RAM, ROM check, IO mismatch check.
B) In continuous while loop
    e.g. IO bcc check, scan time check.

If an error is detected by the self-diagnostic check of the PLC, the error messages and related information shown on the following pages will be recorded in the PLC event history table. If the error is severe and continuation of operation is not possible, the PLC turns OFF all outputs and stops the operation (ERROR mode).

The latest 30 error messages are stored in the event history table. This event history table can be displayed on the FlexiSoft®. (Power ON/OFF is also registered) If the PLC has entered into ERROR mode, connect the FlexiSoft® to the PLC to confirm the error message in the event history table. This information is important to recover from an error.

In the event history table, No.1 message indicates the latest event recorded. Each column shows the following information:

Date: The date when the error has detected
Time: The time when the error has detected
Event: Error message
Count: Number of times the error has detected by retry action
Info n: Related information to the error detected
Mode: PLC operation mode in which the error has detected (INIT. means the power-up initialization)
Down: Shows the PLC has entered into ERROR mode by the error detected

If the PLC is in the ERROR mode, operations to correct the program are not accepted.
In this case, execute the Error reset operation by the FlexiSoft® to return the HALT mode before starting the correction operation.

Configuration registers (MW01 and MW02):

(1) These configuration devices are set by the PLC operating system. These devices are read only for user.
(2) Devices marked as (down) are set in the ERROR mode. These type of errors will cause the PLC to enter in the Error mode.
(3) Devices marked as (alarm) are set when the corresponding condition has occurred. PLC continues to be in the same mode if these errors occurs.

The errors in the PLC can be categorized as below:

1. **CPU error**:
   a. System watchdog Reset (WDT Error)
   If there is error in this category the CPU error flag (MW01_0 device) sets along with corresponding device of the error. So for WDT error MW01_11 device sets.

2. **I/O Error**:
   a. I/O mismatch error
   b. I/O bcc error.
   If there is error in this category the I/O error flag (MW01_1 device) sets along with corresponding device of the error. So for I/O mismatch error MW01_13 device sets and for I/O bcc error MW01_15 device sets.

3. **Program Error**:
   a. Scan Time Over error
   If there is error in this category the I/O error flag (MW01_2 device) sets along with corresponding device of the error. So for Scan Time Over error MW02_1 device.

4. **Other Errors**:
   a. Clock calender error
   b. Retentive Data Loss error
   For Clock calender error MW01_5 device sets and for Retentive Data Loss error MW01_6 device sets

Above error conditions are checked either in each main loop scan or only at power up. This is mentioned in the following table.
The configuration devices (M) and configuration registers (MW) are used for special purposes.

Error Messages and related information:

No.	Event	Info1	Info 2	Info 3	Info 4	Special Device	Meaning and countermeasures	Check at
1	Retentive Data Loss Error					MW01_6	In the power-up initialization, data invalidity of RAM (back-up area) has been detected. If retentive registers are used, these validity are not guaranteed. (No error down)	Only Power-On
2	Clock-cal-endar error					MW01_5	The data of built-in calendar LSI is illegal.(No error down) Set the date and time.	Only Power-On
4	I/O mismatch	slot No.	Unit Type			MW01_1 MW01_13	The I/O allocation information and the actual I/O configuration are not identical.(Error down) Check the I/O allocation and the option card mounting status	Only Power-On
5	I/O BCC error		Unit No.	Register No.		MW01_1 MW01_15	I/O bus parity error has been detected in data read/write for I/O modules. An abnormality has been detected in I/O bus checking. (Error down)I/O No answer. (Error down) Check the expansion cable connection and the I/O module mounting status.	Each main loop scan

No.	Event	Info1	Info 2	Info 3	Info 4	Special Device	Meaning and countermeasures	Check at
6	Scan time over	Scan time				MW01_2 MW02_1	The scan time has exceeded 200 mS (Default). (Alarm)Correct the program to reduce the scan time or use WDT instruction to extend the check time.	Each main loop scan
7	System power off						Power OFF (no error)	Only Power-Up
8	System power on						Power ON (no error)	Only Power-Up
9	WDT Error					MW01_00 MW01_11	The watchdog timer error has occurred.(Error down) If the error occurs frequently, replace the unit.	Only Power-Up

No	Device/register	Name	Function
1	MW01_0	CPU error (down)	ON at error state
2	MW01_1	I/O error	ON at error state
3	MW01_2	Program error	ON at error state
4	MW01_5	Clock/calendar error(alarm)	ON when clock/calendar data is illegal
5	MW01_6	Retentive data loss/invalid(alarm)	ON when retentive data in RAM are invalid
6	MW01_11	System Watchdog error (down)	ON at error state
7	MW01_13	I/O mismatch (down)	ON at error state
8	MW01_14	Analog Power Fail	ON at error state
9	MW01_15	I/O BCC error (down)	ON at error state
10	MW02_1	Scan time over (alarm)	ON when the scan time exceeds 200 ms

ROM Errors:

If the PLC does not have a program (Firmware / Application / Ladder) it remains in the wait loop as given in the Flow Chart. The LEDs are used to indicate these conditions. These errors are not logged in the event history.

No	Condition	Indication
1	No Firmware or Firmware corrupted.	RUN LED and ERR LED blinks at one second interval simultaneously.
2	No Application or Application corrupted.	ERR LED blinks at one second interval.
3	No Ladder or Ladder corrupted.	ERR LED blinks at one second interval.

Diagnosis Registers for Serial and Ethernet Communication channels:

Following system registers and system coils can be used for the control and diagnosis of communication channels:

Register / Coil	Tag Name	Read / Write	Description
SW0003_14	COM1 Status	Read only	0 = Communication Error 1= Communicating with Master
SW0003_15	COM2 Status	Read only	0 = Communication Error 1= Communicating with Master
SW0003_13	COM3 Status	Read only	0 = Communication Error 1= Communicating with Master
SW0018	COM1 failed node reconnect time (Sec)	Read/write	Shows time in sec recover the communication with failed nodes for port1.the default value is 60Sec
SW0019	COM2 failed node reconnect time (Sec)	Read/write	Shows time in sec recover the communication with failed nodes for port1.the default value is 60Sec
SW0022	COM3 failed node reconnect time (Sec)	Read/Write	Shows time in sec recover the communication with failed nodes for port3.the default value is 60Sec
S0021	COM1 failed node reconnect control	Read/write	If this bit is set communication with the failed nodes is detected after scan time SW0018 for port1.By default : ON

Register / Coil	Tag Name	Read / Write	Description
S0022	COM2 failed node reconnect control	Read/write	If this bit is set communication with the failed nodes is detected after scan time SW0019 for port2.By default : ON
S0023	COM3 failed node reconnect control	Read/write	If this bit is set communication with the failed nodes is detected after scan time SW0022 for port3. By default : ON
SW64-S65	Node Status Registers for COM1	Read only	Shows the status of the node, whether node is present or not. Total 2 word Register are mapped for 32 nodes.
SW66-S79	Node Status Registers for COM1	Read only	Shows the status of the node, whether node is present or not. Total 14 word Register are mapped for 224 nodes.
SW80-S81	Node Status Registers for COM2	Read only	Shows the status of the node, whether node is present or not. Total 2 word Register are mapped for 32 nodes.
SW82-S95	Node Status Registers for COM2	Read only	Shows the status of the node, whether node is present or not. Total 14 word Register are mapped for 224 nodes.
SW96-S111	Node Status Registers for COM3	Read only	Shows the status of the node, whether node is present or not. Total 16 word Register are mapped for 256 nodes.

<u>MAINTENANCE AND CHECKS</u>

In this chapter. . . .

♦ Precautions during operation

♦ Daily Checks

♦ Periodic checks

♦ Maintenanace Parts

9.1   Precautions during operation

When the FlexiLogics® units are in operation, you should pay attention to the following points:

(1) The programming cable can be plugged or unplugged while the FlexiLogics® units are in operation. When you try to do it, do not touch the connector pins. This may cause malfunction of the FlexiLogics® units owing to static electricity.

(2) Do not plug nor unplug the expansion cable during power on. This can cause damage to the equipment. Furthermore, to avoid malfunction of the FlexiLogics® owing to static electricity, do not touch the cable ends.

(3) Do not touch any terminals while the FlexiLogics® unit is in operation, even if the terminals are not live parts. This may cause malfunction of the FlexiLogics® unit owing to static electricity.

(4) Do not touch the expansion connector pins while the FlexiLogics® base model is in operation. This may cause malfunction of the units owing to static electricity.
Fix the expansion connector cover if the expansion connector is not used.

(5) Do not insert your finger into the option card slot while the FlexiLogics® unit is in operation. This may cause malfunction of the FlexiLogics® unit owing to static electricity.
Fix the option card slot cover securely.

(6) Do not insert your finger into the expansion rack's ventilation hole during power on. This may cause malfunction of the FlexiLogics® unit owing to static electricity.

9.2   Daily Checks

```
 ┌──────────────────────────────────────────────────────────────────────────────┐
 │  ⚠        CAUTION     1. Pay special attention during the maintenance work to minimize the risk of electrical
 │                          shock.
 │
 │                       2. Turn off power immediately if the FlexiLogics® unit or related equipment is emitting
 │                          smoke or burning. Operation under such situation can cause fire or electrical shock.
 └──────────────────────────────────────────────────────────────────────────────┘
```

To maintain the system and to prevent troubles, check the following items on daily basis.

Item	Check		Corrective measures
Status LEDs	PWR (power)	Lit when internal 3.3 V is normal.	If the LEDs are not normal, see Troubleshooting.
	RUN	Lit when operating normally.	
	ERR (Error)	Not lit when operating normally.	
Mode control switch	Check that the mode control switch is in R (RUN) side. Normal operation is performed when this switch is in R (RUN) side.		Turn this switch to R (RUN) side.
Input LEDs	Lit when the corresponding input is ON.		■ Check that the input terminal screw is not loose. ■ Check that the input terminal block is not loose. ■ Check that the input voltage is within the specified range.
Output LEDs	Lit when the output is ON and the corresponding load should operate.		■ Check that the output terminal screw is not loose. ■ Check that the output terminal block is not loose. ■ Check that the output voltage is within the specified range.

9.3　　　Periodic Checks

┌───┐
│ ⚠ CAUTION   1. Pay special attention during the maintenance work to minimize the risk of electrical
│   shock.
│
│   2. Turn off power immediately if the FlexiLogics® unit or related equipment is emitting
│   smoke or odor. Operation under such situation can cause fire or electrical shock.
└───┘

Check the FlexiLogics® units are based on the following items every six months. Also perform checks when the operating environment is changed.

Item	Check	Criteria
Power supply	Measure the power voltage at the unit's power terminals.	85 - 132/170 - 264 Vac (AC PS) 20.4 - 28.8 Vdc (DC PS)
	Check that the terminal screw is not loose.	Not loose
	Check that the power cable is not damaged.	Not damaged
Installation condition	Check that the unit is installed securely.	Not loose
	Check that the option card is inserted securely. (if any)	Not loose
	Check that the expansion rack/unit is installed securely. (if any)	Not loose
	Check that the expansion cable is connected securely and the cable is not damaged. (if any)	Not loose, not damaged
	Check that the I/O module on the expansion rack is inserted securely. (if any)	Not loose
Input/output	Measure the input/output voltage at the unit's terminals.	The voltage must be within the specified range.
	Check the input status LEDs.	The LED must light normally.
	Check the output status LEDs.	The LED must light normally.
	Check that the terminal block is installed securely.	Not loose, no play
	Check that the terminal screw is not loose and the terminal has a sufficient distance to the next terminal.	Not loose, not contacting the next terminal
	Check that the each I/O wire is not damaged.	Not damaged
Environment	Check that the temperature, humidity, vibration, dust, etc. are within the specified range.	Must be within the range of general specification.

Item	Check	Criteria
Programming tool	Check that the functions of the programming tool are normal.	Monitoring and other operations are available.
	Check that the connector and cable are not damaged.	Not damaged
User program	Check that the T1/T1S program and the master program (saved on a floppy disk, etc.) are the same.	No compare error

9.4   Spare Parts

To recover from trouble quickly, it is recommended to keep the following spare parts:

Item	Quantity	Remarks
FlexiLogics® basic unit	1	Maintain at least one to minimize the down-time of the controlled system.
Programming tool	1	Useful for the troubleshooting procedure.
Master program	As required	Saved on a CD or USB stick, etc.
Expansion rack or unit (if any)	1	
I/O module (if any)	One of each type used	

These spare parts should not be stored in high temperature and/or humidity locations.

9.5   Battery replacement

This fascility is available with the base models: FL010, FL050, and FL100.
In FL series base models, user can take decision to replace the battery if the conditions observed as:
RTC is not working. [i.e. SW010 to SW016 register will show garbage data].

In FL base battery slot is provided on the top side of the unit.
To replace the battery, follow the instructions given below:
1. Switch-off the unit.
2. Remove the expansion if attached.
3. Un-pack the unit from slider.
4. Remove battery cabl as shown below:
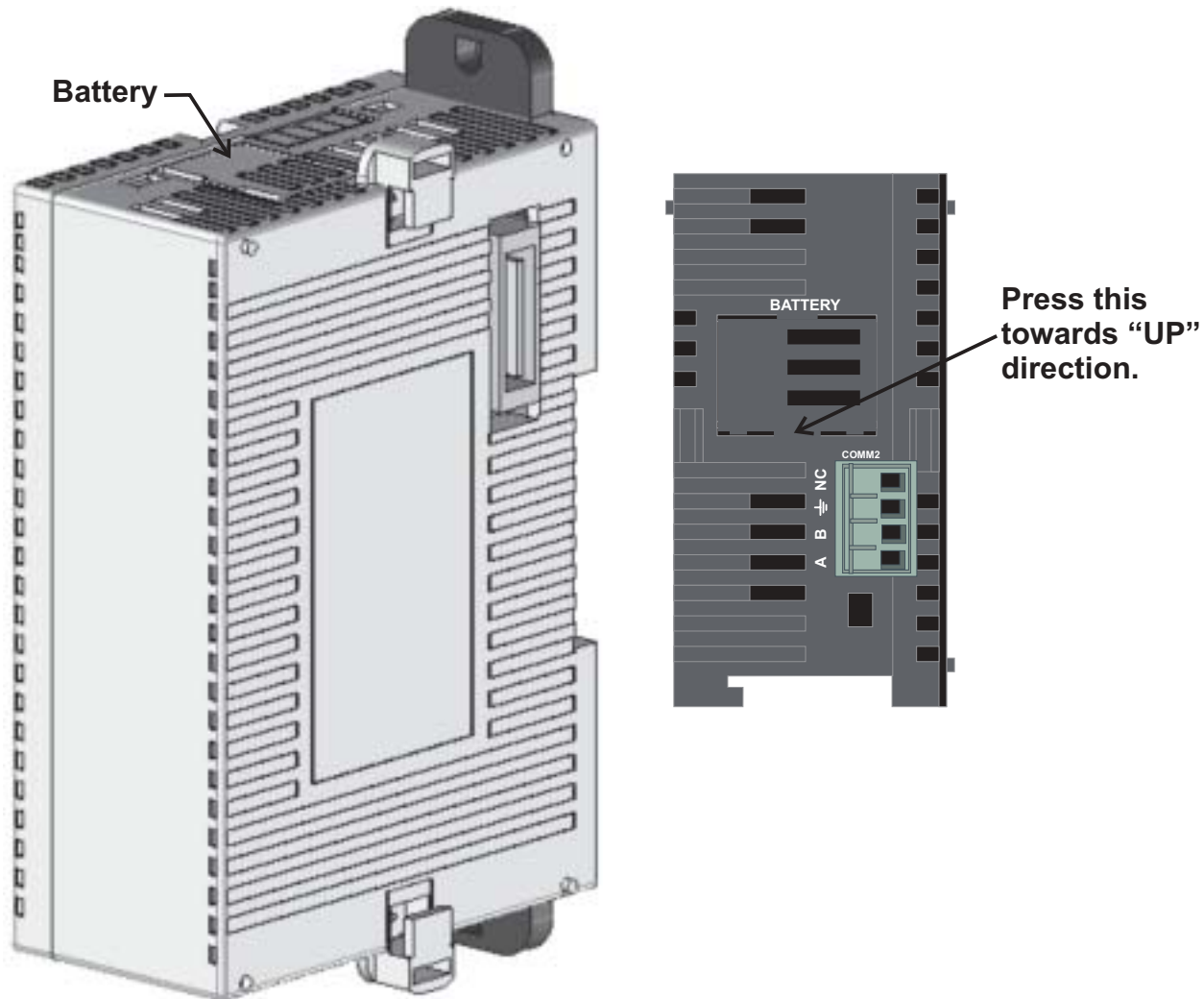
This will remove battery sub-assembly from the unit.
5. This assembly is with Relimate cable. Remove cable from the assembly.
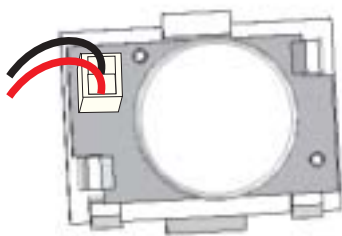
6. Replace this part# with new part# FL-BAT-01.

7. Mount the unit as per requirement.

8. Switch-on the power supply. Set RTC.