2m. ANALYSING AND UNDERSTANDING PLC FUNCTIONALITY

2m.1 Introduction

The main part of the Allen-Bradley demo case is the Compact Logix Controller 1769-L35E. The 1769-L35E controller is designed for mid-range applications. It is equipped in the operating system with a pre-emptive multitasking system. This environment supports as many as 8 tasks, but only one can be continuous. A task can have as many as 32 separate programs with their own executable routines and program tags.

2m.2 Understanding the CoNET_Base project

The CompactLogix 1769-L35E controller supports development programs in four languages:

- Ladder Diagram
- Sequential Function Chart
- Function Block Diagram
- Structured Text

The main features of PLC programming are:

- tasks: max. 8 tasks (only one can be continuous)
- programs: max. 32 separate programs in one task with its own routines and program-scoped tags
- routines

Tasks – max. 8 tasks (only one can be continuous); all programs assigned to the task execute in the order in which they are grouped; each task has a priority level – from lowest priority of 15 up to the highest priority of 1; the continuous task has the lowest priority.

Programs – max. 32 separate programs in one task; a program contains program tags, a main executable routine and other routines

Routines – a set of logic instructions in a single programming language (e.g. ladder logic)

The basic scenario for creating a new RSLogix5000 project is described in the user manual of the 1m exercises titled 'Configuring the network'. The base PLC program for control of the aerolift system is called CoNET_base. The main algorithm consist of three tasks (Fig. 2m-1):

1. MainTask (continuous)

2. Periodic_10ms (periodic)

3. ReadWAGO_Input (periodic)

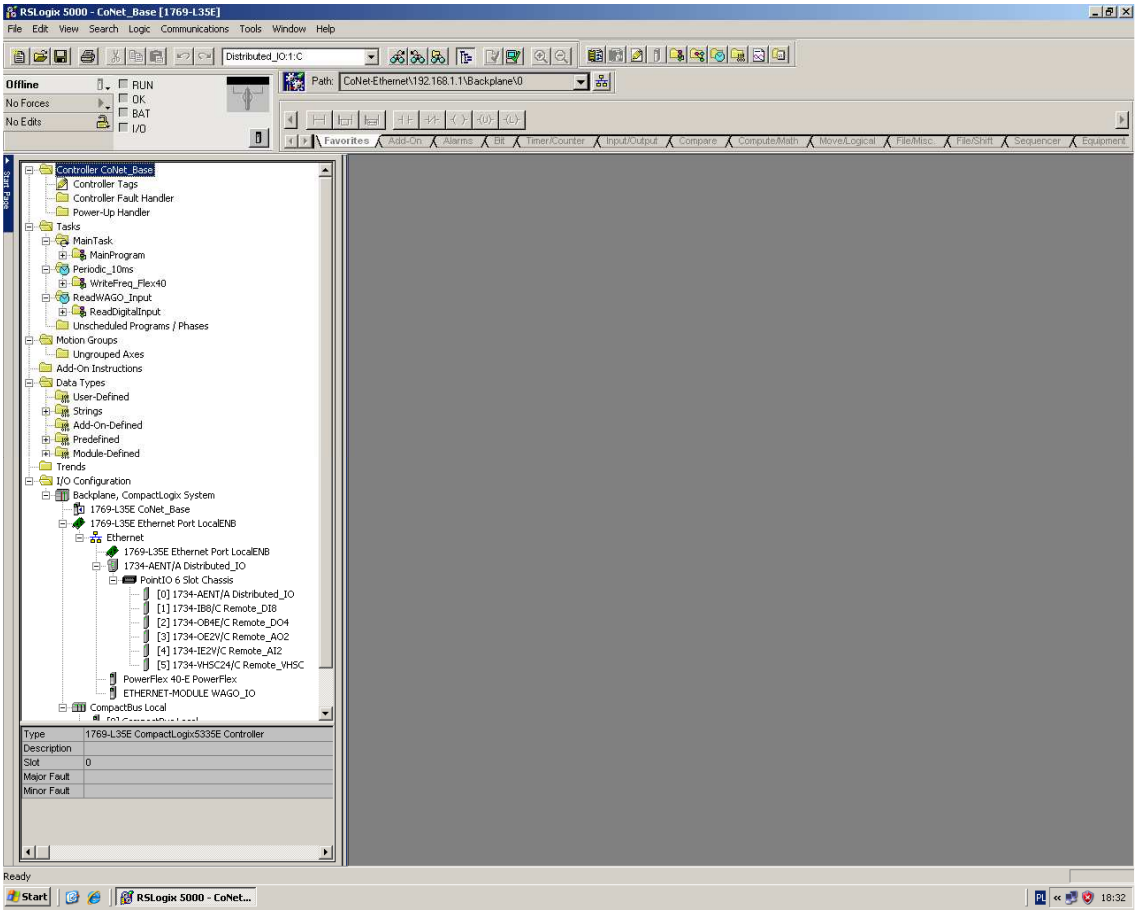

Fig. 2m.1.The main window of RSLogix5000 project

Ad1. The MainTask configuration is shown in Fig. 2m-2. To display the configuration simply click MainTask in the project tree. The MainTask is configured as a continuous type. Only one task can be continuous.

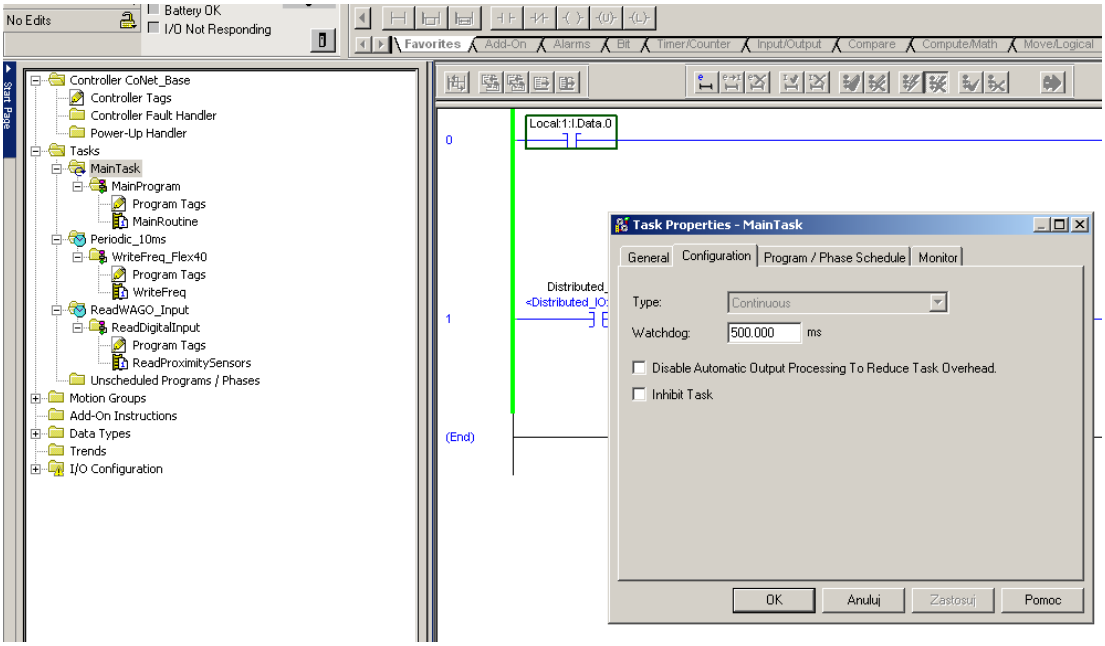

Fig. 2m.2.The parameters of the MainTask

In the section **Program Tags** you can define the local tags to be used in MainRoutine.

MainRoutine contains a main PLC program which is written in ladder diagram (Fig. 2m-3).

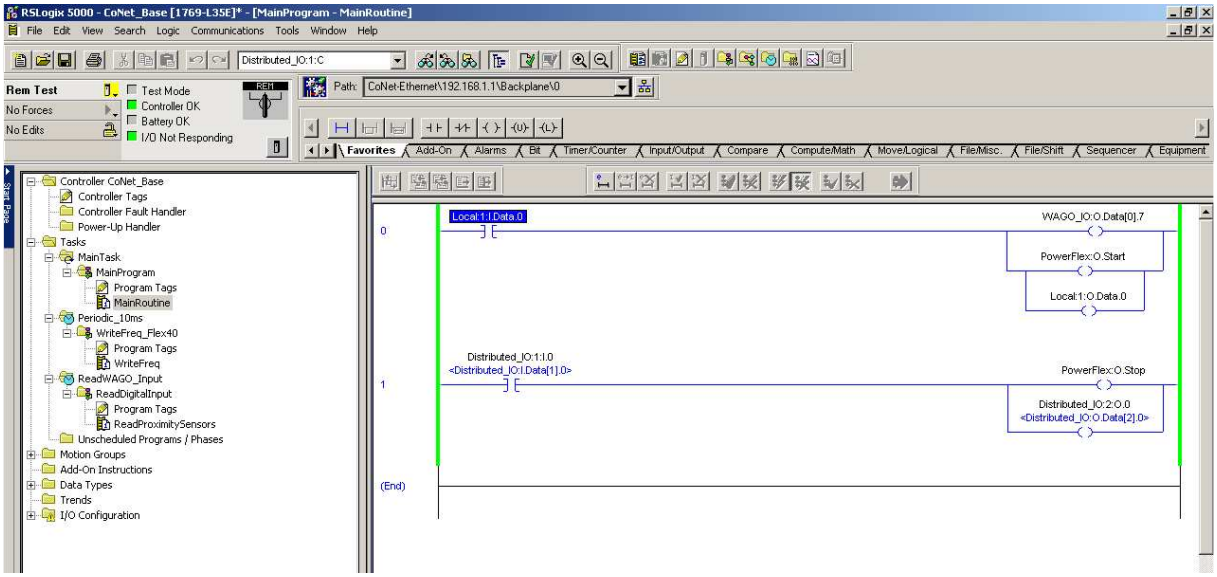

Fig. 2m.3. The ladder diagram in MainRoutine

The program allows you to start and stop the PowerFlex inverter. For starting you should turn on the switch marked ***Local1:I.Data.0*** – this means: bit 0 from Digital Input from digital module in PLC (1769-L35E). To stop – turn on the switch marked

Distributed_IO:1:I.0 – this means: bit 0 from Digital Input of the Distributed_IO module (1734-AENT).

Ad2. The Periodic_10ms task configuration is shown in Fig. 2m-4. This task is configured as ***Periodic*** with 100ms period. In this task program ***WriteFreq_Flex40*** is defined.

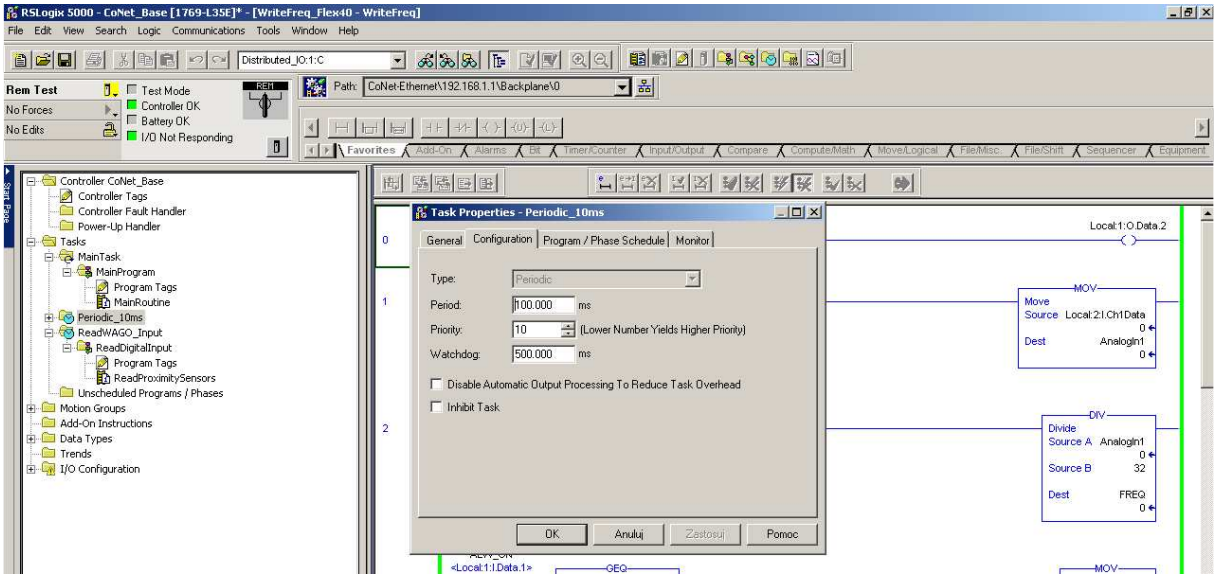

Fig. 2m.4. The parameters of the Periodic_10ms task

The program allows control of the inverter frequency. Voltage from the adjuster on the panel is read by an analog input, processed and served as a control signal to the inverter. A detailed program in a ladder diagram is shown in Fig. 2m-5. The digital input *Local1:I.Data.1* is defined as ALW_ON tag in the ***WriteFreq_Flex40->ProgramTags*** section. The variables: *AnalogIn1, FREQ* and *ControlFREQ* are also defined in this section (Fig. 2m-5). Variables are used to calculate a control frequency to the inverter.

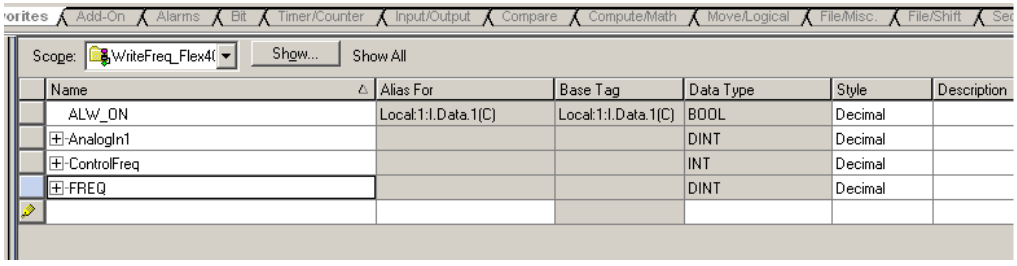

Fig. 2m.5. The variables of WriteFreq_Flex40->ProgramTags

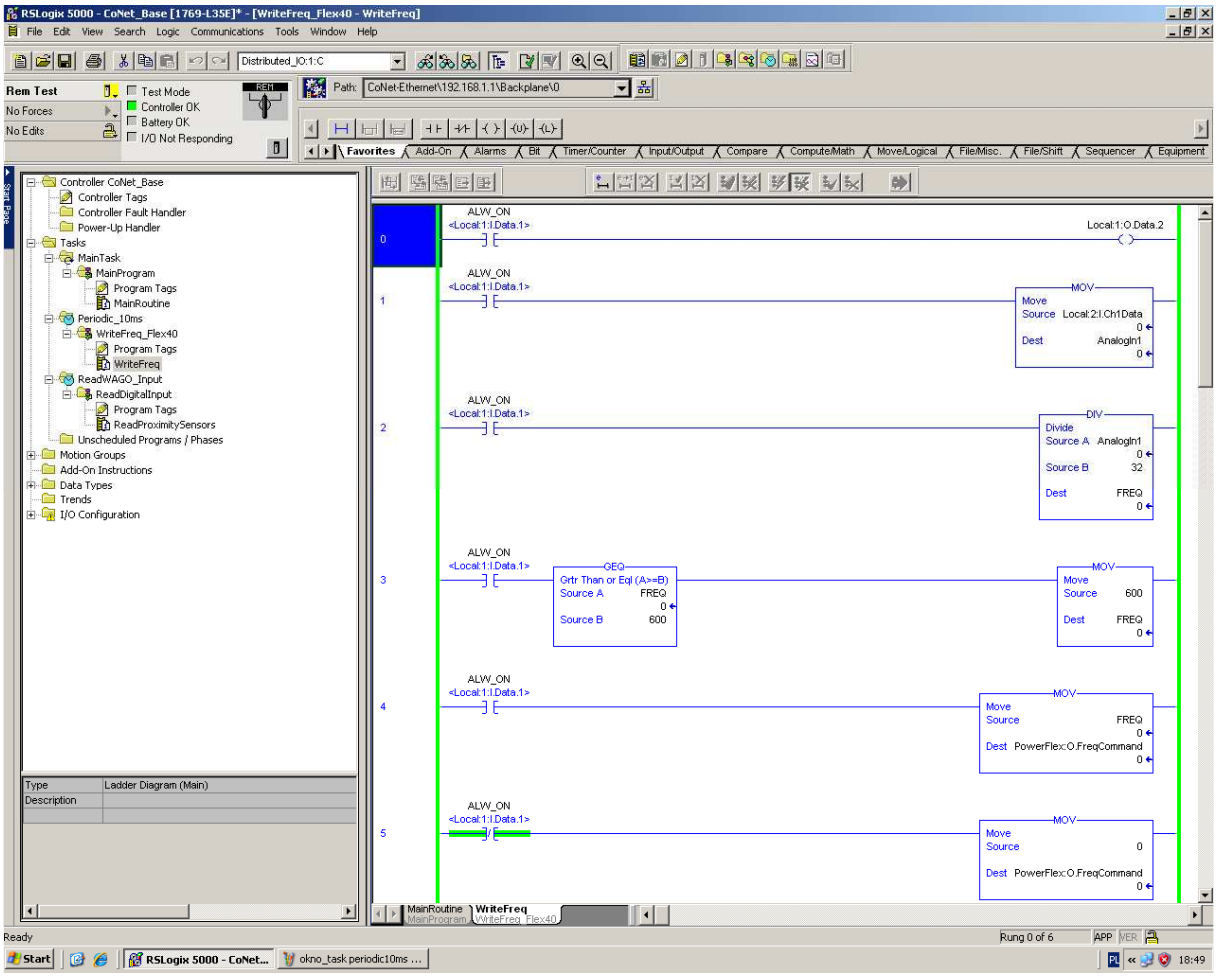

Fig. 2m.6.The WriteFreq program

Ad3. The ReadWAGO_Input task configuration is shown in Fig.2m-6. The task is configured as ***Periodic*** with 25ms period. In this task program ***ReadProximitySensors*** is defined. The program is very simple – signals from digital inputs are read and moved to the variable SensorInput, which is defined in the ***ReadDigitalInput->ProgramTags*** section (Fig. 2m-7).

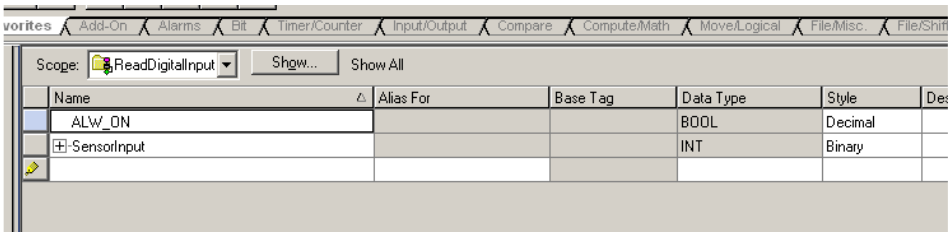

Fig. 2m.7. The variables of ReadDigitalInput->ProgramTags

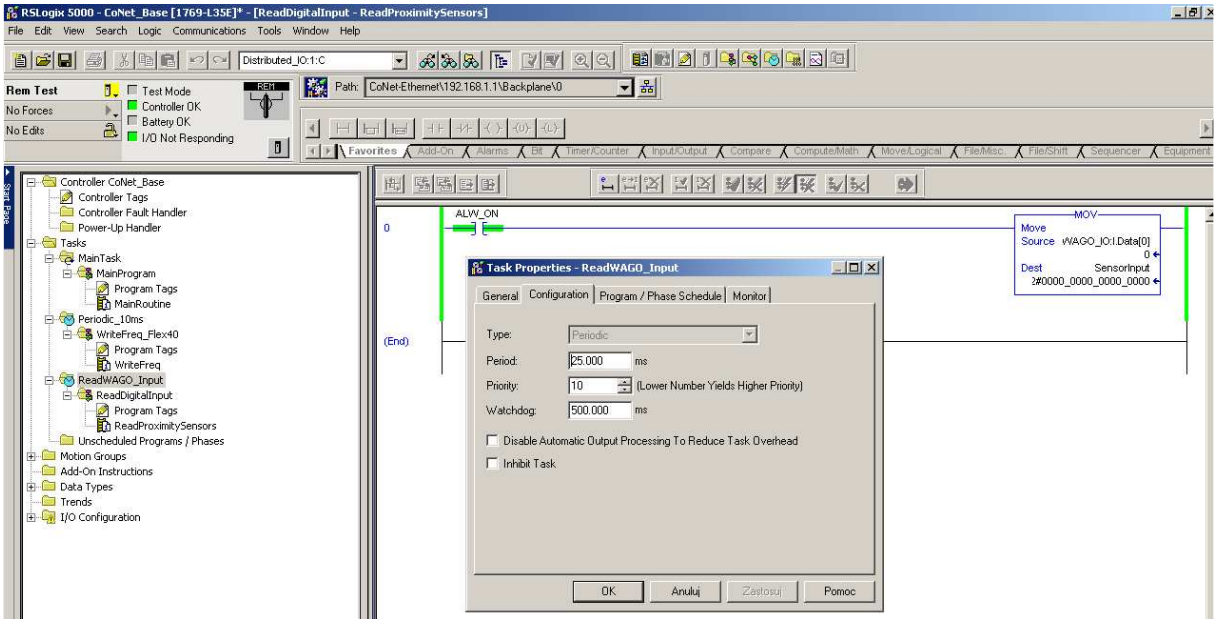

Fig.2m.8. The parameters of ReadWAGO_Input task

2m.3 Running the application.

To run the prepared program, first you should download it to the PLC. To do this first you can go online and next download (Fig. 2m-9). The project will be automatically checked, loaded and start running. In *on-line* mode you can monitor all current process values.

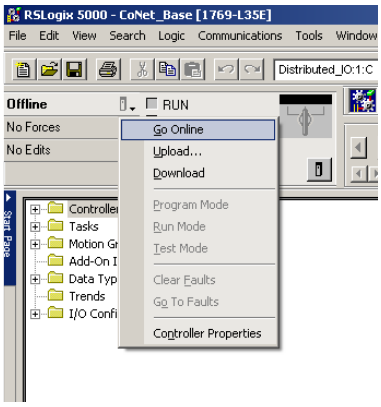

Fig. 2m.9. The 'Go Online' context menu