Do-more T1H Series PLC Overview

Do-more T1H Series PLC

The T1H Series PLC takes the modular and space-saving package of our Terminator I/O line and converts it into a stand-alone control system. Using Do-more Designer as a foundation, the T1H Series PLC system provides a powerful, flexible instruction set, inside a user friendly programming environment.

Do-more T1H PLC System with T1H-DM1E CPU Module

CPU modules

The Do-more T1H Series PLC offers two CPU modules, T1H-DM1 and T1H-DM1E, both of which must be programmed using the Do-more Designer programming software version 1.2 or later.

T1H-DM1

T1H-DM1E (with Ethernet)

Base units

The Do-more T1H Series PLC supports all of the base units available for the Terminator I/O line.

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Discrete I/O modules

The Do-more T1H Series PLC supports all of the discrete I/O modules available in the Terminator I/O product line.
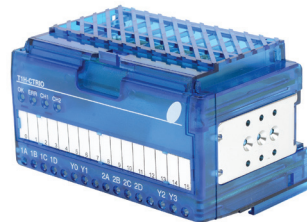
Analog I/O modules

The Do-more T1H Series PLC supports all of the analog I/O modules available in the Terminator I/O product line.

Specialty module

The Do-more T1H Series PLC supports the T1H-CTRIO High-Speed Counter I/O module that is available in the Terminator I/O product line.

T1H-CTRIO

Programming Software

The Do-more T1H Series PLC can only be programmed by Do-more Designer version 1.2 or later.

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Module Compatibility

The following table shows which Terminator I/O product line components are supported by the T1H-DM1 and T1H-DM1E Do-more CPUs.

Module Compatibility Table					
Module	**Part Number**	**Status**	**Module**	**Part Number**	**Status**
Base Units	T1K-08B	✓	*Analog I/O Modules*	T1F-08AD-1	✓
	T1K-08B-1	✓		T1F-08AD-2	✓
	T1K-16B	✓		T1F-16AD-1	✓
	T1K-16B-1	✓		T1F-16AD-2	✓
Discrete I/O Modules	T1K-08ND3	✓		T1F-16RTD	✓
	T1K-16ND3	✓		T1F-16TMST	✓
	T1K-08NA-1	✓		T1F-14THM	✓
	T1K-16NA-1	✓		T1F-08DA-1	✓
	T1K-08TD1	✓		T1F-08DA-2	✓
	T1K-16TD1	✓		T1F-16DA-1	✓
	T1K-08TD2-1	✓		T1F-16DA-2	✓
	T1K-16TD2-1	✓		T1F-8AD4DA-1	✓
	T1H-08TDS	✓		T1F-8AD4DA-2	✓
	T1K-08TA	✓	*Specialty Module*	T1H-CTRIO	✓
	T1K-16TA	✓			
	T1K-08TAS	✓			
	T1K-08TR	✓			
	T1K-16TR	✓			
	T1K-08TRS	✓			

✓ = Supported

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Communications

The Do-more T1H Series PLC supports many communication protocols. The following table shows which CPU module communications port supports each protocol.

Protocols	CPU Modules		
	T1H-DM1 / T1H-DM1E		T1H-DM1E
	USB Port	RS-232 Serial Port	Ethernet Port
Do-more Designer Programming	Yes	Yes	Yes
Modbus/RTU Client (Master)		Yes	
Modbus/RTU Server (Slave)		Yes	
Modbus/TCP Client (Master)			Yes
Modbus/TCP Server (Slave)			Yes
DirectLOGIC RX/WX Client (Master)			Yes
DirectLOGIC RX/WX Server (Slave)			Yes
K-Sequence Server (Slave)		Yes	
DirectNET Server (Slave)			
HEI Ethernet I/O Master			Yes
SMTP (EMail) Client w/Authentication			Yes
Simple Network Time Protocol (SNTP) Client			Yes
Do-more/PEERLINK			Yes
Do-more Time Synchronization Protocol (Client, Server, Alternate Client)			Yes
Do-more Logger/UDP			Yes
Serial ad-hoc ASCII/Binary Programatic Control		Yes	
UDP ad-hoc Programmatic Control			Yes
TCP Client Programmatic Control			Yes
TCP Server Programmatic Control			Yes

Blank = Not Supported

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Do-more T1H Series PLC Hardware User Manual (T1H-DM-M)

Do-more T1H Series PLC Hardware User Manual is available as a free download from Automationdirect.com. A hard copy is also available for purchase.

Do-more Designer (Part No. DM-PGMSW)

Do-more Designer is the full-featured programming software for the Do-more PLC series. Do-more Designer is a free download from Automationdirect.com. A CD-ROM version is also available for purchase for $11.00.

Start Page

When the software is started, the Start Page is displayed. This page contains a Launchpad with Projects, Applications and Links windows. It also contains shortcuts to important help file topics, and you can start the Do-more Simulator from this page.

Launchpad

Do-more Simulator

Help File Shortcuts
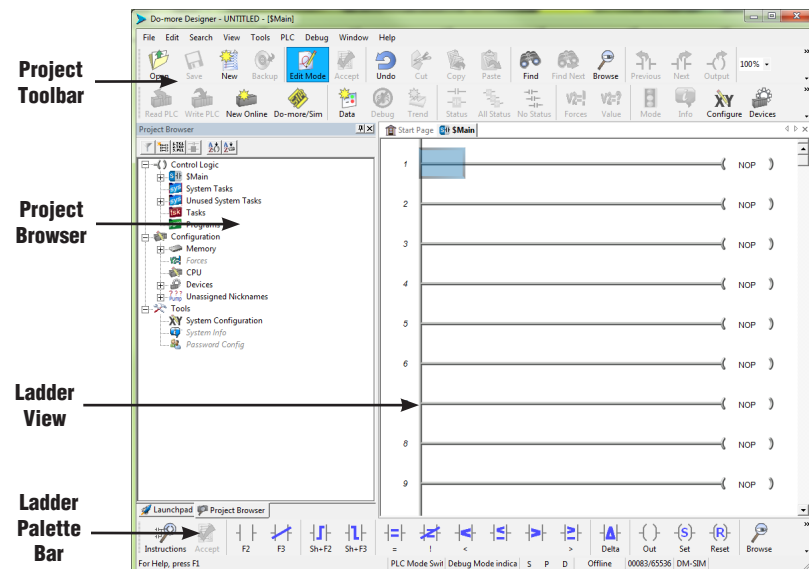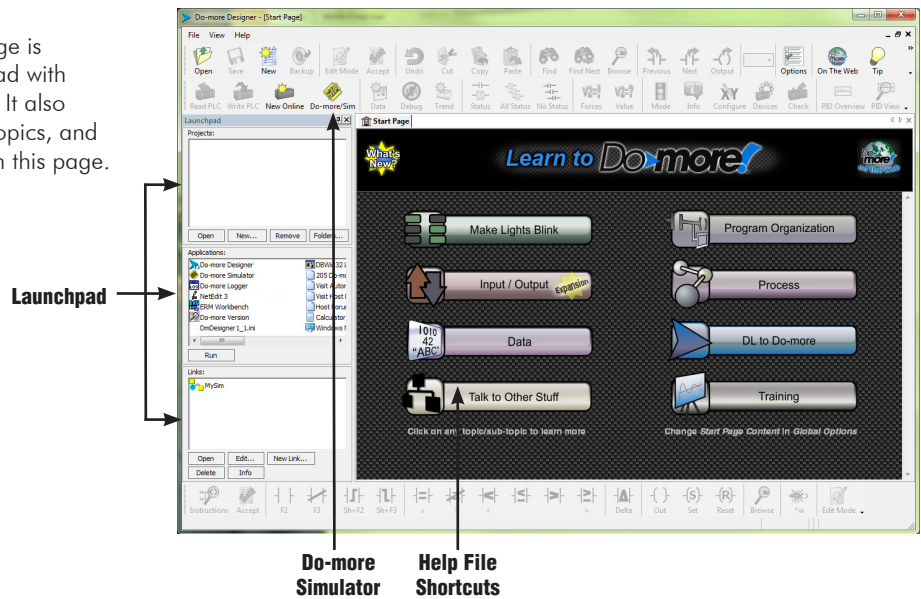
Main Programming Window

The Main Programming Window is displayed when a new project is started or an existing project is opened. It is divided into Menus, Toolbars, and Windows that work together to make project development simple.

Project Toolbar

Project Browser

Ladder View

Ladder Palette Bar

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Do-more Designer Features

Do-more Designer has the following main features:

- Supports the Do-more PLC instruction set
- Project Browser (Window to organize the user project)
- Data View (Interface to monitor and edit PLC data in a list)
- Trend View (Interface to monitor PLC data with trend graphs)
- PID View (Interface to monitor and tune the individual PID control loop)
- PID Overview (Interface to monitor multiple PID control loops)
- Debug View (Interface to debug the ladder programs)

When Do-more Designer is installed on your PC, the following tools are also installed:

- Do-more Simulator (Offline simulator of ladder program execution and PID control)
- Do-more Logger (Software tool to log PLC data)
- ERM Workbench (Configuration tool for the ERM modules)
- NetEdit 3 (Configuration tool for the ECOM/EBC Ethernet modules)

PC Requirements

The Do-more Designer Windows-based programming software works with Windows® XP (Home or Professional, 32-bit), Vista (Home, Basic, Premium, 32 or 64-bit), Windows 7 (Home, Professional, Ultimate, 32 or 64-bit) or Windows 8 (Home, Professional, Enterprise 32 or 64-bit; Windows 8 RT edition is NOT supported). Please check the following requirements when choosing your PC configuration:

- Minimum PC to PLC Connectivity, at least one of the following:
  - USB Port: connects to the CPU with USB-A connector (USB-A to USB-B cable)
  - RS-232 Serial Port: connects to the CPU with RJ-12 connector (RJ-12 to DB9 or RJ-12 to USB-B serial converter cable)
  - Ethernet Port: connects to the CPU (T1H-DM1E) with RJ-45 10Base-T or 100Base-T (Cat5 Patch Cable)
- Hard Disk: 100MB free disk space
- Video Display: 1024x768, 256 colors resolution (1280x720, true color recommended)
- Windows XP, 32-bit:
  - 800MHz, single core CPU (2GHz, multi-core or hyperthreaded recommended)
  - 512MB RAM (2GB recommended)
- Vista or Windows 7 or Windows 8, 32 or 64-bit:
  - 1GHz, single core CPU (2GHz, multi-core recommended)
  - 1GB RAM (3GB recommended)

Programming Cables

The Do-more T1H Series CPU module T1H-DM1 has two communication ports (USB and RS-232 Serial) and the T1H-DM1E has three communication ports (USB, RS-232 Serial and Ethernet). You can use any of those ports for programming and monitoring. Cables for these ports are listed below and can be purchased at Automationdirect.com.

USB Cables (USB 2.0, Type A-B connectors):

- USB-CBL-AB3 (3 ft.)
- USB-CBL-AB6 (6 ft.)
- USB-CBL-AB10 (10 ft.)
- USB-CBL-AB15 (15 ft.)

RS232 Serial Cable

- D2-DSCBL (12 ft. 9-pin D-sub to RJ12 connector)

Ethernet Cables (Cat5e)

Automationdirect.com sells many Ethernet patch cables in various colors and lengths. Please check the Cables section in this catalog for further details.

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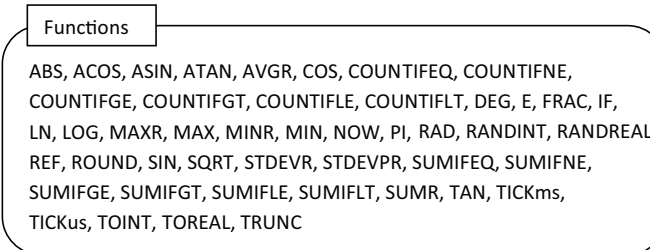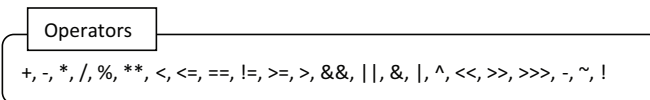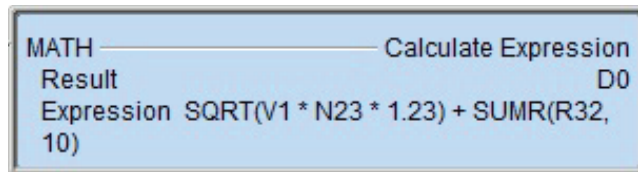
Do-more PLC Instruction Set

This Instruction Set was developed specifically for the new Do-more PLC series; the 'Instruction Palette' displays all available instructions.
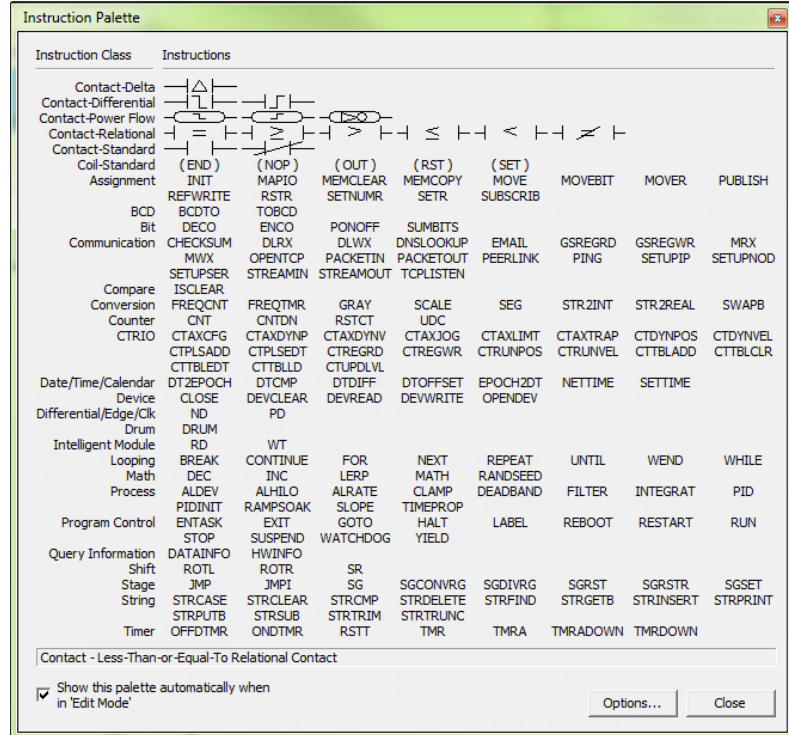
You may see some similarities to the DirectLOGIC PLC instruction set. However, the instruction set for the Do-more PLC is more advanced and intuitive. A good example is the MATH instruction. Now, just one MATH instruction covers all math operations and also allows you to mix different data types in one expression.

There are over 60 operators and functions available with the MATH instruction.

Note: To learn more about the MATH instruction, please refer to the Do-more Designer help topic 'MATH – Calculate Expression'.

Operators

+, -, *, /, %, **, <, <=, ==, !=, >=, >, &&, ||, &, |, ^, <<, >>, >>>, -, ~, !

Functions

ABS, ACOS, ASIN, ATAN, AVGR, COS, COUNTIFEQ, COUNTIFNE, COUNTIFGE, COUNTIFGT, COUNTIFLE, COUNTIFLT, DEG, E, FRAC, IF, LN, LOG, MAXR, MAX, MINR, MIN, NOW, PI, RAD, RANDINT, RANDREAL, REF, ROUND, SIN, SQRT, STDEVR, STDEVPR, SUMIFEQ, SUMIFNE, SUMIFGE, SUMIFGT, SUMIFLE, SUMIFLT, SUMR, TAN, TICKms, TICKus, TOINT, TOREAL, TRUNC

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Data Types

The Do-more PLC supports the following seven primary data types:

- Bit (0 or 1)
- Unsigned Byte (0 to 255)
- Signed Byte (-128 to 127)
- Unsigned Word (0 to 65,535)
- Signed Word (-32,768 to 32,767)
- Signed DWord (-2,147,483,648 to 2,147,483,647)
- Real (-3.4028235E+038 to 3.4028235E+038)

Data Structures

The Do-more PLC supports data structures as additional data types. Structures use the familiar PC programming organization of "dot notation". All available elements of a structure are shown in this format. The following data structures are currently available:

- Timer Structure
- Counter Structure
- String Structure
- PID Structure
- Date/Time Structure
- Task Structure
- Rampsoak Structure
- Program Structure
- DeviceRef Structure
- Drum Structure

- Stream Structure
- SIM_Process Structure
- Server Structure
- Peerlink Structure
- I/O_Master Structure
- Eth_IO_Master Structure
- GS Drive Structure
- Packet Structure

The data structure is a set of data. For instance, a Timer structure (Timer Struct) has the following set of data:

- Acc (Accumulated Time, Signed DWord)
- Done (Bit)
- Zero (Bit)
- Timing (Bit)
- Reset (Bit)

When you use a timer instruction (TMR), a Timer structure is assigned to the instruction. If you select 'T0', you can access the above data with dot notation. For instance, to access the accumulated time (Acc), enter 'T0.Acc'. To access the Done bit, enter 'T0.Done'.

Memory Addressing

With the Do-more PLC, each memory address type has its own specific data type. Here are some examples:

- V (Unsigned Word)
- N (Signed Word)
- D (Signed DWord)
- R (Real)

If you see address 'V123' in the ladder program, the memory address always stores an Unsigned Word value. With this memory addressing method, it becomes easier to read and write the ladder programs.

Although most of the memory addressing is decimal, the memory addresses DLX, DLY, DLC and DLV use octal. These four memory address types can be used to exchange data with DirectLOGIC PLCs, which use octal memory addressing.

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Array Addressing

The Do-more PLC supports one-dimensional array addressing with all memory addresses. A V-memory address must be used as the index for an array. With the Do-more PLC, the following ladder program is valid.
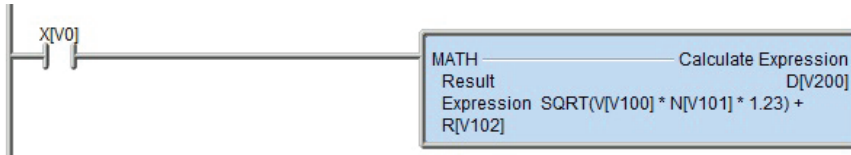
Note: In this example, V0, V100, V101, V102 and V200 are indices.

Code-block, Program and Task

One Do-more project can consist of more than one ladder program. Each ladder program is called a 'Code-block'. The Do-more PLC supports two types of code-blocks, Program and Task:

Program

Programs are code-blocks that run based on an event using the RUN instruction. They can be self-terminating or never terminate. Stage programming is only supported inside Program code-blocks.

Task

Tasks are code-blocks that are enabled and disabled using the ENTASK instruction. The ENTASK instruction allows you to specify an interval to execute the task's logic with a millisecond resolution or to execute a single time on a leading edge input.
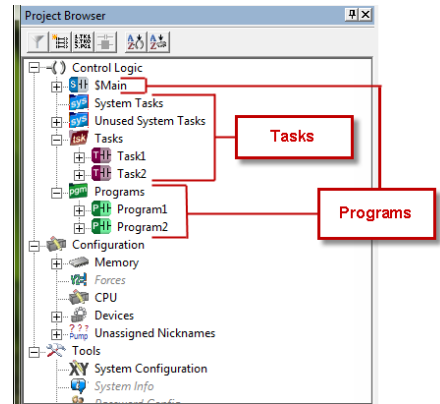
Stages

The Do-more PLC supports Stages. You can use Stages only in the Program code-blocks. (They are not available in the Task code-blocks.) The Do-more PLC supports the following instructions for Stage Programming[1]:

- SG (Stage)
- JMP (Jump To Stage)[2]
- JMPI (Index Jump)
- SGSET (Enable Stage)
- SGRST (Disable Stage)
- SGRSTR (Disable Range of Stages)
- SGCONVRG (Converge Multiple Stages to SG)
- SGDIVRG (Jump to Multiple Stages)
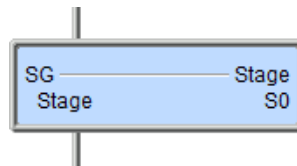
[1] There is no ISG (Initial Stage) instruction for the Do-more PLC; the first stage in the Program code-block becomes the initial stage automatically.

[2] Many asynchronous instructions can directly initiate a Jump to Stage.