2 Introduction

2.1 Features for Different Module Variants

Modern variable speed drives offer a multitude of in-built features such as ramp control, PID loops, simple position control, etc. However this functionality is limited. The drive can only do so many things and when it comes to controlling more complex applications, users often have to resort to using external equipment such as PLCs to control the drive from a system point of view.

However the flexibility of certain drives can be substantially increased by using the Second Processors. These Second Processors provide an additional processor for the drive and allow the user to utilise existing, or write their own, application-specific software. They also offer powerful networking capabilities so many drives (and other equipment) can be connected together to communicate process wide information thus offering a complete application solution. The Second Processors are solutions modules that can be fitted to expansion slots in the supported drives or are embedded in the Digitax drives. The Second Processor are powered from the drive's internal power supply

Specifications for SM-Applications

- High speed dedicated microprocessor
- 384kb Flash memory for user program
- 80kb user program memory
- EIA-RS485 port offering ANSI, Modbus-RTU slave and master and Modbus-ASCII slave and master protocols
- CTNet high speed network connection offering up to 5Mbit/s data rate.
- Two 24V digital inputs
- Two 24V digital outputs
- Task based programming system allowing for real-time control of drive and process
- CTSync

Specifications for SM-Applications Lite

- High speed dedicated microprocessor
- SyPTLite 10kb executable memory
- SyPTPro V2.3.1 or later 384kb executable memory, 80kb user memory.
- SyPTPro V2.2.0 150kb executable memory, 20kb user memory.
- Versions prior to V2.2.0 100kb executable memory, 20kb user memory.
- Task based programming system allowing for real-time control of drive and process.

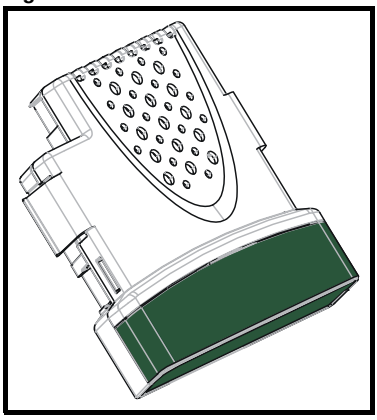
Specifications for Digitax ST Indexer Embedded Processor.

- Only supported on SyPTPro V2.4.0 or later
- Only supported on SyPTLite V1.4.0 or later
- Enhanced high speed dedicated microprocessor
- SyPTLite 10kb executable memory
- 384kb executable memory, 80kb user memory.
- Task based programming system allowing for real-time control of drive and process.

NOTE The SM-Applications Plus module, SM-Applications Lite V2 module and the Digitax ST Plus has a slightly faster variant of the SM-Applications microprocessor, thereby increasing performance of the module over the SM-Applications.

2.2 Solutions Module identification

Figure 2-1 Second Processor



The Second Processors can be identified by:

1. The label located on the underside of the Solutions Module.
2. The colour coding across the front of the Solutions Module.

   SM-Applications: Mint Green

   SM-Applications Lite: White

   SM-Applications Plus: Light Moss Green

   SM-Applications Lite V2: White

3.7.4 Routing of the cable

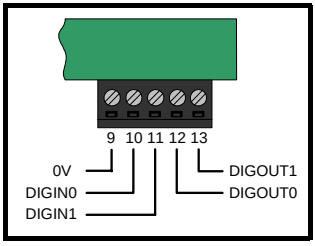
A data communications cable should not run parallel to any power cables, especially ones that connect drives to motors. If parallel runs are unavoidable, ensure a minimum spacing of 300mm (1 foot) between the communications cable and the power cable.

Cables crossing one another at right-angles are unlikely to give trouble. The maximum cable length for a EIA-RS485 link is 1200 metres (4,000 feet). This is at low baud rates only. The higher the baud rate the lower the maximum cable length.

3.7.5 Termination

When a long-distance multi-drop EIA-RS485 system is used, the transmit and receive pairs should have a termination resistor of 120Ω fitted across them in order to reduce signal reflections. However, at the lower data rates this is not so critical.

3.8 Digital I/O Connections



The SM-Applications, SM-Applications Plus and Digitax ST Plus are equipped with 2 digital inputs, known as DIGIN0 and DIGIN1, and 2 digital outputs, known as DIGOUT0 and DIGOUT1. These inputs and outputs can be read/controlled from the user program loaded into the SM-Applications Modules & Motion Processors .

The digital outputs are a positive logic arrangement such that they are at +24V when active and will supply up to 20mA of current. When inactive they are effectively floating. The digital outputs are protected against short-circuit or overload. The trip threshold is 20mA, and if tripped both outputs will be deactivated.

The digital I/O are controlled using menu 86 - refer to section 5.6 *Menu 86 - Digital I/O Parameters* on page 45.

3.9 Port Isolation

The digital input/output ports are connected to the main drive control circuits.

WARNING

The I/O circuits are isolated from the power circuits by basic insulation (single insulation) only. The installer must ensure that external control circuits are insulated from human contact by at least one layer of insulation (supplementary insulation) rated for the AC supply voltage

The CTNet and EIA-RS485 ports have supplementary insulation from the input/output ports, giving overall double insulation from the power circuit.
They have simple separation (functional insulation) from each other.

WARNING

To maintain the double insulation status of the data ports:

- All circuits to which either port is connected must have protective separation (i.e. double insulation or single insulation with grounding)
- All circuits to which the drive control circuits are connected must have at least basic insulation from live parts.

Pr 85.03	Timer Unit 16-bit Timer Count		
Access	RW	Range	16 bit
Default	N/A	Update Rate	Immediate

The current timer value can be read and written at any time using this parameter.

Apps	Apps Lite	Apps Plus	Lite V2	ST Plus	ST Indexer
✓	×	✓	×	✓	×

Pr 85.04	Timer Unit Wrap-around limit		
Access	RW	Range	16 bit
Default	N/A	Update Rate	Immediate

This parameter specifies the value at which Pr **85.03** will wrap-around.

Apps	Apps Lite	Apps Plus	Lite V2	ST Plus	ST Indexer
✓	×	✓	×	✓	×

CAUTION

Setting a small wrap-around figure with the timer operating at fast rates, could result in the Second Processor appearing to lock up. This is caused by the wrap-around interrupt being continually serviced and starving the other product features of processor resource. If this occurs the user can reset the Second Processor by performing a 1070 reset on the drive. If a DPL program sets the figures for the timer then, before resetting, the program auto-run should be disabled (Pr **xx.13**=0). After the reset the user can reinitialise the timer with a more reasonable wrap-around number.

Pr 85.05	Timer Unit Timer Capture Cache		
Access	RW	Range	16 bit
Default	N/A	Update Rate	Immediate

This parameter stores the cached value when using the timer in modes 1 or 2 (Capture modes)

Apps	Apps Lite	Apps Plus	Lite V2	ST Plus	ST Indexer
✓	×	✓	×	✓	×

5.6 Menu 86 - Digital I/O Parameters

The SM-Applications, SM-Applications Plus and Digitax ST Plus have two digital outputs and two digital inputs on-board. These outputs and inputs are controlled though this menu. See Section 3 (Installation) for detailed specifications.

Pr 86.01	Digital Input 0		
Access	RO	Range	0/1
Default	N/A	Update Rate	Immediate

Apps	Apps Lite	Apps Plus	Lite V2	ST Plus	ST Indexer
✓	×	✓	×	✓	×

6 Communications

6.1 EIA-RS485 Serial Communications Port

Please see Features section on pages 8, 9 & 10 for availability on your module.

The Second Processor may come with a EIA-RS485 serial communications port on-board. Refer to section 3 *Installation* on page 13 for information on the hardware connections and wiring or the drive manual for Digitax ST Plus.

This port supports a number of built-in protocols: CT-ANSI slave, Modbus RTU in master and slave modes, Modbus ASCII in master and slave modes and 3 user modes. Both two and four wire configurations are possible

If an invalid or unsupported mode is selected, the mode will be defaulted back to 1 (4-wire CT-ANSI) and a run-time error 49 may occur.

The baud-rate is specified in Pr **81.07**.

The address of this unit is specified in Pr **81.05**.

6.1.1 CT-ANSI

The Second Processor supports the ANSIx3.28 protocol.

NOTE The CT-ANSI protocol supports reading and writing of full 32-bit values. The UD70 product for Unidrive 1 does not support such large values.

All drive parameters as well as Second Processor parameters can be accessed via the EIA-RS485 port on the module.

6.1.1.1 Reading a parameter

The following tables show the message constructs for reading a parameter.

Table 6.1 Master request

Character	Description
EOT	End of transmission (Ctrl & D)
A1	Second Processor address: 1st digit
A1	Second Processor address: 1st digit
A2	Second Processor address: 2nd digit
A2	Second Processor address: 2nd digit
M1	Menu number: 1st digit
M2	Menu number: 2nd digit
P1	Parameter number: 1st digit
P2	Parameter number: 2nd digit
ENQ	Enquiry (Ctrl & E)

Table 6.2 Slave response (if request was correct and parameter exists)

Character	Description
STX	Start of text (Ctrl & B)
M1	Menu number: 1st digit
M2	Menu number: 2nd digit
P1	Parameter number: 1st digit
P2	Parameter number: 2nd digit

Table 6.11 Master request

Byte	Description
12	Register data 0 LSB
11 + byte count	CRC LSB
12 + byte count	CRC MSB

Table 6.12 Slave response

Byte	Description
0	Slave source node address
1	Function code 0x17
2	Length of register data in read block (in bytes)
3	Register data 0 MSB
4	Register data 0 LSB
3 + byte count	CRC LSB
4 + byte count	CRC MSB

6.1.3 Modbus ASCII

Both slave and master modes of the Modicon Modbus ASCII protocol are supported.

In Modbus ASCII slave mode, the following function codes are supported.:

Function	Description
FC3	Read multiple registers
FC6	Preset single registers
FC16	Preset multiple registers
FC23	Read/write multiple registers



Refer to on-line help for further information.
Full details of the Modbus protocol can be found on the Modicon web site at www.modicon.com. Note that the 32-bit access mode is specific to Control Techniques.

6.1.4 User Modes

These modes turn off all internal protocols and allow the user to access the EIA-RS485 port directly from the DPL program. They can be used in conjunction with the DPL ANSI commands - ANSIREAD, ANSIWRITE etc. User defined protocols can also be implemented using the DPL PUTCHAR and GETCHAR commands.

6.2 CTNet

Please see Features section on pages 8, 9 & 10 for availability on your module.

Full details of CTNet are outside the scope of this User Guide and can be found in the separate CTNet *User Guide*.

11 Diagnostics

This chapter details the following:

- Run-time errors and trip codes
- Handling of run-time errors
- CTNet network status
- Support

11.1 Run-time Errors

A run-time error is an error which occurs in a specific operation of the Second Processor. It can happen as a result of an error in the execution of the user's DPL program (such as trying to write to a parameter that doesn't exist, or trying to divide a value by zero), a misconfiguration (such as incorrect CTNet setup) or a system error such as processor overload or *watchdog* time-out.

The action taken when an error occurs may be one or more of the following:

- User program may be halted or prevented from starting
- Drive may be tripped on **SLx.Er** (where x is the slot number) with the run-time error code placed into Pr **xx.50**
- Drive may be tripped on another **SLx.***** code.
- The DPL **ERROR** task may be executed (if it exists).

Which of these occurs depends upon the type of error and the setting of the global run-time trip enable parameter Pr **xx.14**. This is detailed in section 11.3, below.

11.2 Drive Display Trip Codes

The table below shows the possible trip codes that will be displayed on the drive when an error is detected in the Second Processor which instigates a drive trip. Remember, not all run-time errors instigate a drive trip.

Table 11.1 Drive Trip Display Codes

Slot Where Trip Was Initiated			Fault	Description
Slot 1	Slot 2	Slot 3		
SL1.HF	SL2.HF	SL3.HF	Hardware Fault	The drive has detected that an option module is present, but is unable to communicate with it.
SL1.tO	SL2.tO	SL3.tO	Watchdog Timeout	Indicates a user program which has utilised the *watchdog* feature has failed to issue the WDOG command within 200ms.
SL1.Er	SL2.Er	SL3.Er	Error	Run-time trip generated by the Second Processor either due to a user DPL program error or some other event. The actual error code is placed into Pr **xx.50**.
SL1.nF	SL2.nF	SL3.nF	Not Fitted	Module was disconnected while operational, or module has crashed. This trip will also occur if a drive slot is configured for a Second Processor, but the module is not fitted in the slot.
SL1.dF	SL2.dF	SL3.dF	Different Fitted	This trip will occur when an Second Processor is fitted to a slot previously occupied by another solutions module, or is fitted to a previously unused slot.