EMERSON™
Industrial Automation

The Application Note is specific to the CT Products that can host an SM-Profibus module.
This includes the Unidrive SP, Commander GP-20, Digitax ST and Commander SK.

SM-Profibus Unidrive (UD73) Compatibility Mode

Scope – This application note discusses the theory and practice of using the Unidrive Compatibility Mode available on the SM-Profibus in firmware versions 3.01.00 and newer. The most common reason one would be interested in this would be because one was considering replacing a UD73 / Unidrive Classic with a SM-Profibus and SP/GP20/Digitax-ST/SK, and wanted minimal or no changes on the Profibus DP master and / or the PLC logic that controlled the original UD73 within the Unidrive Classic drive.

Background – The Unidrive Classic "fitted" with a UD73 Profibus-DP option has been widely applied worldwide, and enjoys a large installed customer base. A significant amount interest in upgrading these installations with newer Control Techniques products is ongoing.

The SM-Profibus module is the present Profibus-DP interface for current Control Techniques products which include the SP, GP20, SK and Digitax-ST products. All of these products appear very similar to each other with respect to this mode.
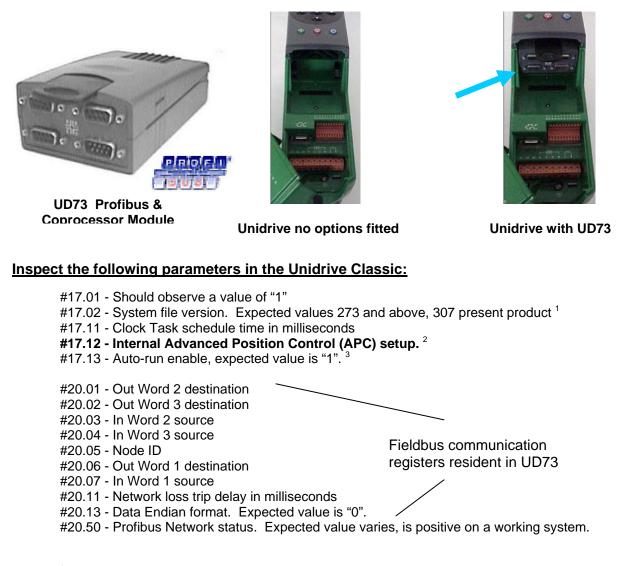
The Unidrive Classic fitted with a UD73 was generally used in two general types of applications; complex ones involving position regulation and simple ones involved coordinated speed regulation.

Because the SM-Profibus appears VERY different to the Profibus master "over-the-wire" than the UD73 does (in native mode), replacement of the original Unidrive with, a SM-Profibus / SM-Apps / Uni-SP would require complete rework of the scanner's cyclic data scan list, and often changes in the PLC logic.

Proper use of the Undrive Compatibility mode can allow the retention of the original cyclic data scan list and the portion of the PLC logic that depends on this. What it CANNOT do is correct for the differences between the Unidrive Classic and the replacement drive with respect to non-cyclic data sent by the Control Techniques Single Word sub-protocol. This would be typically used where an OEM wished the PLC to manage the Unidrive Classic's configuration by "downloading" a block of configuration data to the drive. This area would still require consideration and re-coding within the PLC master

The SM-Profibus module can be matched to one of the current second processors offered by Control Techniques to replace all of the logic in a UD73 retrofit for a "complex" positioning application, or used without such an option in a UD73 retrofit for a "simple" speed application. This application note will provide guidance in determining which one the reader is dealing with and some solutions to the communication issues that crop up.

Instructions – evaluation of the presence of a UD73 / Unidrive Classic application

**UD73 Profibus &
Coprocessor Module**

Unidrive no options fitted

Unidrive with UD73

Inspect the following parameters in the Unidrive Classic:

#17.01 - Should observe a value of "1"
#17.02 - System file version. Expected values 273 and above, 307 present product [1]
#17.11 - Clock Task schedule time in milliseconds
#17.12 - Internal Advanced Position Control (APC) setup. [2]
#17.13 - Auto-run enable, expected value is "1". [3]

#20.01 - Out Word 2 destination
#20.02 - Out Word 3 destination
#20.03 - In Word 2 source
#20.04 - In Word 3 source
#20.05 - Node ID
#20.06 - Out Word 1 destination
#20.07 - In Word 1 source
#20.11 - Network loss trip delay in milliseconds
#20.13 - Data Endian format. Expected value is "0".
#20.50 - Profibus Network status. Expected value varies, is positive on a working system.

Fieldbus communication
registers resident in UD73

[1] **Note** that values below 273 will pose additional challenges. Values below 262 are not
supported with present Control Techniques software tools, and require access to previous Control
Techniques software that is no longer sold or supported.

[2] **Note** that a non-zero value indicates that the internal APC is being used in some fashion, and
this project will have both a communication component and a positioning component each
requiring a solution. The motion component will involve analyzing what the UD73 APC is doing,
and re-creating this function within an SM- EZ-Motion, SM-Apps, SM-Apps Plus, or SM-Index
module

[3] **Note** that one will often need to set this value to "0" and perform a reset to allow analysis of
the UD7x logic hosted by the original UD73.

Starting point for a simple Non-Positioning Applications

Strategy:

- Data setup is for 4 16-bit words in and out total (compression must be On)
- Data format is three (3) cyclic data channels, plus an additional channel for mode 1 non-cyclic data (Control Techniques Single Word)

- First word Out/In reserved for Control Techniques Single Word non-cyclic transmissions
- Next three words are for the three cyclic words

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Starting point for a simple Non-Positioning Applications

Initial SM-Profibus Parameter settings:

Pr MM.05 = 103	(SM Data format that matches the original UD73)
Pr MM.34 = On	(compression On)
Pr MM.41 = 1	(Undrive Classic emulation)
Check and confirm the next two are still at default values listed	
Pr MM.07 = 200	(network loss timeout msec, similar to #20.11, default longer than classic
Pr MM.08 = Off	(Endian select, big endian selected, similar to #20.13)
Pr MM.03 = Node	(similar to UD73 #20.05)
Pr MM.04 = -1	(Auto-detect baud rate)
Pr MM.06 = RO	(similar to UD73 #20.50)
Pr MM.10 = 6150	(Control Techniques Single word, IN word 0)
Pr MM.11 = 2001	(**IN Word 1**, similar to #20.07, usually a Status Word)
Pr MM.12 = 2002	(16-bit, **IN Word 2**, similar to #20.03, usually a speed feedback)
Pr MM.13 = 2003	(16-bit, **IN Word 3**, similar to #20.04, usually a torque feedbact)
Pr MM.14 to MM.19	to zero (0)
Pr MM.20 = 6150	(Control Techniques Single word, OUT word 0)
Pr MM.21 = 2011	(**OUT Word 1**, similar to #20.06, usually a Control Word)
Pr MM.22 = 2012	(16-bit, **OUT Word 2**, similar to #20.01, usually a speed reference)
Pr MM.23 = 2013	(16-bit, **OUT Word 3**, similar to #20.02, usually a torque reference)
Pr MM.24 to MM.29	to zero (0)

This solution will allow the Unidrive SP w/ SM-Profibus to "look" just like the Unidrive Classic with UD73 it replaces. NO changes should be required in the master with regards to mappings. This is incomplete, however.

MM.11 and MM.21 are presently "do nothing" holding registers. There are more than one way to make these links functional.

If EZ-Motion is present, this is probably good enough; EZ-Motion can implement a user defined control and status word.

If a SM-Apps, SM-Apps Lite or SM-Apps Plus are present, these links can hold the value 9011 and the original Unidrive Classic control word / status word will be supported.

If no second processor is present, a bit of logic will be have to coded with the SyPT lite to translate the Control Word and Status Word into suitable SP versions. The following link describes this technique for the simpler case of a SK and an arbitrary custom control word.

http://www.emersonct.com/download_usa/SyPTLite/CTSL006.pdf

In all cases additional scaling and move logic is needed to:
$$\#20.12(16\text{-bit}) * (scaling) \rightarrow \#1.21(32\text{-bit})$$
$$\#20.13(16\text{-bit}) * (scaling) \rightarrow \#4.08(32\text{-bit})$$

$$\#2.01(32\text{-bit}) * (scaling) \rightarrow \#20.02(16\text{-bit})$$
$$\#4.02(32\text{-bit}) * (scaling) \rightarrow \#20.03 (16\text{-bit})$$

This would be coded with a SyPT lite program resident in the SP. A SyPT Pro program block in a SM-Apps / SM-Apps+ or code created with Powertools Pro for an EZ-Motion module.

For example

For an Open Loop application (Reference in Hz) –

$\#20.12(16\text{-bit}) * (scaling) \rightarrow \#1.21(32\text{-bit})$ requires that the (scaling) be 1/10 and an incoming value of 300 will be interpreted as 30.0 Hz target

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