

Connecting UniOP to Profibus DP TI

This Technical Note contains all the information required to connect the UniOP panels to a Profibus DP system with a Simatic TI 555 master and to take advantage from the advanced data access options supported by the UniOP Profibus DP driver.

Important: *this Technical Note applies only to the Profibus DP communication driver identified by the name 'Profibus DP TI' associated to the Designer file UPLC119.DLL. To run this protocol it is required a panel of hardware type -0045 and a communication module type TCM08.*

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1. Introduction

The UniOP panel can be connected to the Siemens Simatic TI 505 family of PLCs via the Profibus DP network. This technical note describes the principal points to follow for a successful connection.

A Profibus DP network can contain multiple nodes. A node in a Profibus DP network can be either a Master or a Slave. The Masters in the network have a group of Slaves assigned to them. A Master is able to exchange data with the Slaves that are under its control.

UniOP is always a Slave in a Profibus DP network and it is only able to exchange data with a single Master PLC. To enable UniOP to work, a set of special function blocks must be added to the PLC program in the Master PLC. These special function blocks are needed to process the requests from UniOP. This approach has the advantage that it offers to the slave panel full access to the data in the PLC, as if the panel was directly connected through the programming port. The current version is limited to some data types; see below in this technical note for more details.

There are 3 main steps that you need to follow to make UniOP work with Profibus DP:

- 1) Program the Master PLC to have UniOP as a slave using the COM Profibus configuration software
- 2) Add the special function blocks for UniOP to the Master PLC program
- 3) Configure UniOP with the Designer package

These steps are described in greater detail in the following sections.

2. Configuring UniOP as a Slave with COM Profibus

The Master PLC must be configured to communicate with its slaves. You can do this with the Siemens COM Profibus version 3.00 programming package. This package programs the Profibus DP port of the Master PLC so that it exchanges data with the specified Slaves. With this package you can select different types of slaves such as MMI, Remote Inputs etc.

A Profibus DP Slave type file for UniOP is provided together with the panel. The filename is EX9649AX.GSD; this file contains the description of the UniOP panels as Profibus DP slaves. The first thing you need to do is to copy this file to the GSD subdirectory of the COM Profibus installation directory and start the 'Scan GSD Files' in the COM Profibus software. This will enable COM Profibus to recognize UniOP as an MMI slave type.

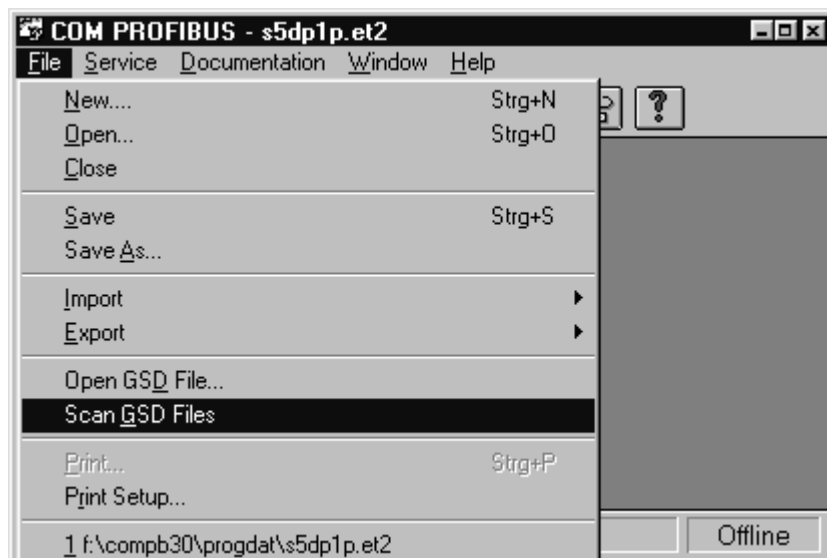


Figure 1 – Scanning for new GSD files

Before configuring UniOP as a slave you must select the PLC type of the Master PLC and the addressing mode that you want to use.

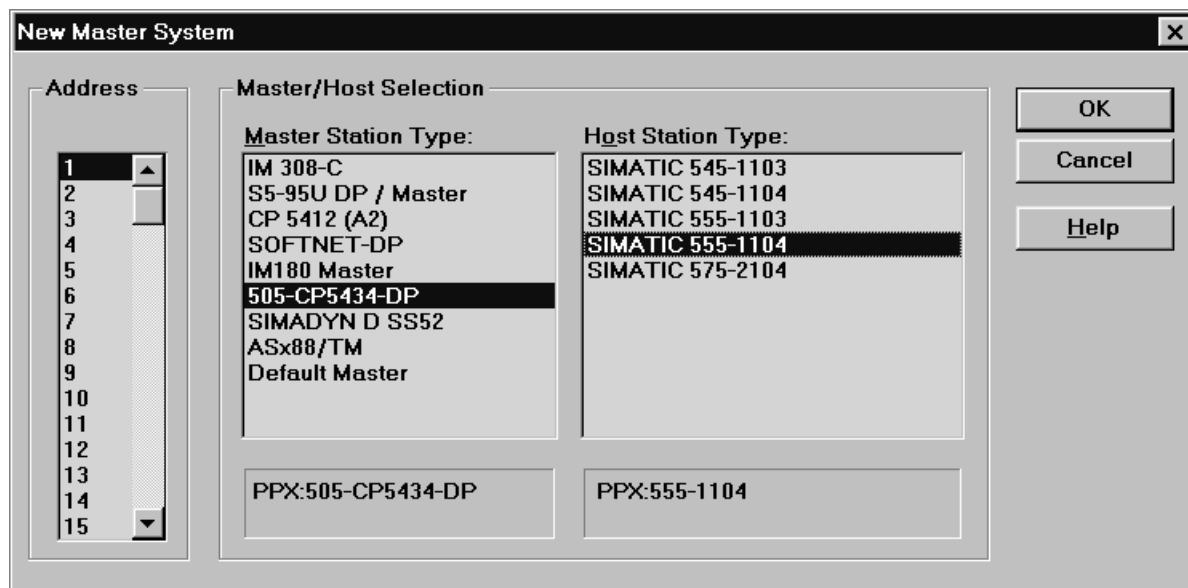


Figure 2 - Master & Host Selection Dialog Box

You select the addressing mode via the Master parameters dialog box as shown in Fig. 3. There are a couple of points to bear in mind when selecting the addressing mode of the Master PLC.

1. UniOP supports only the Linear addressing mode.
2. UniOP does NOT support the Multiprocessor addressing mode.
3. Note that not all addressing modes available in COM Profibus are supported by any Master system; please refer to the relevant Simatic documentation for more information.

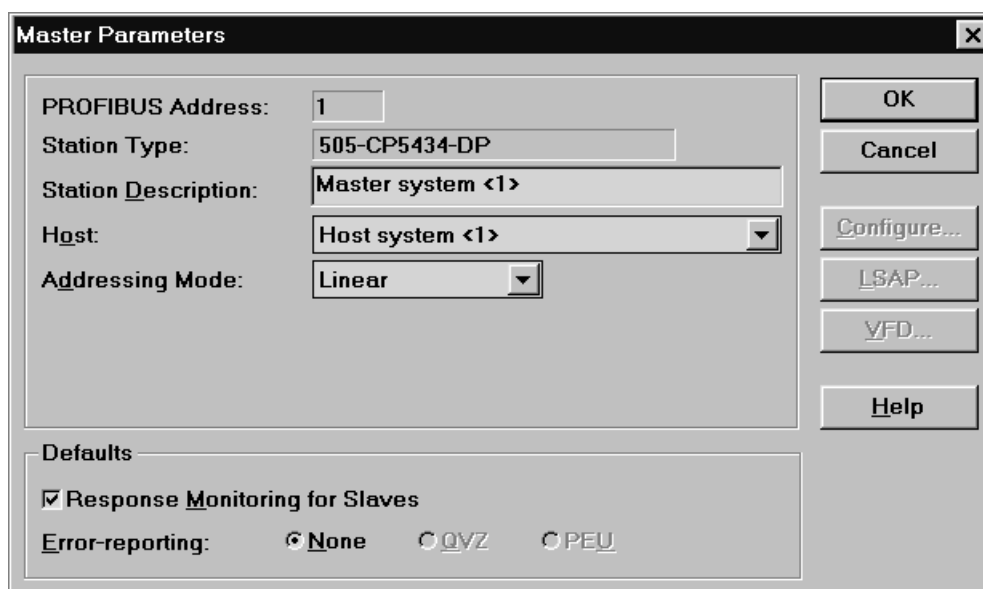


Figure 3 - Master Parameters Dialog Box

The network communication speed must be specified. Note that UniOP supports communication speed from 9600 baud to 12 Mb. UniOP performs automatic detection of the network speed.



Figure 4 - COM Profibus Network Configuration Editor

Once you have selected the Master PLC type and addressing mode the COM Profibus screen will appear as shown in Figure 4 in which there are two configured UniOPs. You can now add UniOP as a slave of the Master PLC by clicking on the MMI button and selecting UniOP from the list of available MMI type files (see Figure 5).

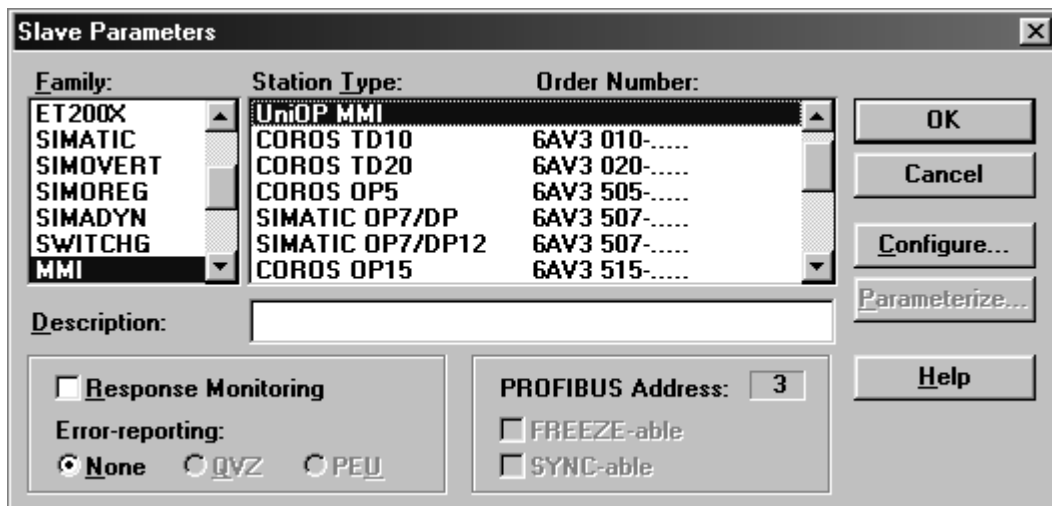


Figure 5 – Slave parameters Dialog Box

COM Profibus will then prompt you to enter the buffer size required by the slave unit. That can be done with the "Preset Configuration" dialog box shown in figure 6.

UniOP panels, when used as Profibus DP slaves require an Input Buffer and an Output Buffer.

Note: the current version supports only buffer sizes of 16 and 32 bytes.

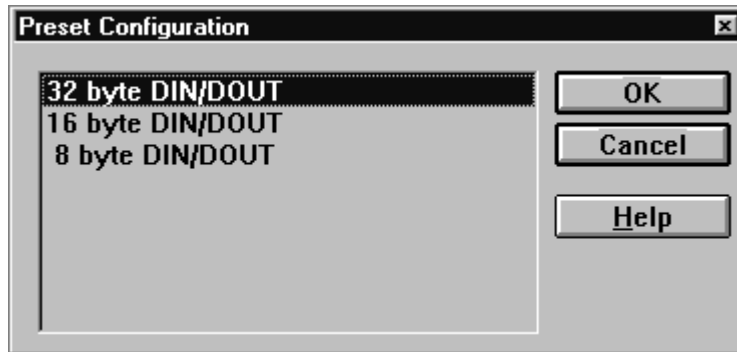


Figure 6 – Preset Configuration Dialog Box

Once you have done this you have to specify the Input and Output addresses that will be reserved for this UniOP panel in the Master PLCs memory and the error reporting mode for the slave. You do this via the Configure UniOP dialog box as shown in Figure 7. In this example the buffer size has been set to 32 bytes. The Simatic TI Profibus Master provides a powerful system to configure Profibus slaves on its I/O space, much more flexible than the method offered by COM Profibus. It is strongly suggested to leave blank the "I Addr." and "O Addr." fields in the dialog box shown in Figure 7 and to configure manually with the TI Soft programming package the UniOP I/O buffers.



Figure 7 - Configure UniOP Dialog Box

Note: see Appendix 4 – PLC Specific Information for more information on PLC addressing limitations.

You must **disable** the error reporting for UniOP. You do this by selecting "Error-reporting NONE" and by disabling the Response monitoring check box. This is a very important point. UniOP will be

unable to communicate if you do not disable Error Reporting for the panels. Note this does not mean that you have to disable error reporting for your other nodes in the Profibus DP network but just for the UniOP panels. Be careful if you enable error reporting globally via the Host Parameters dialog box as this will turn on error reporting for ALL slaves, even for the UniOP panels for which you disabled error reporting locally. Therefore if you change the Global Error Reporting mode via the Host Parameters dialog Box you must make sure that you then **disable** locally the Error Reporting mode for all UniOP panels.

Save the COM Profibus configuration by selecting File/Save.

Then select File/Export to a file and save the binary file that will be exported for use with the TISOFT PLC programming software.

You are now finished with COM Profibus.

Follow now the described steps:

- Use the TISOFT software to import the COM Profibus binary file.
- In order to transfer the configuration to the PLC you should start the ONLINE Mode in the TISOFT. From the menu select CONFIO.
- Select PRO-DP (if not selecting for the first time, this will already be the default selection.). Select MERGE, then YES. Use DIR to choose file directory name, and move the cursor to the name of the COM Profibus binary file to be imported into the TISOFT program. Press SELECT function key to choose the selected file.
- Select CONFIG. Since TISOFT is in ONLINE Mode, you should select the READDK option. The slave address should appear on the top line of the screen.
- Select EDIT and use Down Arrow key to move the cursor to the first line. Position cursor on the first line of the I/O Address column and type in the start address of the buffer. The I/O address provides the starting memory location of one (slave) UniOP unit communication buffer. In the example, the start INPUT address for the 1st UniOP is set to WX4001, and it will take 8 consecutive input words (that is, up to WX4008).
- Press now the ESC key and select UPDATE; answer YES to the prompt and select CONT on the next question.
- If STOP is displayed in the bottom right corner of the TISOFT screen, then select the function, OPR/ST, then choose YES. Verify that the message OPERATE is shown in the bottom right corner of the screen (note that it is possible to set this mode only after going to ONLINE Mode.). Select ESC key.

In chapter 3 you will find the complete description of a sample UniOP support program to be run in the master PLC.

Now you can load into the PLC the user application program that provides the server functionality for the UniOP requests.

Note: *if you are going to use the sample program available from Exor, you do not need to perform the complete sequence of actions previously described. You will need only to load in the PLC all the components provided with the sample project. In fact, this file contains also the complete Profibus DP I/O configuration as required for two UniOP panels. The first UniOP has node number 3 with Input buffer from WX4001 to WX4008 and Output buffer from WY4009 to WY4016. The second UniOP has node number 4 with Input buffer from WX4017 to WX4024 and Output buffer from WY4009 to WY4016.*

2.1 Configuring the PLC Memory Area for UniOP

The PLC program reads configuration data for each connected UniOP on the bus from a reserved data area in the PLC memory in which you have to insert some parameters.

The memory area reserved to UniOP starts in the V-memory at address V11000 and it is organised like show in Table 1.

Address	Memory Location Content
V11000	Number of connected panels
V11001	Reserved
V11002	Buffer size
V11003	Reserved
V11004	Input address 1 st panel - 1
V11005	Output address 1 st panel - 1
V11006	Error code 1 st panel
V11007	Last Job Number 1 st panel
V11008	Reserved
V11009	Reserved
V11010	Input address 2 nd panel - 1
V11011	Output address 2 nd panel - 1
V11012	Error code 2 nd panel
V11013	Last Job Number 2 nd panel
V11014	Reserved
V11015	Reserved
V11016	Input address 3 rd panel - 1
V11017	...
...	...

Table 1

Number of connected panels

Enter here the number of connected panel over the bus.

Buffer size

Specifies the buffer size for all the connected panels. The buffer size must be the same for all UniOPs. This is a coded information according to the following list:

- 8 bytes of I/O enter 4;
- 16 bytes of I/O enter 8;
- 32 bytes of I/O enter 16.

Input address -1

Specifies the start address in the input area for the current panel. You should enter here the address in decimal format, minus 1. If for instance the input buffer for the 1st panel starts at WX4001, you should enter here 4000.

Output address -1

Specifies the start address in the output area for the current panel. You should enter here the address in decimal format, minus 1. If for instance the output buffer for the 1st panel starts at WY4009, you should enter here 4008.

Error code

Contains the last error code for the current UniOP. You do not have to enter anything here

Last Job Number

Contains the last job number for the current UniOP. It is used by the pPLC program to save temporary information. You do not have to enter anything here.

When you have more than two panels on the bus you should fill properly the memory locations. Please remember that the offset between two locations associated to consecutive panels, is always equal to 6.

3. PLC program

One special program is required in the master PLC to serve UniOP communication requests. The example provided with the driver is called TIPROF and has been written using the TISOFT version 6.2.2 programming software.

This PLC program requires some internal memory areas of the PLC to store internal buffer and temporary working variables. Below is the printout obtained from the TISOFT cross reference generator.

WX1	104--MOVE	367--MOVE	
WY1	380--MOVE	562--MOVE	669--MOVE
C510	1--]/[-	7--]/[-	16--]/[-
	29--]/[-	74--]/[-	104--]/[-
	116--]/[-	116--]/[-	116--]/[-
	116--]/[-	116--]/[-	116--]/[-
	116--]/[-	116--]/[-	116--]/[-
	116--]/[-	116--]/[-	116--]/[-
	116--]/[-	116--]/[-	116--]/[-
	116--]/[-	202--]/[-	202--]/[-
	202--]/[-	202--]/[-	202--]/[-
	202--]/[-		
C511	202-()		
C32001	116-()		
C32002	248-()	282--] [-	494--] [-
	669--] [-		
C32003	282-()	299--] [-	309--] [-
	318--] [-	327--] [-	336--] [-
	345--] [-	419--] [-	440--] [-
	465--] [-	659--] [-	
C32004	299-()	659-()	
C32006	354-()	419--] [-	
C32007	367-()	419--] [-	
C32008	380-()	419--] [-	
C32009	393-()	419--] [-	
C32010	406-()	419--] [-	
C32017	419-()	465--] [-	
C32018	440-()		
C32019	465-()		
C32020	7-()	16-()	29-()
	74-()	104-()	669-()
C32023	494-()	513--] [-	522--] [-
	531--] [-	540--] [-	601--] [-
	628--] [-	640--] [-	
C32026	549-()	601--] [-	
C32027	562-()	601--] [-	
C32028	575-()	601--] [-	
C32029	588-()	601--] [-	
C32037	601-()		
C32038	628-()		
C32039	640-()		
C32040	309-()	354--] [-	
C32041	318-()	367--] [-	

C32042	327-()	380--] [-	
C32046	336-()	406--] [-	
C32047	345-()	393--] [-	
C32060	513-()	549--] [-	
C32062	522-()	562--] [-	
C32066	531-()	588--] [-	
C32067	540-()	575--] [-	
V1	354--MOVE	549--MOVE	
V9999	202--MOVE		
V10000	104--MOVE	116--WAND	116--WAND
V10001	116--WAND	116--WAND	
V10002	116--WAND	116--WAND	
V10003	116--WAND	202--WAND	
V10004	202--WAND	299--WAND	659--WAND
V10005	549--MOVE	562--MOVE	575--MOVE
	588--MOVE		
V10029	465--MOVE	640--MOVE	
V10030	282-(SET)	282-(RST)	419--MOVW
	465--WAND	465-(SET)	465-(RST)
	494--LDC	494--MOVW*	601--MOVW
	601-(SET)	601-(RST)	640--WAND
	669--MOVE		
V10031	440--ADD	440--WROT	440-(SET)
	494--MOVW*	494--MOVW*	628-(SET)
	628-(SET)		
V10032	354--MOVE	367--MOVE	380--MOVE
	393--MOVE	406--MOVE	494--MOVW*
	494--MOVW*		
V10033	494--MOVW*	494--MOVW*	
V10034	494--MOVW*	494--MOVW*	
V10035	494--MOVW*	494--MOVW*	
V10036	494--MOVW*	494--MOVW*	
V10037	494--MOVW*	494--MOVW*	
V10038	494--MOVW*	494--MOVW*	
V10039	494--MOVW*	494--MOVW*	
V10040	494--MOVW*	494--MOVW*	
V10041	494--MOVW*	494--MOVW*	
V10042	494--MOVW*	494--MOVW*	
V10043	494--MOVW*	494--MOVW*	
V10044	494--MOVW*	494--MOVW*	
V10045	494--MOVW*		
V10050	116--WAND	116--WOR	202--WAND
	202--WOR	440--ADD	440--ADD
V10051	116--WAND	116--WROT	248--] =[-
V10052	116--WAND	248--] <>[-	248--] =[-
	248--MOVW	419--MOVW	601--MOVW
V10053	116--WAND	116--WROT	282--] =[-
	494--] =[-		
V10054	116--WAND		
V10055	116--WAND	116--WROT	309--] =[-
	318--] =[-	327--] =[-	336--] =[-
	345--] =[-	513--] =[-	522--] =[-
	531--] =[-	540--] =[-	
V10056	116--WAND	116--WOR	116--WOR
	116--WROT		
V10057	202--WAND	202--WOR	202--WOR

	202--WROT	354--MOVE	367--MOVE
	380--MOVE	393--MOVE	406--MOVE
	549--MOVE	562--MOVE	575--MOVE
	588--MOVE		
V10058	202--WAND	248--] =[-	
V10059	299--WAND	354--MOVE	367--MOVE
	380--MOVE	393--MOVE	406--MOVE
	440--ADD	440--ADD	549--MOVE
	562--MOVE	575--MOVE	588--MOVE
	659--WAND		
V10070	29--MOVE	248--] <>[-	248--MOVW
	248--MOVE		
V10072	7--ADD	7--ADD	16--] >[-
	16--LDC	29--MULT	74--MULT
V10073	29--MOVE	104--MOVE	
V10074	74--MOVE	669--MOVE	
V10075	29--MULT*	74--MULT*	
V10076	29--MULT*	29--MOVW	74--MULT*
	74--MOVW		
V10077	29--MOVW	29--SUB	29--SUB
	29--MOVE	29--ADD	
V10078	74--MOVW	74--SUB	74--SUB
	74--MOVE		
V10080	29--ADD	29--MOVE	248--MOVE
V10081	202--MOVE	202--WAND	
V10082	465--WAND	465--MOVE	640--WAND
	640--MOVE		
V11000	16--] >[-	29--MOVE	29--MOVE
	74--MOVE	248--MOVE	
V11002	104--MOVE	202--MOVE	465--MOVE
	640--MOVE	669--MOVE	

The PLC memory has been configure as described below.

PLC TYPE: 555

MEMORY CONFIGURATION

	USER MEMORY	SYSTEM MEMORY
LADDER (L).....	0032 KBYTES ...	0096 KBYTES
VARIABLE (V).....	0052 KBYTES ...	0052 KBYTES
CONSTANT (K).....	0000 KBYTES ...	0000 KBYTES
SPECIAL (S).....	0032 KBYTES ...	0032 KBYTES
USER SUB (U).....	0000 KBYTES ...	0000 KBYTES
TMR/CTR	0001 K	... 0005 KBYTES
DRUMS	0064	... 0003 KBYTES
SHIFT REG	0001 K	... 0001 KBYTES
TABLE MOVE	0001 K	... 0002 KBYTES
ONE SHOTS	0001 K	... 0001 KBYTES
CONTROL RELAYS ...	0032 K	
I/O (X,Y,WX,WY) ..	0008 K	
TOTAL SYSTEM MEMORY		1920 KBYTES
CONFIGURED SYSTEM MEMORY		0192 KBYTES
REMAINING SYSTEM MEMORY		1728 KBYTES

The sample program has been designed to work with two UniOPs. The first panel has node number 3, the second panel has node number 4. The I/O was assigned as shown in the table below.

PROFIBUS-DP I/O CONFIGURATION CHART FOR SLAVE ... 003
I/O POINTS

MODULE	1	1 WX4001	2 WX4002	3 WX4003	4 WX4004
MODULE	1	5 WX4005	6 WX4006	7 WX4007	8 WX4008
MODULE	1	9 WY4009	10 WY4010	11 WY4011	12 WY4012
MODULE	1	13 WY4013	14 WY4014	15 WY4015	16 WY4016

PROFIBUS-DP I/O CONFIGURATION CHART FOR SLAVE ... 004
I/O POINTS

MODULE	1	1 WX4017	2 WX4018	3 WX4019	4 WX4020
MODULE	1	5 WX4021	6 WX4022	7 WX4023	8 WX4024
MODULE	1	9 WY4025	10 WY4026	11 WY4027	12 WY4028
MODULE	1	13 WY4029	14 WY4030	15 WY4031	16 WY4032

In the TISOFT programming package the Profibus DP configuration screen should appear as shown in Figure 8.

Figure 9 shows the status of the Profibus DP slaves when the two UniOP panels are connected and correctly recognised by the master.

PROFIBUS-DP I/O MODULE DEFINITION FOR SLAVE 003									
SLAVE	IDENT	MODULE	I/O ADDRESS	NUMBER OF BIT AND WORD I/O					
				X	Y	WX	WY		
3	.. 9649	.. 1	.... 4001	0	0	8	8	.. ENABLED
4	.. 9649	.. 1	.... 4017	0	0	8	8	.. ENABLED

FROM PLC

OPERATE

555 TIPROF RN

EXIT-F1 SHOW-F2 READDK-F3 READPC-F5 EDIT-F7 UPDATE-F8

Figure 8 - Profibus DP I/O module definition

PROFIBUS-DP SLAVE STATUS				
ADDRESS ASSIGNMENT COMPLETE	SLAVE	ENABLED	ASSIGNED	ONLINE
	3	YES	YES	YES
	4	YES	YES	YES

UPDATE IN PROGRESS

OPERATE

555 TIPROF RN

EXIT-F1 CONFIG-F2 FIND-F3 MERGE-F4 EN/DIS-F5 505I0-F6 OPR/ST-F7 DELETE-F8

Figure 9 - Profibus DP Slave Status

Calling the UniOP support program from the main PLC program requires only one call to a specific subroutine. The subroutine must be called once each PLC program scan.

UniOP will not be able to communicate with the master PLC if the master is in STOP mode as the special server function would not be called in this case.

4. Configuring UniOP with Designer for Profibus DP

Configuring UniOP for operation in a Profibus DP network is straightforward.

- 1) To use the Profibus DP TI protocol with the Designer, you have to select the option "Project/Change Controller Driver" and choose "Profibus DP TI".

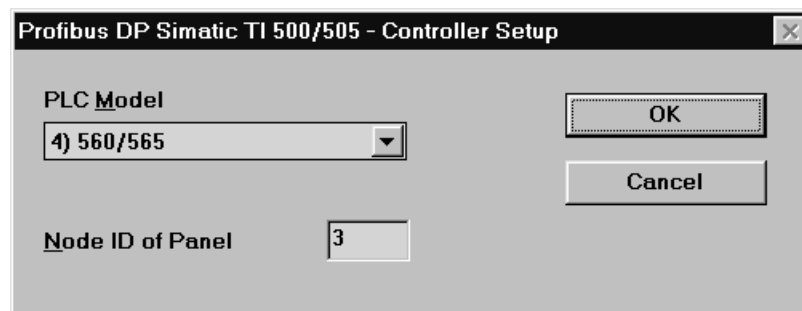


Figure 10 - Controller Setup

- 2) A UniOP panel in a Profibus DP network is always a slave that exchanges data with a single master PLC. Every UniOP in the Profibus DP network must be assigned its own unique Node address. You do this by entering a number in the 'Node ID of Panel' edit box in the Controller Setup dialog box.
- 3) Automatic recognition of the baud rate is supported. Communication speeds up to 12 Mb are supported. There is no need to enter the speed of the Profibus DP network in the Controller Setup dialog box.
- 3) The Real Time Clock information in the Reserved Data Area (RDA) is coded in BCD
- 4) The page number displayed and the page number requested in the RDA are coded in binary.
- 5) The RDA can be freely positioned within the PLC V-Memory area.
- 6) The cable to use for the direct connection between the Aux Port of the UniOP panel and the Profibus DP port of the PLC is CA128.
- 7) You can attach more than one UniOP to a single Master PLC.

5. Summary

To get your UniOP up and running as a Profibus DP slave you need to do:

1. Copy the EX9649AX.GSD file to the COM Profibus GSD subdirectory.
2. Configure your master PLC specifying the UniOP panels as Slaves using the UniOP MMI type.
3. Include the special UniOP PLC support program in the user application program.
4. Personalise the Profibus DP I/O map according to the desired addressing scheme.
5. Create the project files for the UniOP panels. Make sure that the "Panel Node" specified in the Designer Controller Setup dialog matches the node number used for the UniOP panel in the COM Profibus package.
6. Put the PLC into RUN mode and make you sure that the Profibus Mode is running on the PLC.

6. Troubleshooting

UniOP doesn't communicate, COM LED blinks and the Communication Status shows COM ERR 05 or COM ERR 09:

1. PLC is in STOP or is not turned on?
2. Cable is not connected or is broken?
3. UniOP has been programmed via the Designer Controller Setup dialog box to have a node number that is the same as another node in the network?

UniOP does not communicate, COM LED blinks and the Communication Status shows COM ERR 04

1. UniOP has been programmed by Designer to access non-existent (out of range) data. Either the RDA or a data item?

PLC fails to go into RUN mode

1. The Master PLC has been configured with COM Profibus to have Response Monitoring enabled for the UniOP panels?
2. UniOP has been programmed via the Designer Controller Setup dialog box to have a node number that is the same as another node in the network?

Appendix 1 - Communication Error Codes

Current communication status is displayed in the System Menu of the UniOP. Beside the string describing the current status of the communication, there is an additional error code representing the last (which may be not the current one) error encountered. The codes are following:

Code	Description
0	No error There are no communication errors and there have been no errors since start-up.
04	Negative acknowledgement to request Occurs when the PLC does not accept the request from UniOP. This error occurs if a non-existent data is accessed.
05	Time-out error to request Indicates that the communication line has been broken, the PLC has had a power fail or the PLC is in STOP.
06	Ill formed response Means that the response data was received from the PLC but the amount of data received was not what was expected.
07	General communication error Should never happen; it indicates an error in the software. Please note that this error may appear also if the TCM module is not correctly inserted in its socket.
08	Profibus chip error protect update Indicates an error in the low level handshaking with the internal Profibus chip during the ProtectUpdate operation
09	Time-out error on chip initialisation Indicates a time-out during the network initialisation phase. Probably indicates that the communication line has been broken, the PLC has had a power fail or there is in the network a duplicate node conflict.
10	Negative acknowledgement in response Occurs when the PLC accepts the request from UniOP but after processing the request returns a NAK

Appendix 2 - Technical Data and Connection Information

The main technical information on the UniOP Profibus DP Slave interface using TCM08 is shown in the table below:

Baud rate	9.6 Kb to 12 Mb
Buffer size	32 bytes
Slave address	Software configurable
Optical insulation	Yes
Profibus Connector	Standard, 9 pin female sub-D type

UniOP has a standard Profibus connector. A simple point to point connection can be performed with the cable CA128.

Appendix 3 - Requirements and Compatibility

This version of Profibus DP is included in the Designer DLL file UPLC119.DLL. The initial release level is 3.00 for the communication driver and 5.00 for the DLL (both version numbers can be seen in the Change Controller Driver dialog box of the Designer software).

A communication module of type TCM08 is required.

The UniOP panel must have hardware type -0045 and firmware version number 4.10 or higher to support the TCM08 modules.

Appendix 4 - PLC Specific Information

The PLC program, provided as an example together with the driver has some limitation. Current version is **TiProf1**.

The Designer interface gives you the possibility to define all the available data types of the PLC, but the support program handles only a sub-set of them. Table 2 shows a list of supported Data Types by the current release of the PLC program.

Supported DATA TYPE	NOT supported DATA TYPE
V – Memory [V]	Input [X]
Input Word [WX]	Output [Y]
Output Word [WY]	Control Relay [CR]
Timer/Counter Preset Value [TCP]	ALL Drum/Edrum Memories
Timer/Counter Current Value [TCC]	

Table 2 – Supported/Not Supported Data Types