Connecting UniOP to Telemecanique PLC's

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1. Introduction

There are two communication drivers for Telemecanique PLCs, a driver for Uni-Telway and a driver for the TSX programming port. All Telemecanique PLCs are able to support the Uni-Telway protocol, however, only the TSX-17, TSX-47 and TSX 47-1 PLCs can support the TSX programming port protocol.

Communication via the TSX programming port driver tends to be faster than with the Uni-Telway driver as there is less overhead. However, the TSX programming port driver only allows communication with a single PLC. The Uni-Telway driver, on the other hand, allows communication with any PLC in a Uni-Telway network.

2. Uni-Telway Driver

An operator panel on UNI-TELWAY is always a Slave in a Uni-Telway network. One Telemecanique PLC must be configured as a Master in order to poll all the slaves in the network and to broker the communication between them. Telemecanique PLCs can be configured to be either Masters or Slaves in a Uni-Telway network.

2.1 Uni-Telway Addresses

All the Slaves in a Uni-Telway network must be assigned unique data link addresses. The Master is always assigned data link address 0 while the Slaves can have data link addresses in the range 1 - 255. Telemecanique PLCs are assigned the data link addresses in one of three ways.

- If it is attached to an SCA 64 junction box, or similar, then the PLCs data link address is set by the dip switches within the junction box.
- The data link address can be set by special wiring on the cable attached to the PLCs Uni-Telway port.
- The data link address can be set by a Text Block within the PLC program.

The Uni-Telway philosophy allows for multiple "Wires" (Uni-Telway networks) and also for backward support for the earlier TELWAY 7 networks. This complicates the addressing scheme considerably. To support these concepts the full address of any Master or Slave consists of 5 address levels:

Network
Station
Gate
Module
Channel

The Network element is used ONLY for backward support for the earlier TELWAY 7 networks. If you have a pure Uni-Telway network then this element is always 0.

The Station element is also ONLY used for backward support for the earlier TELWAY 7 networks. If you have a pure Uni-Telway network then this element is always 254.

The Gate element specifies the logical gate. 0 specifies the system gate, 5 indicates a Slave attached to a TSX SCM 21.6 in the Master PLC. The Master PLC that actually contains the TSX SCM 21.6 will take a value of 0 for this element. The Slaves that are attached to the "Wire" that originates from this TSX SCM 21.6 will take a value of 5 for this element.

The Module element takes a non zero value only when a value of 5 (SCM 21.6) is used for the Gate element. In this case the module element specifies in which rack and in which module slot the SCM 21.6 is located in the Master PLC. In hexadecimal notation the first hexadecimal digit specifies the rack number, 0 - F, while the second hexadecimal digit specifies the module location, 0 - 7. A hexadecimal value of H'FE' can be used if there is only a single Uni-Telway "Wire".

The Channel element specifies the data link address as specified by the dip switches on the SCA 64 junction box, or by the Text Block in the PLC program. This value is actually specified as the data link address + H'64'. A value of 0 is used if the value of the Gate element is NOT 5. A value of H'65' corresponds to data link address 1, H'66' to data link address 2 and so on.

2.2 Designer Controller Setup

You have to inform Designer of the addresses of all the PLCs that you want your panel to communicate with. You do this in the Controller Setup Dialog Box. If you just want to communicate with a single PLC then all you have to do is specify the 5 address levels for the one particular PLC that you want to communicate with.

If you want the panel to communicate with multiple PLCs then you need to click the “Multipoint Connection” check box and the “Access Multiple PLCs” checkbox. You will then be able to enter the addresses for all the PLCs that you want to access. In order for UniOP to communicate successfully with Uni-Telway PLCs you MUST make sure you enter the correct addresses for the PLCs.

If you click the “Multipoint Connection” check box then you will notice that the “PLC Slave ID” edit box is enabled. This “PLC Slave ID” does not directly correspond to any Uni-Telway address, it is not the data link address but is rather the “Internal Designer” reference for the PLC address that you configure. When you later add data items to the Designer pages you will be able to specify from which PLC you want to access the data item from. You will do this by selecting the “PLC Slave ID” in the Field Dialog Box. This means that you won’t have to enter the full five level PLC address in the Field Dialog Box but rather just the “Internal Designer” reference to an already configured PLC address.

Aswell as the PLC addresses you must also enter a unique data link address for the panel itself. You do not need to enter the full 5 level address for the panel just the data link address. Remember that the Channel number equals the data link address plus 64 hexadecimal. If you enter a data link address of 1 for the panel then this will correspond to Channel 65 hexadecimal.

Remember that every PLC and operator panel must be assigned unique addresses. Make sure you don’t assign your panel a data link address used by a PLC!

You must also make sure that you configure the panel - Uni-Telway communication parameters, Baud Rate, Parity and Stop Bits so they match the communication parameters configured in the PLCs. You specify these parameters by pressing the “PLC Comm” button in the Controller Setup Dialog Box.

The different Telemecanique PLC model types need slightly different handling at the level of the communication driver. Therefore you must be sure to select the PLC model type that matches your PLC. The supported types are :

TSX 07 Nano
TSX 37 Micro
TSX 57 Premium
TSX 17-20
TSX 47
TSX 47-1

The TSX 47 model type includes TSX 47-10, 47-20, 47-30, 47-40 and V4 PLCs.
The TSX 47-1 is for very old TSX 47 PLCs.

2.3 Point To Point Connection Addressing

If you want to attach your UniOP panel directly to a Telemecanique Master PLC in point to point connection then you would enter the PLC address in the Controller Setup Dialog box as:

- Network 0
- Station 254
- Gate 0
- Module 0
- Channel 0

And you would enter the UniOP Node ID as: 1

2.4 Multiple Point Connection Addressing

If you want to attach your UniOP panel to a Uni-Telway network to access data from both the Master PLC and the Slave PLCs then, again, you would enter the PLC address of the Master PLC in the Controller Setup Dialog Box, remembering that the Gate element and the Module element for the Master PLC always take the value 0 regardless of the actual location of the SCM 21.6 module, as:

- Network 0
- Station 254
- Gate 0
- Module 0
- Channel 0

The addresses of the Slave PLCs would depend on their configuration, but as an example lets consider that the Uni-Telway network consists of :

- Master PLC with a SCM 21.6 module in rack 0, slot 3
- Slave TSX-17 PLC with coupleur module and data link address 1

The address of the Slave TSX-17 PLC would be entered in the Controller Setup Dialog Box as:

- Network 0
- Station 254
- Gate 5
- Module H'FE' or H'03'
- Channel H'65'

The UniOP Node ID would be entered as: 2

The important points to notice for the Slave PLCs are that:

- The Gate element is set to 5. This means that this is a Slave PLC that is connected to a "Wire" originating from a SCM 21.6 module in the Master.
- The Module element specifies the rack number and module number where the SCM 21.6 module that is the "Wire" controller is located in the Master PLC.

2.5 TSX 07 Nano

The TSX 07 Nano has a built-in Uni-Telway port that is used also for programming the PLC. This PLC is factory configured as a Uni-Telway Master.
UniOP can be attached directly to this PLC with cable CA76.

2.6 TSX 37 Micro

The TSX 37 Micro has one or two built-in Uni-Telway ports, the first one, called the TER port, is used also for programming the PLC. The second port, when available, is called the AUX port. This PLC is factory configured as a Uni-Telway Master.
UniOP can be attached directly to either of the two ports with cable CA76.

If UniOP is connected to the Aux port and if the programming package is connected to the main port, the panel must be assigned a Slave address of 4 or higher.

2.7 TSX 57 Premium

The TSX 57 Premium has one or two built-in Uni-Telway ports, the first one, called the TER port, is used also for programming the PLC. The second port, when available, is called the AUX port. This PLC is factory configured as a Uni-Telway Master.
UniOP can be attached directly to either of the two ports with cable CA76.
If UniOP is connected to the Aux port and if the programming package is connected to the main port, the panel must be assigned a Slave address of 4 or higher.

2.8 TSX SCG 116 Coupleur Module, Point To Point

UniOP can be attached directly to the TSX SCG 116 coupleur module, used with the TSX-17 PLCs, in point to point mode with cable CA72. This cable will force the TSX-17 PLC to the default settings for a Uni-Telway Master. These settings are:

- poll 31 data link addresses
- 9600 Baud rate
- 30 ms time out
- 8 bytes of event data

When using cable CA72 make sure that the Baud rate in the Controller Setup Dialog Box is also set to 9600, unless you have overridden the default Baud rate using a Text Block.

An important point to remember is that the TSX-17 PLC will ONLY use these default settings listed above if the PLC is powered up with cable CA72 ALREADY attached. Therefore FIRST attach cable CA72 to the UniOP panel and to the PLC, THEN turn on the PLC.

The TSX SCG coupleur module has 2 red LEDs for Uni-Telway diagnostics. One is for the PLCs Uni-Telway address setting; it is turned ON if the PLC has not reverted to it's default settings. This LED should be OFF if the cable CA72 is attached. The other LED is to indicate that at least one Slave is talking to the PLC. This LED is turned ON when there are NO Slaves communicating. This LED should be OFF if the UniOP panel is connected and communicating with the PLC.

Remember to set the data link address for UniOP with Designer via the Controller Setup Dialog Box. For a point to point connection you could set it to 1.

2.9 TSX SCM 21.6, Point To Point

UniOP can be attached directly to the TSX SCM 21.6 module, used with the TSX-47 PLCs, in point to point mode with cable CA84. This cable will force the module to the default settings for a Uni-Telway Master. These settings are:

- poll 31 data link addresses
- 9600 Baud rate
- 30 ms time out
- 8 bytes of event data

When using cable CA84 make sure that the Baud rate in the Controller Setup Dialog Box is also set to 9600, unless you have overridden the default Baud rate using a Text Block.

An important point to remember is that the TSX-47 PLC will ONLY use these default settings listed above if the PLC is powered up with cable CA84 ALREADY attached. Therefore FIRST attach cable CA84 to the UniOP panel and to the PLC, THEN turn on the PLC.

Remember to set the data link address for UniOP with Designer via the Controller Setup Dialog Box. For a point to point connection you could set it to 1.

2.10 TSC SCA 62

UniOP can be attached to the TSC SCA 62 junction box with cable CA102. UniOP will ignore the data link address that you may set in the junction box for the UniOP using the dip switches. The UniOP data link address can ONLY be specified by Designer via the Controller Setup Dialog Box.

2.11 LES 64

UniOP can be attached to the LES 64 junction box with cable CA101. The UniOP data link address must be specified by Designer via the Controller Setup Dialog Box.

There is a red LED for Uni-Telway diagnostics next to the port for the LES 64. This LED is to indicate that at least one Slave is talking to the PLC. This LED is turned ON when there are NO Slaves communicating. This LED should be OFF if the UniOP panel is connected and communicating with the PLC.

2.12 Customized Configurations Using a Text Block

If you are not satisfied with the default configuration of the Uni-Telway network you can customize it using the Text Block instruction which is available for both the TSX17 and TSX47 PLCs. For example, to improve the performance of the network you might want to increase the Baud rate to 19200 and to reduce the number of Slaves polled by the Master to 5. This could be done with a Text Block instruction.

The Text Block instruction must be added as part of your PLC program. The Text Block instruction performs an initialization of the Uni-Telway parameters for the PLC. You pass the Text Block instruction the address of the start of a block of data containing the Uni-Telway parameters. This block of data can either be in the Internal Word (W) or Constant Word (CW) area of memory.

This block of data takes the following form:

Uni-Telway Master

Function 5	0	Num link addresses to poll		Wi
0	0	0		
Binary data flow				
Time Out				
0		Size of event data		Wi + 4

Uni-Telway Slave

Function 6	0	Server system address		Wi
0	0	0		
Binary data flow				
Time Out				
Line monitoring address		Client application address		Wi + 4

If you do change the Baud rate then you should keep in mind that all nodes in the network should use the same Baud rate. This will mean that you might have to reconfigure the other nodes so that they use the same Baud rate. You can always use the ADJUST option in the Telemecanique programming software to modify the PLC data.

As an example, we use W50 through W54 to configure the Master PLC as follows

W50 = H'5005'
W51 = H'0000'
W52 = H'1920'
W53 = H'0000'
W54 = H'0008'

The breakdown of these parameter are :

W50 = Uni-Telway master, 5 nodes to poll
W51 = n/a
W52 = 19200 baud rate
W53 = 0 delay

W54 = 8 bytes of data to send

When you use a Text Block to configure the Uni-Telway parameters it is always a good idea to make sure that the Text Block operation has worked as expected. You can use the DEBUG option in the Telemecanique programming software to monitor the Text Block instruction. The field T,R (or T,V) in the instruction must show H'00FE' indicating successful configuration. If you do not see H'00FE' then the coupleur module has not been initialised properly and communication will not be possible. In this case investigate the reason for the problem.

2.13 Important Points To Remember

- Uni-Telway is a single Master, Multiple Slaves network. The Master keeps everything going by sequentially polling all the Slaves. The Slaves can only request information when they are polled by the Master. This means that the amount of time available to each Slave for communication will be reduced in direct proportion to the number of Slaves in the network. UniOP is just another Slave in the network so it is to be expected that the update of variables on the UniOP screen will be slower the larger the number of PLC Slaves in the network.

- You can attach more than one UniOP panel to the same Uni-Telway network. Just be sure to assign each UniOP a unique data link address in the Controller Setup dialog box.

- If you use a Text Block instruction to initialise the Uni-Telway parameters then it is always a good idea to check whether the Block Text instruction was successful. You can use the DEBUG option in the Telemecanique programming software to monitor the Text Block instruction. The field T,R (or T,V) in the instruction must show H'00FE' indicating successful configuration. If you do not see H'00FE' then the coupleur module has not been initialised properly and communication will not be possible. In this case investigate the reason for the problem.

- If you use a Text Block instruction to initialise the Uni-Telway parameters for an SCM 21.6 module then be careful that you don't re-initialise the module on every cycle of your PLC program or the communication will be very seriously degraded. The exchange of the Text Block is started by a rising edge on the S, I, O inputs. If there is a rising edge on every cycle of the PLC program you will be re-initialising the SCM 21.6 module on every cycle. If you use the EXCHG TXTi command in Literal mode to exchange the Text Block then you should be very carefull. If this command is added, as is, to your program it WILL reinitialise the SCM 21.6 module on every cycle of the PLC program. In this case you should provide some extra code to ensure that the command is executed only once on startup.

- The processors of the Telemecanique PLCs can, at most, exchange a single input and a single output message with each module, for example SCM 21.6, on each cycle of the application PLC program. Some PLCs, for example the TSX 47-20, can only exchange either a single input or a single output message. This means, in effect, that the speed with which UniOP can refresh variables on the screen will be limited by the duration of the PLC program in the PLC from which it wants to access the data. In a worst case scenario of a PLC program that has a cycle time of 255ms this means that the fastest possible time for UniOP to refresh a single variable on it's screen would be half a second. Unfortunately there is no way that UniOP can access the data any faster as it has to wait for the PLC to respond. Of course reducing the execution time of the PLC program would also improve the response. In fact it can easily be seen by placing the PLC in STOP that UniOP is able to refresh it's screen much faster as, in this case, the PLC replies immediately.

- Some Telemecanique processors, for example TSX 47-20, are not able to communicate with modules, for example SCM 21.6, when the PLC is in STOP. This. of course. also means that a UniOP would not be able to communicate with such a PLC via Uni-Telway when it is STOPed.

- A SCM 21.6 module used as a Master can store a maximum of 3 messages from the Uni-Telway network until they are routed to the PLC processor or back onto the Uni-Telway line. If more than 3 messages arrive before this moment they are lost.

- A SCM 21.6 module used as a Slave can only handle a single system access exchange at a time. This means that if UniOP makes a request while the Slave is already processing one, the UniOP request will not be accepted.

- Make sure that your Telemecanique processor supports the SCM 21.6 module. Not all processors support it. Also make sure that your TSX 47 RACK supports the SCM 21.6 module. The simplified rack does not support it.

- Make sure that you have configured your PLC for the SCM 21.6 module using the CONFIGURATION - I/O MODULE option. This will also enable you to check whether your PLC supports the SCM 21.6 module as the configuration will not be accepted if the PLC doesn't support the module. If you do not configure the SCM 21.6 module properly it won't be able to communicate with your CPU.

- If the CPU MEM LED is ON then communication with Uni-Telway will be blocked by the CPU. In this case UniOP will not be able to communicate with the PLC. The CPU MEM LED is turned on when, for example, you are transferring a PLC program to the CPU with the Telemecanique programming software.

With the Telemecanique PLCs you must configure the number of Inputs, Outputs, Internal Words, Constant Words, Common Words, Timers, Counters and Monostables. If a variable that is outside the configured range is attempted to be read from or written to, the PLC will respond with an error code in the communication packet. For this reason you should be carefull that you do not add to the UniOP pages data items that are outside the configured range for the PLC.

If you need to refer to the Module number for the location of the TSX SCG 116 when specifying the address in the Controller Setup dialog box then you should keep in mind that the first Module number is 1 and not 0 for the TSX 17. This is different to a TSX 47 using a SCM 21.6 which uses a value of 0 for the first module location.

Communication with Uni-Telway is unfortunately very slow. This is not due in any way to the operator panel but rather due to the architecture of Uni-Telway and the Telemecanique PLCs. If you find that the update of variables on the page is unacceptably slow then there are a number of things you can try:

- Try to reduce the execution time of your PLC program. Maybe you could split it into a number of different tasks. For some PLC types, for example the V4 PLCs, the Telemecanique programming software allows you to specify the Cycle Time of the program. Try setting this to a low value, for example 50 ms, while making sure that this doesn't compromise the operation of your program.

- Disable all or parts of the Reserved Data Area in the Designer RDA Setup Dialog Box. If you don't need the RDA then there is no point having it enabled; it will just eat up valuable communication time.

- Reduce the number of variables on each UniOP page.

- If you are using a Text Block to initialise the Uni-Telway parameters then make sure you are initialising it properly.

- Reduce the number of Slaves polled by the Master and the Time Out value using a Text Block.

- Use a Baud rate of 19200 using a Text Block.

3. TSX Programming Port Driver

The TSX-17 and TSX-47 PLCs have built in programming ports on the CPU module. The programming port does not use the Uni-Telway protocol but a different protocol called TSX Reglage. UniOP can communicate with the PLC via the programming port using the TSX programming port driver.

3.1 Designer Controller Setup

The TSX driver can be configured to operate in two modes, Single Point, the default, or Multiple Point. You can select the required mode via the PLC Setup dialog box in Designer. You select Multiple Point by checking the '1:N Multiple Point' check box. If this check box is not checked then Single Point is assumed.

UniOP can only communicate with a single PLC using the TSX programming port driver. Therefore, you should invariably select the Single Point mode. The Multiple Point mode is available if the PLC that you want to communicate with is part of a TELWAY 7 network. In this case you may need to specify the TELWAY 7 address of the PLC in the network. The TELWAY 7 network is not the same as the Uni-Telway network, it is an older and more or less obsolete network. If the PLC is attached to a Uni-Telway network then you should still select Single Point if you want to attach a UniOP to the programming port of the PLC.

The different Telemecanique PLC model types need slightly different handling at the level of the communication driver. Therefore you must be sure to select the PLC model type that matches your PLC. The supported types are :

TSX 17-20
TSX 47
TSX 47-1

The TSX 47 model type includes TSX 47-10, 47-20, 47-30, 47-40 and V4 PLCs.
The TSX 47-1 is for very old TSX 47 PLCs.

3.2 TSX 17-20

UniOP can be attached to the programming port of the TSX 17-20 with cable CA94.

3.3 TSX 47 and 47-1

UniOP can be attached to the programming port of the TSX 47 and 47-1 PLCs with cable CA103.