

Product Description

The AL-2720 communication driver allows that the programmable controllers of Ponto Series PO3X42 and Quark Series QK801 communicate to the Metasys® nets, so supervision systems and master equipments can communicate through the N2 protocol.

The driver associates the operands of the CPUs with the regions of data defined for the N2 protocol, allowing the access to the values of the operands through reading, writing and forcing commands. The clock of the CPU also can be adjusted through synchronism commands.

The serial interface used in the communications is the COM2, RS485 physical layer, with baud rate and fixed format of the character, defined by the norm of the N2 protocol.

Ordering Information

Included Items

The product packing contains only a disc with a set of archives that compose the N2 communication driver, specific for each type of UCP.

Product Code

The following part number must be used when ordering the product:

Part Number	Description
AL-2720	Communication driver for N2 protocol

Related Items for Obligator Acquisition

The following products must separately be acquired to make possible the use of the product:

Part Number	Description
AL-2703	Modules F of communication

Notes:

AL-2703: The N2 communication driver was developed in diagram of relays and blocks, making calls to the Modules F of communication.

Related Items

Depending on your system requirements, the following products might be ordered separately.

Part Number	Description
AL-2300	ALNET II / AL-2600 Cable
AL-2600	Network Branch and Termination
PO8500	Expansion Cable 0.4 meters (RJ45 – RJ45)
PO8525	RS485 Network Branch and Termination
AL-2306	RS485 Network Cable
MT4100	MasterTool Programming
MT6000	MasterTool ProPonto

Notes:

AL-2300: This cable have a DB9 serial connector in one of the extremities, and on the other five pins identified with numbers. It can be used to:

- Connect the RS485 port of a QK801 CPU to the AL-2600 branch and terminator

PO8500: This cable have two RJ45 connectors. It can be used to:

- Connect the RS485 port of a PO3X42 CPU to the PO8525 branch and terminator

AL-2306: This cable is used to pass through data on the RS485 network. It can be used to:

- Interconnection between branches AL-2600 and/or PO8525

Functional Characteristics

The communication driver for the N2 protocol, product AL-2720, wrote for the CPUs Altus of Quark Series, model QK801, and Ponto Series, models PO3042, PO3142, PO3242 and PO3342, was developed to support only the basic commands of the N2 protocol, simplifying its implementation in diagram of relays and blocks.

This CPUs supports the following commands of the N2 protocol

Command	Subcommand	Region	Command Description
0	0	-	Clock synchronism.
	4, 5	-	Pooling with or without ACK: it always returns without COS.
1	-	2	Read of the attribute 1: it always returns value 0. Read of the attribute 2: it returns the object state.
		4	Read of the attribute 1: it always returns value 0. Read of the attribute 2: it returns the object state. Read of the attributes 3, 4 e 5: not implemented.
		5, 6, 7	Read of the attribute 1: it always returns value 0. Read of the attribute 2: it returns the object state.
2	-	2, 4	Write of the attributes: without effect, returning success.
		5, 6, 7	Write of the attribute 1: without effect, returning success. Write of the attribute 2: implemented.
7	2 ⁽¹⁾	2, 4	Forces the state of the object.
		5, 6, 7	Forces the value of the object.
	3 ⁽²⁾	-	Release the forces: without effect, returning success.
F	-	-	Identification of the type of the equipment.

Notes:

- ⁽¹⁾ The objects don't keep forced when commands to force the objects (command 7, subcommand 2) are used. These commands have the same effects as single writing commands, and the objects stay being able to be overlapped immediately by a new value, in case of be an input object type.
- ⁽²⁾ The command to release the forces (command 7, subcommand 3) don't have any effect, because we don't have forced objects (commands to force objects made only single writes).

The N2 protocol commands to read, write and to force objects are guided to the regions, numbered from 1 up to 7, each one with a size of specific data: 32, 16, 8 or 1 bit. The regions, that can be composed for up to 256 objects each one, had been related to the areas of Altus operands in accordance with the size of the data:

N2 Region	Altus Operand	Size of Data	Quantity		Description
			QK801	PO3X42	
1	-	32 bits	0	0	analog input of float type
2	%E	1 bit	256	256	binary input
3	-	32 bits	0	0	analog output of float type
4	%S	1 bit	256	256	binary output
5	%F	32 bits	0	255	float internal value
6	%M	16 bits	256	256	integer internal value
7	%A	8 bits	96	256	byte internal value

Notes:

- The driver is implemented in diagram of relays and blocks, because of this some areas of operands of the CPUs had been reserved for exclusive use. These operands must be declared in the CPUs: memory operands from %M2000 to %M2047, real operand %F0255 (exclusive for CPUs PO3X42) and memory table operands from %TM040 to %TM044, each one with respectively 10, 255, 255, 7 and 7 positions.
- Observe that exist only 255 objects of type 5 available (from %F0000 to %F0254). It's because the operand %F0255 is used by the communication driver N2. The real operand %F0255 is used independently from the value of the relative index of the first internal float point (position 5 of the table %TM040) defined by the user.

Installation

The N2 communication driver is composed by a set of 10 procedure modules, numbered from 40 to the 49. These modules must be included in the MasterTool project, and later loaded in the respective CPU, QK801 or PO3X42. For more details consult the section Programming of this document.

Programming

The project to be created and edited in the MasterTool and later loaded in the CPU, must be constituted at least of the modules described in the follow table. The user must create some modules, and others need only be inserted by editing the project with the use of the MasterTool programmer.

Module	Description
C-.000 E-.000 E-.001	Modules to be created and edited by the user, described below.
F-CFGCOM.076 F-TX.077 F-RX.078	Product AL-2703 function modules.
F-RELG.048 ou F-RELG.061	Function module to read/write the CPUs PO3X42 clock. Function module to read/write the CPU QK801 clock.
P-N2_PRO.040 P-N2_ASC.041 P-N2_INT.042 P-N2_CKS.043 P-N2_CFG.044 P-N2_CMD.045 P-N2_C00.046 P-N2_C1X.047 P-N2_C2X.048 P-N2_C72.049	N2 protocol communication driver procedure modules.

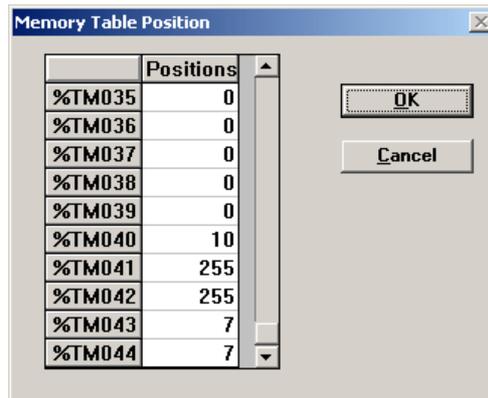
Module C-.000

In the C-.000 configuration module the user must to declare the cards to be used, the memory operands from %M2000 to %M2047, the real operand %F0255 (exclusive for CPUs PO3X42) and memory table operands from %TM040 to the %TM044. Also the COM2 serial port must be configured.

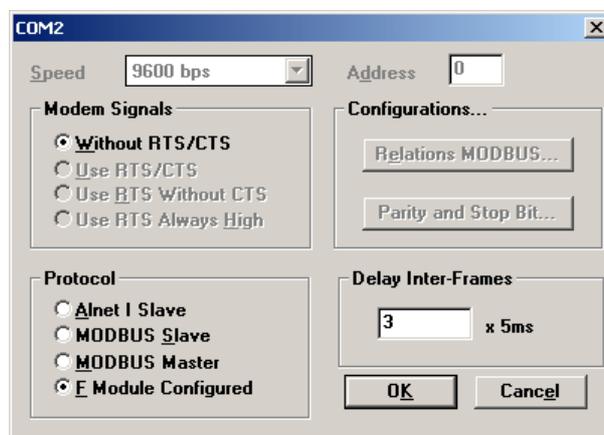
The screenshot shows the configuration window for module C-N2_PO.000. The PLC Model is set to PO3142. The configuration is divided into several sections:

- Operands:**
 - Memory:** Total of operands: 2048 (%M0000 a %M2047); Retentive Operands: 0 (Not declared)
 - Decimal:** 0 (Not declared); Retentive Operands: 0 (Not declared)
 - Real:** 256 (%F0000 a %F0255); Retentive Operands: 0 (Not declared)
 - Integer:** 0 (Not declared); Retentive Operands: 0 (Not declared)
 - Output:** 0 (Not declared); Retentive Operands: 0 (Not declared)
 - Auxiliary:** 512 (%A0000 a %A0511); Retentive Operands: 0 (Not declared)
- Tables:**
 - Memory:** 45 positions...
 - Decimal:** 0 positions...
 - Real:** 0 positions...
 - Integer:** 0 positions...
- Free bytes:** 42964
- Maximum Execution Program Time:** 400 ms
- E018 Period:** 50 ms
- Networks:** COM 1..., ALNET II..., Ethernet..., Synchronism..., COM 2..., COM 3..., PROFIBUS...

Declaration of memory operands, real operands and memory table operands for CPU PO3142, in the C-.000 configuration module.



Declaration of memory tables positions.

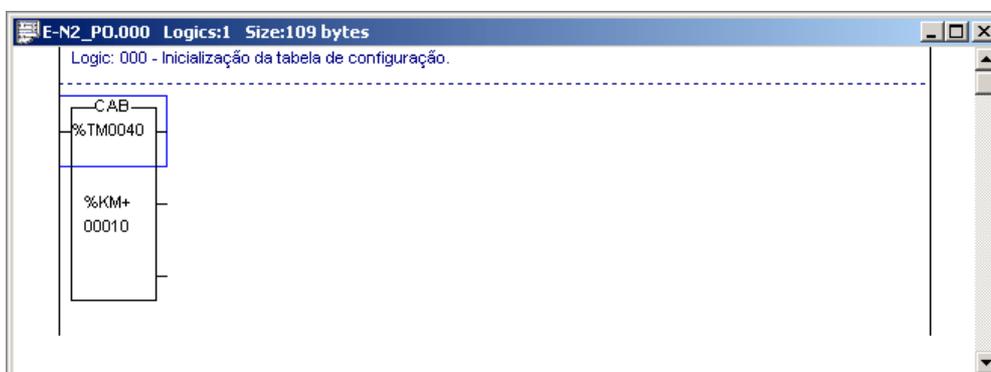


COM2 serial port configuration for CPU PO3142.

The types and amounts of declared operands can be modified by the user, in accordance with its necessities, since that the minimum amounts of memory operands, real operands and memory table, necessary to the driver N2 functioning, are respected.

Module E-.000

In the E-.000 startup module, it is suggested the use of an instruction CAB to configure the parameters of N2 driver, such the address of the equipment in the Metasys® network and the relative addresses of the N2 objects, through the table %TM040 (tag CONFIG).



Example to load the configuration table with values, in the E-.000 startup module.

The following table has the description of the 10 positions of the %TM040 configuration table. These are all the parameters that the user needs to configure for the N2 driver.

Table Position	Description
000	Metasys [®] network equipment address.
001	Relative index of the first analog float input point.
002	Relative index of the first binary input point (%Exxx).
003	Relative index of the first analog float output point.
004	Relative index of the first binary output point (%Sxxx).
005	Relative index of the first internal float point (%Fxxxx).
006	Relative index of the first internal integer point (%Mxxxx).
007	Relative index of the first internal byte point (%Axxx).
008	Reserved: initialize with zero.
009	Reserved: initialize with zero.

Description of the positions of the %TM040 configuration table for the N2 driver.

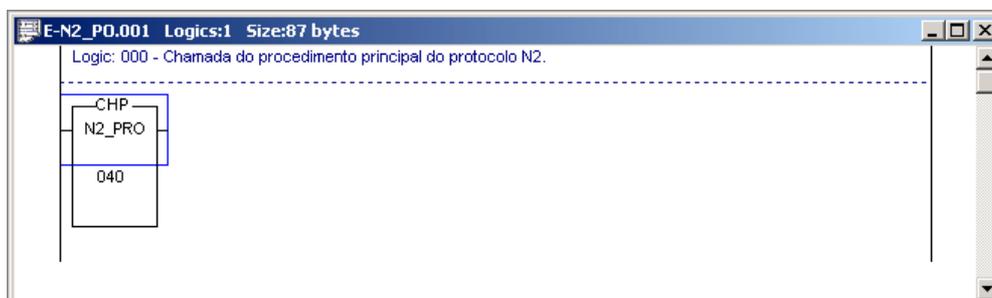
Analog float type objects (regions 1 and 3) aren't used in this version of the N2 driver. Because of this, the values of the configuration table, positions 001 and 003, will be unused by the N2 driver.

Relative index example: if the position 004 of the configuration table has the value 10, then the first binary output point (object address zero) will be related with the %S010.0 output point of Altus CPU, the second binary output point (object address one) will be related with the %S010.1 output point and so on, until the last binary output (object address 255) related with the %S041.7 output point of Altus CPU.

The N2 driver is automatically configured in the first execution cycle of the CPU. If the configuration table will be modified in execution time, a reconfiguration of the N2 driver will be needed. That is made clearing the bit 0 of memory operand %M2010.

Module E-.001

It is suggested the use of an instruction CHP to call the main procedure of N2 driver protocol, module P-N2_PRO.040, in the first logic of the main module E-.001 (logic 000).



Example of call of the N2 driver protocol main procedure in the first logic of the E-.001 module.

The call to the main procedure of the N2 driver protocol must be made at each cycle of CP execution, with no jumps, to don't have loss of performance of the driver.
For more long CP cycle times, it can be made more than one call to the main procedure (P-N2_PRO.040), distributed between the logics of the E-.001 main module.

New logic can be added to the E-.001 main module, in accordance with the necessities of the user, since that the operands reserved for specific use of the N2 driver is respected.

New modules of execution, procedure or functions can also be added to the project, in accordance with the necessities of the user application.

Preventive Maintenance

The N2 driver communication has a set of operands reserved for it exclusive use. Some of these operand are used to indicate determined functioning situations, being able to assist the user to detect and solve errors.

Operand %M2010 – N2 driver state: bits 0 and 1 must normally be on (in one), while bits 2 to 8 must be varying during the reception of characters.

Bit(s)	Meaning (bit = 1)	Causes of the failure, when bit = 0
0	Driver configured correctly.	Verify the operand %M2014.
1	Command of identification (F) received.	Equipment not connected to the network. Wrong equipment network address.
2 to 8	Used during the validation of a new message.	
9 to 15	Not used (always zero).	

Operand %M2014 – N2 driver errors: when in normal functioning, all bits of this operating remain off (in zero).

Bit(s)	Meaning (bit = 1)	Causes
0	Character received with format error.	Electric noise on the communication line. Look at the operand %M2030.
1	Error in the call parameters of the function F-CFGCOM.076.	Original parameters modified by the user. Invalid function version.
2	Error in the call parameters of the function F-RX.078.	Original parameters modified by the user. Invalid function version.
3	Error in the call parameters of the function F-TX.079.	Original parameters modified by the user. Invalid function version.
4	CTS signal timeout of the function F-TX.079.	This will not occur with the COM2.
5 ao 7	Not used (always zero).	
8	Insufficient amount of declared memory (%M) operands.	The %M memory operands, necessary to the functioning of the N2 driver, has not been declared.
9	Configuration table with insufficient size or not declared.	The configuration table was not declared or it don't has a sufficient number of positions for the necessities of the N2 driver.
10	Reception table with insufficient size or not declared.	The reception table was not declared or it don't has a sufficient number of positions for the necessities of the N2 driver.
11	Transmission table with insufficient size or not declared.	The transmission table was not declared or it don't has a sufficient number of positions for the necessities of the N2 driver.
12	Clock information read table with insufficient size or not declared.	The clock information read table was not declared or it don't has a sufficient number of positions for the necessities of the N2 driver.
13	Clock information write table with insufficient size or not declared.	The clock information write table was not declared or it don't has a sufficient number of positions for the necessities of the N2 driver.
14	Invalid network address configuration of the equipment.	The network address configured for this equipment is not valid.
15	PO3X42: Insufficient amount of declared real (%F) operands. QK801: Not used (always zero).	The %F real operands, necessary to the functioning of the N2 driver, has not been declared.

Operand %M2030 – Counter of characters received with format errors.

Operand %M2031 – Counter of successfully received messages for the configured network address.

Operand %M2032 – Counter of response messages mounted/transmitted with success.

Manuals

For further technical details, configuration, installation and programming of Ponto Series products please consult following documents:

Document Code	Description
CT109000	Features and Configuration of Serie Ponto
MU200006	AL-2703 Utilization Manual
MU209000	Serie Ponto Utilization Manual
MU209104	Serie Ponto CPUs Utilization Manual
MU299011	Serie Quark CPUs Manual Utilization
MU299025	MT4000 Utilization Manual - MasterTool
MU299040	MT6000 Utilization Manual - MasterTool ProPonto
MP399100	MT4000 Program Manual - MasterTool
MP399101	Serie Ponto Program Manual - MasterTool