Platinum™
SERIES
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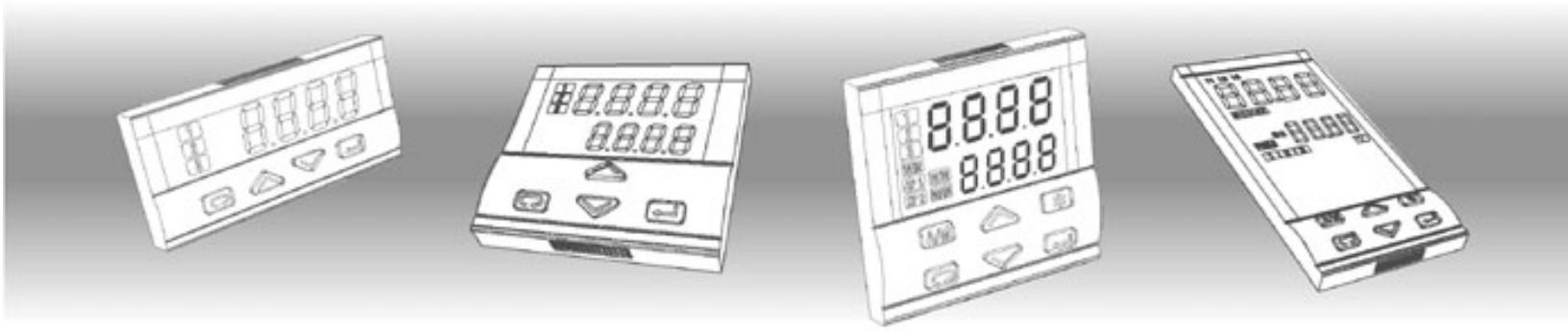
COMMUNICATION MANUAL

Universal Digital Controller



C10
M10 – M300 – M400 – M5000
X100 – X400 – X5000 – X7000

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C O N T E N T S

1. MODBUS Protocol

The Modbus protocol defines the format and method of communications between a “master” which controls the system and one or more “slaves” which respond to commands sent by the master. The Modbus defines how the transmitter and reciever are identified, how messages are exchanged and how errors are detected.
There may be one master and up to 247 slaves on a common line; this is the protocol’s logical limit, the physical interface may limit the number of devices further, for example, the standard RS485 interface handles a maximum of 31 slaves connected on the line. Substituting the last device on the line with a proper “repeater” or “bridge”, another 31 instruments can be added to the line and so on up to the above mentioned limit (247).
All transactions are started by the master. A transaction may be a direct question/reply to a single slave or broadcast in which the message is sent to all the devices on the line and no answer is given. A transaction consists of a single question/replay frame or a single broadcast message/no answer frame.
Some of the characteristics of the protocol are not defined. These are: standard interface, baud rate parity, number of bits.
The protocol also enables the user to choose between two communications modes, ASCII and RTU (binary). Only the RTU mode is implemented on ATHENA CONTROLS instruments as it is more efficient.
The Jbus protocol is functionally identical to Modbus and differs from it in how the addresses are numbered: with Modbus the addresses are numbered starting from zero) 0000= 1st address, while with Jbus they start from one (0001=1st address). This difference is maintained throughout all addresses. From here on, unless explicitly specified, even though reference is made to Modbus, the description is valid for both.

2. Message Format

For communication to take place between the two devices, the message must be put in a "packet". The packet leaves the transmitter through a "port" and is "carried" along the line to a similar "port" on the receiver. MODBUS establishes the format of this packet which includes, for both the master and the slave:

- The address of the device with which the master has established the connection (address 0 corresponds to a broadcast message sent to all slave devices).
- The code of the function that is to be or has been performed.
- The data that is to be exchanged.
- The error check based on the CRC16 algorithm.

If a device detects an error in the message received (in the format, parity or CRC16) the message is considered invalid and rejected, a slave that detects an error in the message will therefore not take any action or answer the question, such as when the address does not correspond to a device on the line.

2.1 Characters Format

The above mentioned packets referred to the transmitted character from the PC or Supervisor.In this case this character cannot be modified because they are set by Athena Controls. The default value is 8 , N, 1. It means 8 data bits without parity check and with 1 stop bit.

2.2 The Address

As mentioned above, MODBUS transactions always involve the master, which handles the line, and one slave at a time (except in the case of broadcast messages). To identify the user to whom the message is sent, the first character sent is a byte containing the numeric address of the selected slave device. Each of the slaves will therefore be assigned a different address that identifies it uniquely. The valid addresses range from 1 to 247, while address 0, which cannot be assigned to a slave, set at the start of the message sent by the master indicates that the message is to be "broadcast", that is, sent to all the slaves at the same time. Broadcast messages are exclusively those that do not require an answer to carry out their function, i.e. assignments only.

2.3 The Function Code

The second character in the message identifies the function that is to be performed in the message sent by the master, to which the slave answers by sending back the same code to indicate that the function has been performed. On ATHENA CONTROLS instruments, a subset of the MODBUS functions has been implemented as follows:

- 01 Read Coil Status
- 02 Read Input Status
- 03 Read Holding Registers
- 04 Read Input registers
- 05 Force Single Coil
- 06 Preset Single register
- 07 Read Status
- 15 Force Multiple Coils
- 16 Preset Multiple Registers

In the implementation for ATHENA CONTROLS instruments, functions 01 and 02 are functionally identical and interchangeable, as are functions 03 and 04. For a full and detailed description of the functions, see chapter 3.

2.4 The CRC 16 Algorithm

The last two characters in the message contain the Cyclic Redundancy Check based on the CRC16 algorithm. To calculate these two characters, the message (address, function code and data without the start, stop and parity bits) is considered as a single continuous binary number whose most significant bit (MSB) is sent first. The message is first multiplied by x^{16} (shifted to the left by 16 bits) and then divided by $2^{16}+2^{15}+2^{2}+1$ expressed as a binary number (1100000000000101). The integer part of the quotient is then rejected and the 16 bit remainder (initialised at FFFFh at the start to avoid messages consisting exclusively of zeros) is added on to the end of the message sent. The resulting message, when divided by the same polynomial ($2^{16}+2^{15}+2^{2}+1$) by the receiving device must give zero as a remainder if no errors occurred (the receiving device recalculates the CRC).

In reality, as the device that converts the data to be sent into serial form (UART) sends the least significant bit (LSB) first instead of the MSB as it should do for the CRC calculation, the CRC is carried out by inverting the polynomial. In addition, as the MSB of the polynomial only affects the quotient and not the remainder, the remainder is eliminated, thus giving 1010000000000001.

The step by step procedure for the CRC16 calculation is as follows:

1) Load a 16-bit register with FFFFh (all bits set to 1).

2) Execute the exclusive OR of the first character with the high order byte in the register and place the result in the register.

3) Shift the register to the right by one bit.

4) If the bit that left the register on the right (flag) is a 1, execute the exclusive OR of the polynomial 1010000000000001 with the register.

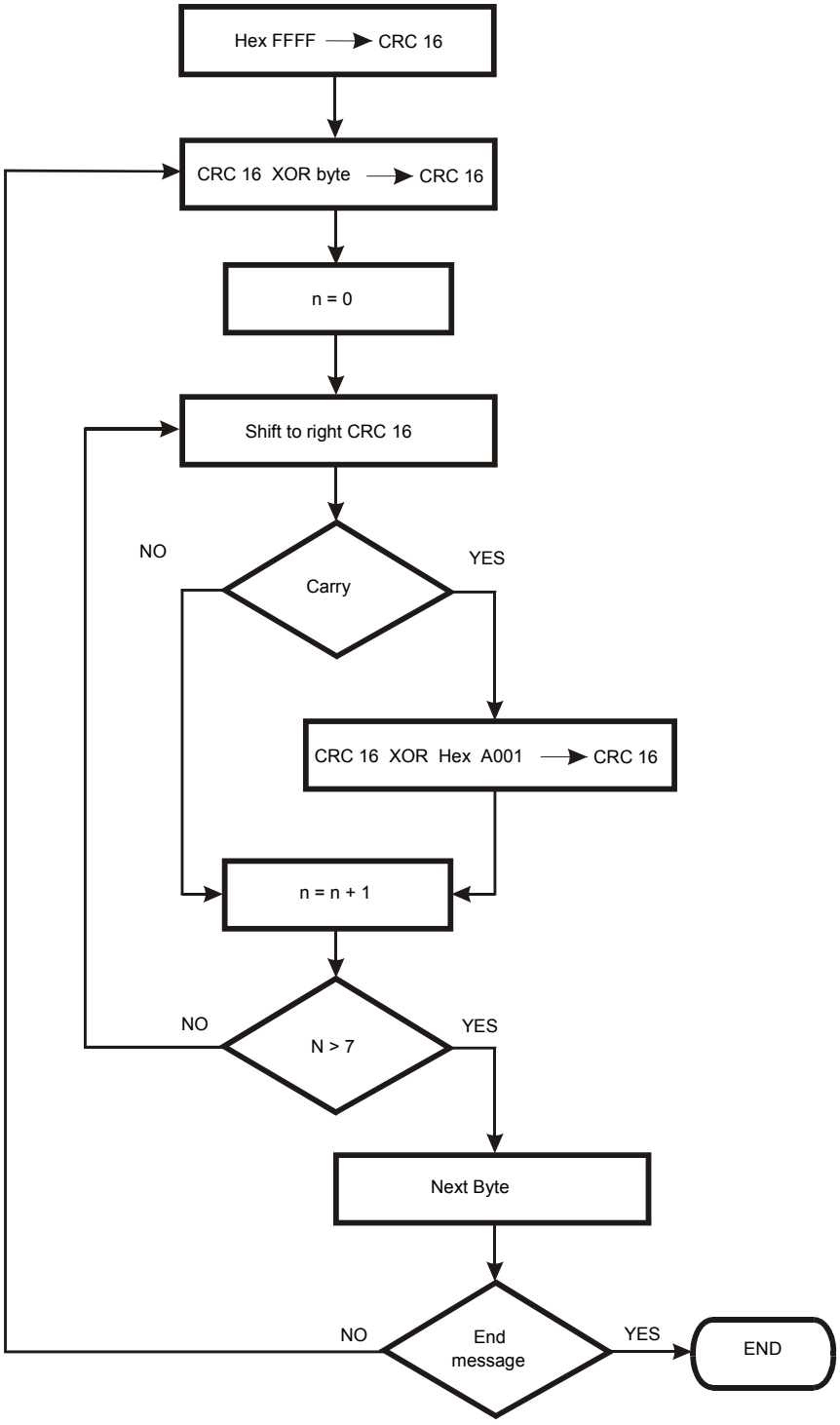
5) Repeat steps 3 and 4 eight times.

6) Execute the exclusive OR of the next character with the high order byte in the register and place the result in the register.

7) Repeat steps 3 to 6 for all the characters in the message.

8) The contents of the 16 bit register are the CRC code that is to be added to the message.

2.4.1 CRC 16 Flow Chart



2.4.2 Visual Basic Calculate CRC16 example

```
Function CRC16(String As String) As String

  Dim N As Integer, i As Integer, NByte As Integer
  Dim CRC As Long, a As Byte
  Dim Buffer As String

  NByte = Len(String)
  CRC = 65535

For i = 1 To NByte
    a = Asc(Mid$(String, i, 1)) 'C(I)
    CRC = (CRC Xor a) And &HFFFF

    For N = 0 To 7

      If CRC And 1 Then
        CRC = (CRC \ 2)
        CRC = (CRC Xor 40961)
      Else
        CRC = CRC \ 2
      End If

    Next

Next

Buffer = Right$("0000" + Hex$(CRC And &HFFFF), 4)
CRC16 = Chr$("&H" + Right$(Buffer, 2)) + Chr$("&H" + Left$(Buffer, 2))

End Function
```

2.5 Message Synchronisation

Message synchronisation between the transmitter and the receiver is obtained by inserting a pause of at least 3.5 times the time of one character between the messages. If the receiving device does not receive for the time required for 3 characters, it considers the previous message completed and concludes that the next byte received will be the first of a new message and, consequently, an address.

3. The MODBUS Functions

This section provides a detailed description of the MODBUS functions implemented on ATHENA CONTROLS instruments.

3.1 Read Output Status (01)

This function is used for requesting the ON or OFF status of binary logical variables. Broadcast mode is not allowed.

Question

In addition to the address of the slave and the function code (01), the message contains the starting address expressed in two bytes and the number of bits to be read, also occupying two bytes. Address numbering starts from zero (bit1 = 0) for MODBUS, or one (bit1 = 1) for JBUS.

Example: Request for slave 17 to read bits 0004 to 0015.

ADDR	FUNC	DATA start Addr HI	DATA start Addr LO	DATA bit # HI	DATA bit # LO	CRC HI	CRC LO
11	**01**	**00**	**03**	**00**	**0C**	**CE**	**9F**

Answer
In addition to the address of the slave and the function code (01), the message comprises a character containing the number of data bytes and the characters containing data. The data are compacted, so one byte contains the status of 8 bits, the least significant bit of the first byte must contain the bit corresponding to the starting address and so on. If the number of bits to be read is not a multiple of 8, the last character must be completed with zeros in the most significant bits.
Example: Answer to the request indicated above.

ADDR	FUNC	DATA Byte Count	DATA bit 04..11	DATA bit 12..15	CRC HI	CRC LO
11	**01**	**02**	**CD**	**0B**	**6D**	**68**

3.2 Read Input Status (02)

This function works in exactly the same way as the previous one.

3.3 Read Output Registers (03)

This function is used for requesting the value of 16-bit (word) registers containing numeric variables. Broadcast mode is not allowed.
Question
In addition to the address of the slave and the function code (03), the message contains the starting address expressed in two bytes and the number of words to be read, also occupying two bytes. The maximum number of words that may be read is 125. Address numbering starts from zero (word1 = 0) for MODBUS, or one (word1 = 1) for JBUS.

Example: Request for slave 25 to read registers 069 to 0071.

ADDR	FUNC	DATA start Addr HI	DATA start Addr LO	DATA word # HI	DATA word # LO	CRC HI	CRC LO
19	**03**	**00**	**44**	**00**	**03**	**46**	**06**

Answer
In addition to the address of the slave and the function code (03), the message comprises a character containing the number of data bytes and the characters containing data. The registers require two bytes each, the first of which contains the most significant byte.
Example: Answer to the request indicated above.

ADDR	FUNC	DATA Byte Count	DATA word 69 HI	DATA word 69 LO	DATA word 70 HI	DATA word 70 LO	DATA word 71 HI	DATA word 71 LO	CRC HI	CRC LO
19	**03**	**06**	**02**	**2B**	**00**	**00**	**00**	**64**	**AF**	**7A**

3.4 Read Input Registers (04)

This function works in exactly the same way as the previous one.

3.5 Force Single Coil (05)

This function is used for forcing the status of a single binary variable ON or OFF. Broadcast mode is allowed.

Question

In addition to the address of the slave and the function code (05), the message contains the address of the variable to be forced in two bytes and two characters of which the first is set to FFh (255) to force it ON and 00h to force it OFF, while the second is always set to zero. Address numbering starts from zero (bit1 = 0) for MODBUS, from one (bit1 = 1) for JBUS.

Example: Request to force bit 4 on slave 47 ON.

ADDR	FUNC	DATA bit # HI	DATA bit # LO	DATA ON/OFF	DATA (zero)	CRC HI	CRC LO
2F	**05**	**00**	**03**	**FF**	**00**	**7A**	**74**

Answer

The answer consists in retransmitting the message received once the variable has been changed.

Example: Answer to request mentioned above.

ADDR	FUNC	DATA bit # HI	DATA bit # LO	DATA ON/OFF	DATA (zero)	CRC HI	CRC LO
2F	**05**	**00**	**03**	**FF**	**00**	**7A**	**74**

3.6 Preset Single Register (06)

This function is used for setting the value of a single 16-bit register. Broadcast mode is allowed.

Question

In addition to the slave and the function code (06), the message contains the address of the variable expressed in two bytes and the value to be assigned. Address numbering starts from zero (word1 = 0) for MODBUS, from one (word1 = 1) for JBUS.

Example: Request to force address 26 of slave 38 to 926.

ADDR	FUNC	DATA bit # HI	DATA bit # LO	DATA WORD HI	DATA WORD LO	CRC HI	CRC LO
26	**06**	**00**	**19**	**03**	**9E**	**DF**	**82**

Answer

The answer consists in retransmitting the message received once the variable has been changed.

Example: Answer to request indicated above.

ADDR	FUNC	DATA bit # HI	DATA bit # LO	DATA WORD HI	DATA WORD LO	CRC HI	CRC LO
26	**06**	**00**	**19**	**03**	**9E**	**DF**	**82**

3.7 Read Status (07)

This function is used for reading the status of eight predetermined bits with a compacted message. Broadcast mode is not allowed.

Question

The message consists only of the slave address and the function code (07).

Example: Request of the status of slave 25.

ADDR	FUNC	CRC HI	CRC LO
19	**07**	**4B**	**E2**

Answer

In addition to the address of the slave and the function code (07), the message comprises a character containing the status bits.

Example: Answer to the request indicated above.

ADDR	FUNC	DATA status byte	CRC HI	CRC LO
19	**07**	**6D**	**63**	**DA**

3.8 Force Multiple Coils (15)

This function is used for forcing the status of each binary variable in a consecutive block. Broadcast mode is allowed.

Question

In addition to the address of the slave and the function code (15), the message contains the starting address expressed in two bytes, the number of bits to be written, the number of bytes containing the data and the data characters. The data are compacted, so one byte contains the status of 8 bits, the least significant bit of the first byte must contain the bit corresponding to the starting address and so on. If the number of bits to be written is not a multiple of 8, the last character must be completed with zeros in the most significant bits. Address numbering starts from zero (bit1 = 0) for MODBUS, from one (bit1 = 1) for JBUS.

Example: Request to force 4 bits starting from address 1 on slave 12. Bits 1 and 4 forced to "1" and the others to "0".

ADDR	FUNC	DATA start Addr HI	DATA start Addr LO	DATA bit # HI	DATA bit # LO	DATA Byte Count	DATA bit 1..4	CRC HI	CRC LO
0C	**0F**	**00**	**00**	**00**	**04**	**01**	**09**	**3F**	**09**

Answer

In addition to the address of the slave and the function code (15), the message contains the starting address and the number of bits written.

Example: Answer to request indicated above.

ADDR	FUNC	DATA start Addr HI	DATA start Addr LO	DATA bit # HI	DATA bit # LO	CRC HI	CRC LO
0C	**0F**	**00**	**00**	**00**	**04**	**55**	**15**

3.9 Preset Multiple Registers (16)

This function is used for setting the value of a consecutive block of 16-bit registers. Broadcast mode is allowed. **Question.**
In addition to the address of the slave and the function code (16), the message contains the starting address, the number of words to be written, the number of bytes that contain data and the data characters. Address numbering starts from zero (word1 = 0) for MODBUS, from one (word1 = 1) for JBUS.
NOTE: In the ATHENA CONTROLS implementation, this function is present for compatibility but does not permit more than 8 word to be assigned.

Example: Request to set 1 word to value 268 at address 35 on slave 17.

ADDR	FUNC	DATA start Addr HI	DATA start Addr LO	DATA word # HI	DATA word # LO	DATA Byte Count	DATA word 35 HI	DATA word 35 LO	CRC HI	CRC LO
11	**10**	**00**	**22**	**00**	**01**	**02**	**01**	**0C**	**6C**	**87**

Answer
In addition to the address of the slave and the function code (16), the message contains the starting address and the number of words written.

Example: Answer to the request indicated above.

ADDR	FUNC	DATA start Addr HI	DATA start Addr LO	DATA word # HI	DATA word # LO	CRC HI	CRC LO
11	**10**	**00**	**22**	**00**	**01**	**A3**	**53**

4. Error Management

In MODBUS there are two types of errors, handled in different ways: transmission errors and operating errors. Transmission errors are errors that change the format of the message, the parity (if used) or the CRC16. A device that detects errors of this type in the message treats it as invalid and gives no answer. When the format of the message is correct but the function requested cannot be executed for some reason, an operating error has occurred. When it detects this kind of error, the slave device answers by sending an error message. This message consists of the address, the code of the function requested, an error code and the CRC. To indicate that the answer is an error message, the function code is returned with the most significant bit set to "1".

Example: Request for slave 10 to read bit 1185.

ADDR	FUNC	DATA start Addr HI	DATA start Addr LO	DATA bit # HI	DATA bit # LO	CRC HI	CRC LO
0A	**01**	**04**	**A1**	**00**	**01**	**AC**	**63**

Answer
The request is for the contents of bit 1185, which is not present on the slave. The slave answers by sending error code "02" (ILLEGAL DATA ADDRESS) and returns the function code 81h (129).

Example: Error code in response to the request indicated above.

ADDR	FUNC	DATA Except. Code	CRC HI	CRC LO
0A	**81**	**02**	**B0**	**53**

4.1 Error Codes

Although the MODBUS standard uses 8 error codes, the ATHENA CONTROLS implementation of the protocol uses only four:

Code	Name	Meaning
01	ILLEGAL FUNCTION	The function code received does not correspond to a function allowed on the addressed slave.
02	ILLEGAL DATA ADDRESS	The address to which the data field refers is not an address allowed on the addressed slave.
03	ILLEGAL DATA VALUE	The value to be assigned, specified in the data field, is not allowed for this address.
07	NAK - NEGATIVE ACKNOWLEDGMENT	The function cannot be performed under the current operating conditions or an attempt has been made to write in a read-only address.

5. MODBUS ON ATHENA CONTROLS PLATINUM® INSTRUMENTS

5.1 Serial communications parameters

The parameters are shown in the below table:

Parameter	Parameter code	Set up range
Communications protocol	Prot	MbuS / JbuS
Serial address	Addr	1 ... 247
Baud rate	baudr	1200, 2400, 4800, 9600, 19200

The protocol is chosen by means the M.buS o JbuS selection.
The address can be set among 1..247 and must be unique for each instrument connected on the same line.
The Baud rate parameter enable a clear and simple communications speed setting.
No Parity and stop bit must be set. They have already been set by the manufacturer as follows:
Parity = none
Stop bit = 1

5.2 Communications time

The messages, as described in Chapter 2.4, must be exchanged with an internal pause that is less than 3 times the time required for a character to be exchanged, otherwise it would be interpreted as the end of the message. The ATHENA CONTROLS instruments with the MODBUS protocol are able to receive and transmit characters without an interval. Between a master message and the following reply on the part of the instrument there is a latent time lapse necessary for the completion of the function. This is connected to the fact that, once a command has been received, the instrument responds only after having completed the

requested function. To evaluate the lapse in time for different functions reference can be made to the following expressions:

Request: $T_L \cong 3T_c + T_s$

where:

T_L = Elapsed time.

T_C = Time of a character.

T_S = Variable time from 0 to 10mS which is dependent on the internal processes.

Assignment: $T_L \cong 3T_c + T_s + T_w$

where:

T_L = Elapsed time.

T_C = Time of a character.

T_S = Variable time from 0 to 10mS which is dependent on the internal processes.

T_W = Multiple time of 25mS which is dependent on the number of bytes to be written. For assignment of words, this time can be 0, 25 or 50 ms depending on whether both one or none of the two bytes is equal to the preceding value; for the assignment of bit $T_{W,}$ it can be a value from 0 to 100mS.

5.3 Data Base

The ATHENA CONTROLS instrument variables available for serial communication through the MODBUS protocol are contained in two distinct sections: the bit zone and the word zone.

5.4 Bit Zone

The bit zone is made up of 16 addressable bits that contain information on the functioning status of the instruments. With some instruments, certain bits are not used; the status request for these bits with the 01 and 02 functions is permitted but returns a fixed value of 0; these bits are indicated in the tables by the presence of a hyphen "-". The assignment of the bit status with the 05 and 15 functions is only allowed on addresses in which this is possible, which condition is indicated by "R/W".

5.5 Word Zone

The word zone is made up of 128 addressable words that contain control variables and the instrument parameters. With some instruments certain words are not used; the request for the values of these words with the 03 and 04 functions is permitted but returns a fixed value of 0; these words are indicated in the table by the presence of a hyphen "-". The assignment of the word value with the 06 and 16 functions is only allowed on addresses in which this is possible, which condition is indicated by "R/W". The variables and parameters are coded as integer numbers with a plus or minus sign (two's complement) without taking into account the decimal point in the representation (for example: the Proportional Band displayed on the screen with a decimal digit "25.0" is transmitted as 250). Assignment is only allowed within the values assigned to each parameter, any attempt to assign a value outside of those permitted within the field, will cause the instrument to respond with an error message and a an exception code equal to 3, and the assignment will not be carried out.

5.6 Assignment of the parameters and E^2PROM

All the parameters modified from keyboard or assigned through serial communication, come written in a permanent way in the EEPROM of the instruments. Like known good, these components have limited writing cycles beyond to which the component could be damaged. In our case the number of cycles of writing are about 10.000 and also if this number could appear limited, we must be held present that the writings during the arc of life of the instrument don't arrive to overcome the thousand of cycles. Different thing is when we talk about the serial communication. In fact the computer could assign any parameter and with any frequency to the regulators.
Being well aware of this fact, Athena Controls has provided to protect the component in matter according to different hardware formality and resources of the instruments. One of the protection made consists of the fact to compare the new given with the datum already resident. If the two data correspond, no writing doesn't happen in as not necessary and the new given comes writing only and entirely if the two data disagree between them.
Normally the datum that has a frequency of better writing it is the value of Setpoint. In the instruments C10, M10 and M300 in as not furnished of NOVRAM or buffered RAM, exists two formality of assignment of the Setpoint that is:

1) Assignment to the Jbus address 2
2) Assignment to the Jbus address 5

With the first formality, the Setpoint could be assigned endless times because it work in the RAM of the microprocessor but attention because at the turning off of the regulator this datum comes lost for engage the last value that had stayed written locally from keyboard or from the serial to the Jbus address 5.
With the second formality the datum comes written in a permanent way directly in the EEPROM of the instrument and the writing must be limited to a real necessity.
The instruments of the series M5000, X100, X400, X5000 and X7000 possessing a different hardware structure, furnished that is of NOVRAM or buffered RAM, they are not subdued to the limits previously exposed and the assignments of the Setpoint to the Jbus addresses 2 or 5 don't involve any difference. The two addresses come maintained active only for a problem of compatibility with the preceding series.

6. Electrical Connections

6.1 General Description

All the Platinum® controllers may be fitted with a two wire (half duplex) RS485 serial comm.s option. It makes the wiring simpler and enables a larger connection length (maximum 1200 m).
The Platinum ® C10, M10, M300 and M400 instruments do not have any line termination or polarisation system. If necessary a termination resistance (120Ω ¼ W) must be connected to the terminals of the last instrument of the line. In any case the polarisation is not possible.
The Platinum ® M5000, X100, X400 and X5000 instruments do have any line termination or polarisation system. Please refere to the specific chapter on these instruments.

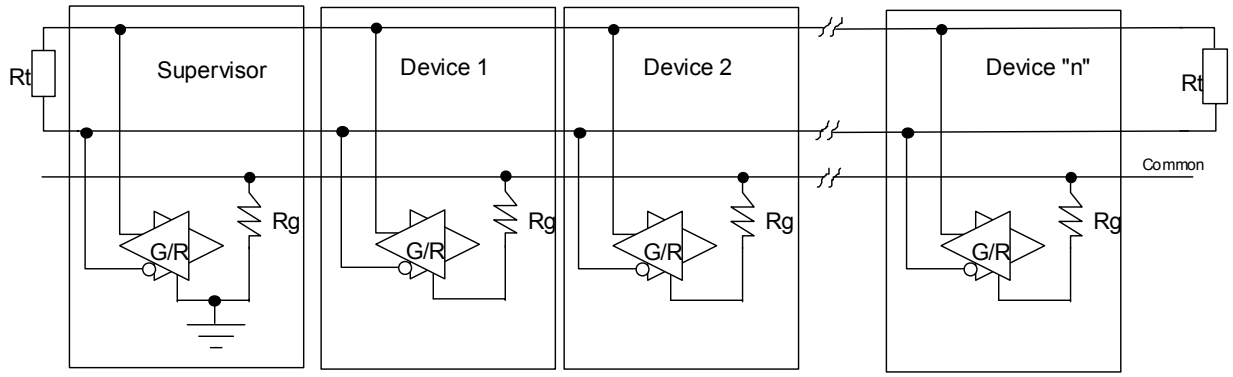
6.2 Communication Cable Laying Recommendations

In order to minimise interference caused by the external environment to serial communication, and thus obtain maximum efficiency between the supervisor and the instruments, a few essential technical precautions must be taken.
The most important and easiest to implement of all is to separate the power or power supply lines from the communication lines and lay them as far as possible from remote-controlled switches, electromagnets, powerful motors, etc. The same rule applies to the control panel in that it is pointless to cable the control panel perfectly and then haphazardly "throw" the cables into the channel or vice versa. If the communication cables are extended to another control panel or other equipment, leave a space in the terminal board, isolated from all the other cables (normally towards the sides).
The type of cable used is of fundamental importance for the functioning of the entire system. The most important condition to be respected is the cable's capacity per meter (pF/m). The lower the capacity of the cable is the longer the line can be. Consequently, power cables, shielded coaxial cables and general channel cables are to be avoided under all circumstances in that they have an extremely high capacity per metre. In addition, to ensure high interference rejection, the cables must be twisted and preferably provided with a metal shield to be connected to an efficient ground socket (on one side only).
Two examples of cables with suitable characteristics produced by Belden are indicated below:

A) Belden code 9729 Z = 100 Ω pF/m = 41
B) Belden code 9502 Z = 150 Ω pF/m = 98

6.3 Instruments with an RS-485 interface (2 wire)

The line requires twisted cable with a characteristic impedance of about 120 Ω.
Normally this type of connection uses a standard 4-wire communication interface. The transmission and reception signals for the computer and the communicating device (Tx+Rx+ and Tx-Rx-) can be paralleled, resulting in a single duplex connection RTx+ and RTx-.
The communication port cannot usually work if it is connected in this way as every time the supervisor is transmitting a message, it is also present on the receiving port before awaiting the reply from the other devices. To prevent this problem occurring, the supervisor uses the RTS (Request To Send) signal from the communication port. Before beginning a transmission, the supervisor “raises” the status of its RTS signal to inhibit its receiver. When the transmission has ended, the supervisor brings the RTS signal back to “zero” to re-enable its receiver. In the same way, the devices connected to the supervisor must be able to manage the direction of the message that is flowing, otherwise the communication will fail. ATHENA CONTROLS controllers include this ability in their software.
There are commercially available interfaces for handling the RTS signal at the hardware level, so that it is completely transparent and not required by the communications software.
It is strongly recommended that the two ends of the link between the various devices is correctly terminated, as shown in the following drawing to demonstrate the principle.



G = Transmitter
R = Receiver
G/R = Bi-directional (Receiver/Transmitter) buffer
Rt = Termination resistance: the transmitter can drives up to 32 receivers plus two 120 Ω resistors.
Rg = 100 Ω Resistor
From the above drawing it may be seen that a “star” connection is not valid. Each branch would have to be terminated, which in turn would reduce the overall the impedance of the line. In these conditions, the signal level would be too low for reliable communications.

6.3.1 References

GOULD	Gould Modbus Protocol Reference Guide (PI-MBUS-300 Rev. B)
APRIL	JbuS Specification
GLOBAL ENG. DOC.	EIA STANDARD RS -485

7. C10 / M10 Controllers

7.1 Bit Zone

Address			
Modbus	**JbuS**	**Variable**	**Type**
0	1	-	-
1	2	-	-
2	3	-	-
3	4	Main output condition (0 = OFF, 1 = ON)	R
4	5	AL2 alarm status (0 = OFF, 1 = ON)	R
5	6	AL3 alarm status (0 = OFF, 1 = ON)	R
6	7	Out of range (0 = Normal operation, 1 = Safety)	R
7	8	Auto-Tune (0 = OFF, 1 = Run)	R
8	9	-	-
9	10	Out of range (0 = Normal operation, 1 = Safety)	R
10	11	-	-
11	12	-	-
12	13	-	-
13	14	-	-
14	15	-	-
15	16	-	-

7.2 Read Status

Function 07 (Read Status) returns an eight bit status with the following meanings:

Bit	Address	Variable
1 (LSB)	1	-
2	2	-
3	3	-
4	4	Main output condition (0 = OFF, 1 = ON)
5	5	AL2 alarm status (0 = OFF, 1 = ON)
6	6	AL3 alarm status (0 = OFF, 1 = ON)
7	7	Out of range (0 = Normal operation, 1 = Safety)
8 (MSB)	8	Auto-Tune (0 = OFF, 1 = Run)

7.3 Word Zone - Page 1 Parameters

Address				
Modbus	**JbuS**	**Variable**	**Parameter Code**	**Type**
0	1	Process variable		R
1	2	Setpoint		R/W [1]
2	3	Main output		R
3	4	Target Setpoint		R
4	5	Local Setpoint		R/W [2]
5	6	Proportional Band (Hysteresis ON - OFF) [3]	P.b. (hy))	R/W
6	7	Overshoot control	O.C.	R/W
7	8	Integral time	t.i.	R/W
8	9	Derivative time	t.d.	R/W
9	10	Output cycling time	t.c.	R/W
10	11	Low range	Sc.Lo	R
11	12	High range	Sc.Hi	R
12	13	AL2 Alarm threshold	A2S.P	R/W
13	14	AL3 Alarm threshold	A3S.P	R/W
14	15	AL2 Alarm Hysteresis	A2hy	R/W
15	16	AL3 Alarm Hysteresis	A3hy	R/W
16 .. 28	17 .. 29	-	-	-
29	30	Setpoint low limit	S.P. L	R/W
30	31	Setpoint high limit	S.P. H	R/W
31	32	-	-	-
32	33	Main output high limit	OP. H	R/W
33	34	-	-	-
34	35	Setpoint ramp up	Sl. u	R/W
35	36	Setpoint ramp down	Sl. d	R/W
36	37	Input filter	t.FiL	R/W
37	38	Input shift	In.Sh	R/W
38	39	Auto-Tune enable	tune	R/W
39	40	-	-	-
40	41	Serial comm.s address	Addr	R/W
41	42	-	-	-
42	43	Retransmission low range	rt.Lo	R/W
43	44	Retransmission high range	rt.Hi	R/W
44 .. 99	45 .. 100	-	-	-

7.4 Word Zone - Page 2 Configuration

Address		Variable	Parameter Code	Type
Modbus	JbuS			
100	101	-	-	-
101	102	Configuration code	ConF	R/W [4]
102	103	AL3 alarm configuration code	Con.2	R/W [4]
103	104	Engineering units	unit	R/W [4/7]
104	105	Decimal point	Sc.d.d	R/W [4]
105	106	Low range for engineering units	Sc.Lo	R/W [4]
106	107	High range for engineering units	Sc.Hi	R/W [4]
107	108	Communications protocol	Prot	R/W [8]
108	109	Baud rate	baud	R/W [9]
109	110	Retransmitted range	retr	R/W [10]
110	111	-	-	-
111	112	-	-	-
112	113	Password	Code	R/W
113	114	RTX low range calibration value (Reserved)	CAL.3	R/W
114	115	RTX high range calibration value (Reserved)	CAL.4	R/W
115..119	116..120	-	-	-
120	121	Factory code		R(W) [5]
121	122	Product code (“C1”)		R [6]
122	123	-	-	R
123	124	Software release		R [6]
124	125	-	-	R
125	126	Custom code		R
126	127	-	-	-
127	128	-	-	-

Notes:

1. Assignment of Setpoint to the address JbuS 2 writes the Computer Setpoint. It is different from the Local Setpoint, which can be in any case set by keypad.
2. Assignment of Setpoint to the address JbuS 5 writes the Local Setpoint (the previous value is lost).
3. In case of ON - OFF output (address JbuS 6) the proportional band is substituted by the output Hysteresis.
4. All the configuration parameters are accepted, if valid, but not brought into effect. To execute the reconfiguration procedure and bring the changes into effect, the code 55AAh must be written at the address JbuS 121.
5. Address JbuS 121 is read only, but if the code 55AAh (21930d) is written at this address, the configuration is brought into effect.
6. The JbuS 122 + 123 and 124 + 125 addresses contain the strings (of 4 characters) for the product and release codes: each address represents two characters, the most significant byte in the word contains the ASCII code of the second.
7. To select the engineering unit, the value between 0 and 10 must be assigned as per the below table:

Engineering unit	Serial value
°C	0
°F	1

none	2
nU	3
U	4
nA	5
A	6
bar	7
PSI	8
rh	9
Ph	10

8. To select the protocol type, the value between 0 and 1 must be assigned as per the below table:

Protocol type	Serial value
Modbus	0
JbuS	1

9. To select the serial comm.s baud rate, the value between 0 and 3 must be assigned as per the below table:

Baud Rate	Serial value
1200	0
2400	1
4800	2
9600	3

10. To select the retransmission signal type, the value between 0 and 1 must be assigned as per the below table:

Retransm. signal type	Serial value
0 .. 20 mA	0
4 .. 20 mA	1

7.5 Termination and Polarisation

The Platinum ® C10 and M10 instruments do not have any line termination or polarisation system. If necessary a termination resistance (120Ω ¼ W) must be connected to the terminals of the last instrument of the line. In any case the polarisation is not possible.

8. M300 Controller

8.1 Bit zone

Address			
Modbus	**JbuS**	**Variable**	**Type**
0	1	Timer function status (0 = OFF, 1 = Run) [1]	R/W
1	2	-	-
2	3	-	-
3	4	Main output condition (0 = OFF, 1 = ON)	R
4	5	Alarm condition AL2 (0 = OFF, 1 = ON)	R
5	6	Alarm condition AL3 (0 = OFF, 1 = ON)	R
6	7	Out of range (0 = Normal operation, 1 = Safety)	R
7	8	Auto-Tune (0 = OFF, 1 = Run)	R
8	9	-	-
9	10	Out of range (0 = Normal operation, 1 = Safety)	R
10	11	Keypad lock (0 = locked, 1 = unlocked)	R/W

11	12	Outputs lock (0 = locked, 1 = unlocked)	R/W
12	13	-	-
13	14	-	-
14	15	-	-
15	16	-	-

8.2 Read Status

Function 07 (Read Status) returns an eight bit status with the following meanings:

Bit	Address	Variable
1 (LSB)	1	Timer function status (0 = OFF, 1 = Run) [1]
2	2	-
3	3	-
4	4	Main output condition (0 = OFF, 1 = ON)
5	5	Alarm condition AL2 (0 = OFF, 1 = ON)
6	6	Alarm condition AL3 (0 = OFF, 1 = ON)
7	7	Out of range (0 = Normal operation, 1 = Safety)
8 (MSB)	8	Auto-Tune (0 = OFF, 1 = Run)

Notes:
1. Only available with Timer option.

8.3 Word Zone - Page 1 Parameters

Address				
Modbus	**JbuS**	**Variable**	**Parameter Code**	**Type**
0	1	Process variable		R
1	2	Setpoint		R/W [1]
2	3	Main output		R [2]
3	4	Target Setpoint		R/W [1]
4	5	Local Setpoint		R/W [3]
5	6	Proportional Band (Hysteresis ON - OFF) [4]	P.b. (hy.)	R/W
6	7	Overshoot control	O.C.	R/W
7	8	Integral time	t.i.	R/W
8	9	Derivative time	t.d.	R/W
9	10	Cycle time	t.c.	R/W
10	11	Low range	Sc.Lo	R
11	12	High range	Sc.Hi	R
12	13	AL2 Alarm threshold	A2S.P	R/W
13	14	AL3 Alarm threshold	A3S.P	R/W
14	15	AL2 Alarm Hysteresis	A2hy	R/W
15	16	AL3 Alarm Hysteresis	A2hy	R/W
16	17	Heat/cool proportional band	P.b. C	R/W
17	18	Heat/cool integral time	t.i. C	R/W
18	19	Heat/cool derivative time	t.d. C	R/W
19	20	Heat/cool dead band	d.bnd	R/W
20	21	Cool output cycling time	t.c. C	R/W
21	22	Cool output high limit	OP.HC	R/W
22	23	Motor travel time	MU.tM	R/W
23	24	Minimum output step	MU.Hy	R/W
24	25	Timer setting	tiMe	R/W
25	26	Stand-by Setpoint	S.P 2	R/W
26	27	Stand-by Setpoint of Timer	tM.S.P	R/W
27	28	Soft-start output value	St.OP	R/W
28	29	-	-	-

29	30	Setpoint low limit	S.P. L	R/W
30	31	Setpoint high limit	S.P. H	R/W
31	32	Error dead band	d.Err	R/W
32	33	Main output high limit	OP. H	R/W
33	34	Output safety value	Sa.OP	R/W
34	35	Setpoint ramp up	Sl. u	R/W
35	36	Setpoint ramp down	Sl. d	R/W
36	37	Input filter	t.FiL	R/W
37	38	Input shift	In.Sh	R/W
38	39	Auto-Tune enable	tune	R/W
39	40	-	-	-
40	41	Serial comm.s address	Addr	R/W
41	42	-	-	-
42	43	Retransmission low range	rt.Lo	R/W
43	44	Retransmission high range	rt.Hi	R/W
44	45	start-up Setpoint	S.P.S.U	R/W
45	46	Start Up Holding time	t.h.S.U	R/W
46	47	start-up output high limit	OP.HS	R/W
47	48	Timer remaining time	tM.r.	R/W
48	49	Load current (CT option)	t.Cur	R
49 .. 99	50 .. 100	-	-	-

8.4 Word Zone - Page 2 Configuration

Address				
Modbus	**JbuS**	**Variable**	**Param. Code**	**Type**
100	101	-	-	-
101	102	Configuration code	ConF	R/W [5]
102	103	AL3 alarm configuration code	Con.2	R/W [5]
103	104	Engineering units	unit	R/W [5/8]
104	105	Decimal point	Sc.d.d	R/W [5]
105	106	Low range for engineering units	Sc.Lo	R/W [5]
106	107	High range for engineering units	Sc.Hi	R/W [5]
107	108	Communication protocol	Prot	R/W [9]
108	109	Baud rate	baud	R/W [10]
109	110	Retransmission range	retr	R/W [11]
110	111	Retransmission signal selection	rtH	R/W [12]
111	112	Current transformer range	Ht.F.S	R/W
112	113	Password	Code	R/W
113	114	RTX low range calibration value (Reserved)	CAL.3	R/W
114	115	RTX high range calibration value (Reserved)	CAL.4	R/W
115	116	Timer/Start-up operating mode	t.Mod	R/W [13]
116	117	Timer action	t.Act	R/W [14]
117..119	118..120		-	-
120	121	Factory code		R(W) [6]
121	122	Product code (“M3”)		R [7]
122	123		-	-
123	124	Software release		R [7]
124	125		-	-
125	126	Custom code		R
126	127	-	-	-
127	128	-	-	-

Notes:

1. Assignment of Setpoint to the addresses JbuS 2 and 4 writes the Computer Setpoint. It is different from the Local Setpoint, which can be in any case set by keypad.
2. Assignment of output at the address JbuS 3 is only possible if the Auto/Man option if fitted and when the controller is in Manual mode.
3. Assignment of Setpoint to the address JbuS 5 writes the Local Setpoint (the previous value is lost).
4. In case of ON - OFF output (address JbuS 6) the proportional band is substituted by the output Hysteresis.
5. All the configuration parameters are accepted, if valid, but not brought into effect. To execute the reconfiguration procedure and bring the changes into effect, the code 55AAh must be written at the address JbuS 121.
6. Address JbuS 121 is read only, but if the code 55AAh (21930d) is written at this address, the configuration is brought into effect.
7. The JbuS 122 + 123 and 124 + 125 addresses contain the strings (of 4 characters) for the product and release codes: each address represents two characters, the most significant byte in the word contains the ASCII code of the second.
8. To select the engineering unit, the value between 0 and 10 must be assigned as per the below table:

Engineering unit	Serial value
°C	0
°F	1
none	2
nU	3
U	4
nA	5
A	6
bar	7
PSI	8
rh	9
Ph	10

9. To select the protocol type, the value between 0 and 1 must be assigned as per the below table:

Protocol type	Serial value
Modbus	0
JbuS	1

10. To select the serial comm.s baud rate, the value between 0 and 3 must be assigned as per the below table:

Baud Rate	Serial value
1200	0
2400	1
4800	2
9600	3

11. To select the retransm. output range, the value between 0 and 1 must be assigned as per the below table:

Variable	Serial value
0 .. 20 mA	0
4 .. 20 mA	1

12. To select the retransmitted variable (PV or SP), a value between 0 and 1 must be assigned as per the below table:

Variable	Serial value
PV	0
SP	1

13. To select the Timer/Start-up operating mode, a value between 0 and 7 must be assigned as per the below table:

Timer/Start-up operating mode	Serial value
Disabled	0
Start-up	1
Counting inside band	2
Counting inside band / End mode OFF	3
Counting when launched	4
Counting when launched / End mode OFF	5
Counting disable when launched	6
Stand-by Setpoint	7

14. To select the Timer action, a value between 0 and 7 must be assigned as per the below table:

Timer action			Serial value
Launch	**OP3 status**	**Time**	
By Keypad	OFF	Second	0
By Keypad	ON	Second	1
Key + at power on	OFF	Second	2
Key + at power on	ON	Second	3
By Keypad	OFF	Minute	4
By Keypad	ON	Minute	5
Key + at power on	OFF	Minute	6
Key + at power on	ON	Minute	7

8.5 Termination and Polarisation

The Platinum ® M300 instruments do not have any line termination or polarisation system. If necessary a termination resistance (120Ω ¼ W) must be connected to the terminals of the last instrument of the line.
In any case the polarisation is not possible.

9. M400 Controller

9.1 Bit zone

Address			
Modbus	**JbuS**	**Variable**	**Type**
0	1	Timer function status (0 = OFF, 1 = Run) [1]	R/W
1	2	Auto/Man (0 = Auto, 1 = Man) [2]	R/W
2	3	-	-
3	4	Control output status (0 = OFF, 1 = ON)	R
4	5	AL2 alarm status (0 = OFF, 1 = ON)	R
5	6	AL3 alarm status (0 = OFF, 1 = ON)	R
6	7	Out of range (0 = Normal operation, 1 = Safety)	R
7	8	Auto Tuning (0=OFF 1=Run)	R
8	9	-	-
9	10	Out of range (0 = Normal operation, 1 = Safety)	R
10	11	Keypad lock (0 = locked, 1 = unlocked)	R/W
11	12	Outputs lock (0 = locked, 1 = unlocked)	R/W
12	13	Logic input #1 (0=Open 1=Close)	R
13	14	-	-
14	15	-	-
15	16	-	-

9.2 Read Status

Function 07 (Read Status) returns an eight bit status with the following meanings:

Bit	Address	Variable
1 (LSB)	1	Timer function status (0 = OFF, 1 = Run) [1]
2	2	Auto/Man (0 = Auto, 1 = Man) [2]
3	3	-
4	4	Control output status (0 = OFF, 1 = ON)
5	5	Alarm 2 (0 = OFF, 1 = ON)
6	6	Alarm 3 (0 = OFF, 1 = ON)
7	7	Out of range (0 = Normal operation, 1 = Safety)
8 (MSB)	8	Auto Tune (0=Disabled 1=Run)

Notes:
1. Only available with Timer option.
2. Only available with Auto/Man function.

9.3 Word zone - Page 1 Parameters

Address				
Modbus	**JbuS**	**Variable**	**Parameter Code**	**Type**
0	1	Process variable	-	R
1	2	Setpoint	-	R/W [1]
2	3	Main output	-	R(W) [2]
3	4	Local Setpoint	-	R/W [1]
4	5	Local Setpoint	-	R/W [3]
5	6	Proportional Band (Hysteresis ON - OFF) [4]	P.b. (hy.)	R/W
6	7	Overshoot Control	O.C.	R/W
7	8	Integral time	t.i.	R/W
8	9	Derivative time	t.d.	R/W
9	10	Cycle time	t.c.	R/W
10	11	Low range	Sc.Lo	R
11	12	High range	Sc.Hi	R

12	13	AL2 alarm threshold	A2S.P	R/W
13	14	AL3 alarm threshold	A3S.P	R/W
14	15	AL2 alarm Hysteresis	A2hy	R/W
15	16	AL3 alarm Hysteresis	A2hy	R/W
16	17	Relative Cold Gain	r.C.Ga	R/W
17	18	Cool output Hysteresis (On-OFF only)	Hy. C	R/W
18	19	-	-	-
19	20	Heat/Cool dead band	d.bnd	R/W
20	21	Cool output cycling time	t.c. C	R/W
21	22	Cool output maximum value	OP.HC	R/W
22	23	Motor travel time	MU.tM	R/W
23	24	Minimum output step	MU.Hy	R/W
24	25	Timer setting	tiMe	R/W
25	26	Stand-by Setpoint	tM.S.P	R/W
26	27	Soft start output high limit	St.OP	R/W
27	28	Soft-start activation time	St.tM	R/W
28	29	-	-	-
29	30	Setpoint low limit	S.P. L	R/W
30	31	Setpoint high limit	S.P. H	R/W
31	32	PID Dead Band	d.Err	R/W
32	33	Main output high limit	OP. H	R/W
33	34	Output safety value	Sa.OP	R/W
34	35	Setpoint ramp up	Sl. u	R/W
35	36	Setpoint ramp down	Sl. d	R/W
36	37	Input filter	t.FiL	R/W
37	38	Input shift	In.Sh	R/W
38	39	Start/Stop One shoot tuning (0=Stop 1=Run)	tune	R/W
39	40	-	-	-
40	41	Serial comm.s address	Addr	R/W
41	42	-	-	-
42	43	Retransmission low range	rt.Lo	R/W
43	44	Retransmission high range	rt.Hi	R/W
44	45	Start-Up Setpoint	S.P.S.U	R/W
45	46	Start-Up Hold time	t.h.S.U	R/W
46	47	Output high milit during Start-up	OP.HS	R/W
47	48	Timer remaining time	tM.r.	R/W
48	49	Load current in ampere	t.Cur	R
49 - 99	50 - 100	-	-	-

9.4 Word zone - Page 2 Configuration

Address				
Modbus	**JbuS**	**Variable**	**Parameter Code**	**Type**
100	101	-	-	-
101	102	Configuration code	ConF	R/W [5]
102	103	AL3 alarm configuration code	Con.2	R/W [5]
103	104	Engineering units	unit	R/W [5/8]
104	105	Decimal point	Sc.d.d	R/W [5]
105	106	Low range for engineering units	Sc.Lo	R/W [5]
106	107	High range for engineering units	Sc.Hi	R/W [5]

107	108	Communications protocol	Prot	R/W [9]
108	109	Baud rate	baud	R/W [10]
109	110	Retransmission range	retr	R/W [11]
110	111	Retransmission signal selection	rtH	R/W [12]
111	112	Current transformer range	Ht.F.S	R/W
112	113	Password	Code	R/W
113	114	RTX low range calibration value (Reserved)	CAL.3	R/W
114	115	RTX high range calibration value (Reserved)	CAL.4	R/W
115	116	Timer operating mode	t.Mod	R/W [13]
116	117	Timer action	t.Act	R/W [14]
117	118	Digital input function	IL.Fn	R/W [15]
118	119	-	-	-
119	120	-	-	-
120	121	Factory code		R(W) [6]
121	122	Product code ("M4") [7]		R
122	123	-		R
123	124	Software release (p. es. " 00A") [7]		R
124	125	-	-	-
125	126	Custom code		R
126	127	-	-	-
127	128	-	-	-

Notes:

1. Assignment of Setpoint to the addresses JbuS 2 and 4 writes the Computer Setpoint. It is different from the Local Setpoint, which can be in any case set by keypad.
2. Assignment of output at the address JbuS 3 is only possible if the the Auto/Man option if fitted and when the controller is in Manual mode.
3. Assignment of Setpoint to the address JbuS 5 writes the Local Setpoint (the previous value is lost).
4. In case of ON - OFF output (address JbuS 6) the proportional band is substituted by the output hysteresis.
5. All the configuration parameters are accepted, if valid, but not brought into effect. To execute the reconfiguration procedure and bring the changes into effect, the code 55AAh must be written at the address JbuS 121.
6. Address JbuS 121 is read only, but if the code 55AAh (21930d) is written at this address, the configuration is brought into effect.
7. The JbuS 122 + 123 and 124 + 125 addresses contain the strings (of 4 characters) for the product and release codes: each address represents two characters, the most significant byte in the word contains the ASCII code of the second.

8. To select the engineering unit, the value between 0 and 10 must be assigned as per the below table:

Engineering unit	Serial value
°C	0
°F	1
none	2
nU	3
U	4
nA	5

A	6
bar	7
PSI	8
rh	9
Ph	10

9. To select the protocol type, the value between 0 and 1 must be assigned as per the below table:

Protocol type	Serial value
Modbus	0
JbuS	1

10. To select the serial comm.s baud rate, the value between 0 and 3 must be assigned as per the below table:

Baud Rate	Serial value
1200	0
2400	1
4800	2
9600	3

11. To select the retransm. output range, the value between 0 and 1 must be assigned as per the below table:

Variable	Serial value
0 .. 20 mA	0
4 .. 20 mA	1

12. To select the retransmitted variable, a value between 0 and 3 must be assigned as per the below table:

Variable	Serial value
PV	0
SP	1
MV (OP Heat)	2
MVC (OP Cool)	3

13. To select the Timer/Start-up operating mode, a value between 0 and 7 must be assigned as per the below table:

Timer/Start-up operating mode	Serial value
Disabled	0
Start-up	1
Counting inside band	2
Counting inside band / End mode OFF	3
Counting when launched	4
Counting when launched / End mode OFF	5
Counting disable when launched	6
Stand-by Setpoint	7

14. To select the Timer action, a value between 0 and 7 must be assigned as per the below table:

Timer action			Serial value
Launch	**OP3 status**	**Time**	
By Keypad	OFF	Second	0
By Keypad	ON	Second	1
Key + at power on	OFF	Second	2
Key + at power on	ON	Second	3
By Keypad	OFF	Minute	4
By Keypad	ON	Minute	5
Key + at power on	OFF	Minute	6
Key + at power on	ON	Minute	7

15. To select the digital input functions, a value between 0 and 4 must be assigned as per the below table:

Digital input function	Serial value
None	0
Keypad lock	1
Manual mode	2
Stand-by Setpoint	3
Timer launch	4

9.5 Termination and Polarization

The Platinum ® M400 instruments do not have any line termination or polarization system. If necessary a termination resistance (120Ω ¼ W) must be connected to the terminals of the last instrument of the line.
In any case the polarization is not possible.

10. M5000 Controller

10.1 Bit zone

Address			
Modbus	**JbuS**	**Variable**	**Type**
0	1	Remote status (0=LOC, 1=REM)	R/W
1	2	Auto/Man (0 = Auto 1 = Man)	R/W
2	3	AL3 alarm status (0 = OFF, 1 = ON)	R
3	4	AL4 alarm status (0 = OFF, 1 = ON)	R
4	5	AL1 alarm status (0 = OFF, 1 = ON)	R
5	6	AL2 alarm status (0 = OFF, 1 = ON)	R
6	7	Out of range (0 = Normal operation, 1 = Safety)	R
7	8	Self Tuning (0=Disabled 1=Run)	R
8	9	-	R
9	10	Out of range (0 = Normal operation, 1 = Safety)	R
10	11	-	-
11	12	-	-
12	13	1st Stored setpoint	R/W
13	14	2nd Stored setpoint	R/W
14	15	-	-
15	16	-	-
16	17	IL1 Digital input status (0 = OFF, 1 = ON)	R
17	18	IL2 Digital input status (0 = OFF, 1 = ON)	R
18	19	-	-
19	20	-	-
20	21	Keys enable (0=Enabled 1=Disabled)	R/W
21	22	Slope enable (0=Disabled 1=Enabled)	R/W

22	23	Hold PV (0=Disabled 1=Enabled)	R/W
23	24	OP1 forced status by serial comm.s (0 = OFF 1 = On)	R/W [19]
24	25	OP2 forced status by serial comm.s (0 = OFF 1 = On)	R/W [19]
25	26	OP3 forced status by serial comm.s (0 = OFF 1 = On)	R/W [19]
26	27	OP4 (logic) forced status by serial comm.s (0 = OFF 1 = On)	R/W [19]

10.2 Read Status

Function 07 (Read Status) returns an eight bit status with the following meanings:

Bit	Address	Variable
1 (LSB)	1	Local setpoint/Remote (0 = Local 1 = Remote)
2	2	Auto/Man (0 = Auto 1 = Man)
3	3	AL3 alarm status (0 = OFF, 1 = ON)
4	4	AL4 alarm status (0 = OFF, 1 = ON)
5	5	AL1 alarm status (0 = OFF, 1 = ON)
6	6	AL2 alarm status (0 = OFF, 1 = ON)
7	7	Out of range (0 = Normal operation, 1 = Safety)
8 (MSB)	8	Self Tuning (0=Disabled 1=Run)

10.3 Word zone - Page 1 Parameters

Address				
Modbus	**JbuS**	**Variable**	**Parameter Code**	**Type**
0	1	PV Process variable	-	R
1	2	SP Setpoint	-	R
2	3	MV Main output	-	R/W [1]
3	4	SPT Target setpoint	-	R/W [2]
4	5	SPL Local setpoint	-	R/W [2]
5	6	Proportional Band (Hysteresis ON - OFF)	P.b. (Hy)	R/W
6	7	Overshoot Control	O.C.	R/W
7	8	Integral time	t.i.	R/W
8	9	Derivative time	t.d.	R/W
9	10	Cycle time	t.c.	R/W
10	11	Low range	Sc.1o	R/W
11	12	High range	Sc.hi	R/W
12	13	AL1 alarm threshold	1***	R/W
13	14	AL2 alarm threshold	2***	R/W
14	15	AL3 alarm threshold	3***	R/W
15	16	AL4 alarm threshold	4***	R/W
16	17	AL1 alarm hysteresis Up	Hy1u	R/W
17	18	AL1 alarm hysteresis Down	Hy1d	R/W
18	19	AL2 alarm hysteresis Up	Hy2u	R/W
19	20	AL2 alarm hysteresis Down	Hy2d	R/W
20	21	AL3 alarm hysteresis Up	Hy3u	R/W
21	22	AL3 alarm hysteresis Down	Hy3d	R/W
22	23	AL4 alarm hysteresis Up	Hy4u	R/W
23	24	AL4 alarm hysteresis Down	Hy4d	R/W
24	25	Heat/cool proportional band	P.b. C	R/W
25	26	Heat/cool integral time	t.i. C	R/W
26	27	Heat/cool derivative time	t.d. C	R/W
27	28	Cool output cycling time	tc.C	R/W
28	29	Output minimum step	MU.tM	R/W
29	30	Setpoint low limit	SPLl.	R/W

30	31	Setpoint high limit	SPL.H.	R/W
31	32	Main output low limit	OP.l	R/W
32	33	Main output high limit	OP.H	R/W
33	34	Cool output maximum value	OP.CH	R/W
34	35	Setpoint ramp up	5l.u	R/W
35	36	Setpoint ramp down	5l.d	R/W
36	37	Input filter	t.Fil	R/W
37	38	Input shift	1n.Sh	R/W
38	39	Start/Stop One shoot tuning (0=Stop 1=Run)	tune	R/W
39	40	Start/Stop Adaptive (0=Stop 1=Run)	AdPt	R/W
40	41	Serial comm.s address	Addr	R/W
41	42	Communication protocol (0=Modbus 1=JbuS)	Prot	R/W
42	43	Baud rate	baud	R/W
43	44	Remote setpoint	-	R/W
44	45	Soft start time	5t.tn	R/W
45	46	Soft start output high limit	5t.OP	R/W
46	47	Control output maximum speed	OP.r	R/W
47	48	Cool output maximum speed	OP.rC	R/W
48	49	CT current	Tcur	R
49	50	Sampling time	tSan	R/W
50	51	Manual Reset	Mre5	R/W
51	52	Configuration password	CPA5	R/W
52	53	Internal servomotor position	-	R
53	54	Heat/Cool dead band	d.bnd	R/W
54	55	Access password	PAS5	R/W
55	56	Proportional band (Adaptive)	Pb.	R [3]
56	57	Integral time (Adaptive) (Deriv=1/4 Ti)	t.i.	R [3]
57	58	1st stored setpoint	5P.1	R/W
58	59	2nd stored setpoint	5P.2	R/W
59	60	Remote setpoint bias	biaS	R/W
60	61	Remote setpoint ratio	rtio	R/W
61	62	Motor travel time	MU.tM	R/W
62	63	Target setpoint	t.5P	R
63	64	PID Dead Band	d.Err	R/W

10.4 Word zone - Page 2 Configuration

Address				
Modbus	**JbuS**	**Variable**	**Parameter Code**	**Type**
100	101	Input configuration	Inp	R/W [4]
101	102	Square root (0 = No 1= Yes)	5qr	R/W
102	103	Decimal point (0 .. 3)	5C.dd	R/W
103	104	Low range for engineering units	5C.lo	R/W
104	105	High range for engineering units	5C.Hi	R/W
105	106	Engineering units	Unit	R/W [5]
106	107	Control type	01ty	R/W [6]
107	108	OP output type	0P.1	R/W [7]
108	109	Cool output type	0P.2	R/W [7]
109	110	Retransmission type	rtH	R/W [8]
110	111	Retransmission output	0.r.ty	R/W [9]

111	112	Retransmission low range	rt.lo	R/W
112	113	Retransmission high range	rt.Hi	R/W
113	114	Auto/Man enable	E.AMn	R/W
114	115	Remote input configuration	rS.In	R/W [11]
115	116	Setpoint configuration	rSPC	R/W [10]
116	117	-	-	-
117	118	Access level	OPer	R/W [12]
118	119	-	-	-
119	120	Safety output (-100 .. 100 101 = OFF)	5.Out	R/W
120	121	Factory code	-	R
121	122	Product code ("P "program ," " no program)	-	R [18]
122	123	Product code (“M5”)	-	R [18]
123	124	1st byte product code	-	R [18]
124	125	2nd byte product code	-	R [18]
125	126	Custom code	-	R
126	127	AL1 alarm configuration	Al.1	R/W [13]
127	128	AL1 alarm output	A1.Ou	R/W [14]
128	129	AL1 alarm latching (0 = No 1= Yes)	ltch	R/W
129	130	AL1 alarm blocking (0 = No 1= Yes)	bloc	R/W
130	131	AL2 alarm configuration	Al.2	R/W [13]
131	132	AL2 alarm output	A2.Ou	R/W [13]
132	133	AL2 alarm latching (0 = No 1= Yes)	ltch	R/W
133	134	AL2 alarm blocking (0 = No 1= Yes)	bloc	R/W
134	135	AL3 alarm configuration	Al.3	R/W [13]
135	136	AL3 alarm output	A3.Ou	R/W [14]
136	137	AL3 alarm latching (0 = No 1= Yes)	ltch	R/W
137	138	AL3 alarm blocking (0 = No 1= Yes)	bloc	R/W
138	139	AL4 alarm configuration	Al.4	R/W [13]
139	140	AL4 alarm output	A4.Ou	R/W [14]
140	141	AL4 alarm latching (0 = No 1= Yes)	ltch	R/W
141	142	AL4 alarm blocking (0 = No 1= Yes)	bloc	R/W
142	143	IL1 digital input configuration	1L1	R/W [15]
143	144	IL2 digital input configuration	1L2	R/W [15]
144	145	Setpoint slope unit	5.P.t.M	R/W
145	146	On status CT alarm configuration (0=OFF 1=On)	Ht.On	R/W
146	147	CT maximum value	Ht.F.C	R/W
147	148	Linearization enable (0 = OFF 1= Enabled)	CHar	R/W

10.5 Word zone - Page 3 Programmer

Address				
Modbus	**JbuS**	**Variable**	**Parameter Code**	**Type**
148	149	Program status	5tat	R/W [16]
149	150	N° of segments	n.5eg	R/W
150	151	Allowed deviation	band	R/W
151	152	Recover action type after blackout	-	R/W [21]
152	153	Time unit	Unit	R/W [17]
153	154	Cycles	Cyc.	R/W
154	155	Segment 0 – Time	ti.0	R/W
155	156	Segment 0 – Setpoint	5P.0	R/W
156	157	Segment 0 [20] digital output	d0.0	R/W

157	158	Segment 1 – Time	ti.1	R/W
158	159	Segment 1 – Setpoint	5P.1	R/W
159	160	Segment 1 [20] digital output	d0.1	R/W
160	161	Segment 2 – Time	ti.2	R/W
161	162	Segment 2 – Setpoint	5P.2	R/W
162	163	Segment 2 [20] digital output	d0.2	R/W
163	164	Segment 3 – Time	ti.3	R/W
164	165	Segment 3 – Setpoint	5P.3	R/W
165	166	Segment 3 [20] digital output	d0.3	R/W
166	167	Segment 4 – Time	ti.4	R/W
167	168	Segment 4 – Setpoint	5P.4	R/W
168	169	Segment 4 [20] digital output	d0.4	R/W
169	170	Segment 5 – Time	ti.5	R/W
170	171	Segment 5 – Setpoint	5P.5	R/W
171	172	Segment 5 [20] digital output	d0.5	R/W
172	173	Segment 6 – Time	ti.6	R/W
173	174	Segment 6 – Setpoint	5P.6	R/W
174	175	Segment 6 [20] digital output	d0.6	R/W
175	176	Segment 7 – Time	ti.7	R/W
176	177	Segment 7 – Setpoint	5P.7	R/W
177	178	Segment 7 [20] digital output	d0.7	R/W
178	179	Segment 8 – Time	ti.8	R/W
179	180	Segment 8 – Setpoint	5P.8	R/W
180	181	Segment 8 [20] digital output	d0.8	R/W
181	182	Segment 9 – Time	ti.9	R/W
182	183	Segment 9 – Setpoint	5P.9	R/W
183	184	Segment 9 [20] digital output	d0.9	R/W
184	185	Segment 10 – Time	ti.10	R/W
185	186	Segment 10 - Setpoint	5P.10	R/W
186	187	Segment 10 [20] digital output	d0.10	R/W
187	188	Segment 11 – Time	ti.11	R/W
188	189	Segment 11 - Setpoint	5P11	R/W
189	190	Segment 11 [20] digital output	d0.11	R/W
190	191	Segment 12 – Time	ti.12	R/W
191	192	Segment 12 - Setpoint	5P.12	R/W
192	193	Segment 12 [20] digital output	d0.12	R/W
193	194	Segment 13 – Time	ti.13	R/W
194	195	Segment 13 - Setpoint	5P.13	R/W
195	196	Segment 13 [20] digital output	d0.13	R/W
196	197	Segment 14 – Time	ti.14	R/W
197	198	Segment 14 - Setpoint	5P.14	R/W
198	199	Segment 14 [20] digital output	d0.14	R/W
199	200	Segment F – Time	5PF	R/W
200	201	Segment F – Setpoint	d0.F	R/W

Note:

1. The OP1 value can only be assigned when the controller is working in Manual mode.
2. The Local Setpoint (Wloc) can be read at the both JbuS addresses 4 and 5. It only depend on the compatibility with the other Athena Controls instruments.

3. The above parameters can only be read when the Adaptive Tuning is launched. The Td derivative time is not shown but it can be simply calculated as the ¼ of the Ti integral time (Td = Ti/4).
4. To select the Input type, the value between 0 and 15 must be assigned as per the below table:

Input Type	Serial Value
TC **J**	0
TC **L**	1
TC **K**	2
TC **S**	3
TC **R**	4
TC **T**	5
TC Custom	6
RTD 1	7
RTD 2	8
Delta T	9
0 .. 50 mV	10
0 .. 5 V	11
1 .. 5 V	12
0 .. 10 V	13
0 .. 20 mA	14
4 .. 20 mA	15

5. To select the engineering unit, the value between 0 and 9 must be assigned as per the below table:

Engineering Unit	Serial Value
None	0
°C	1
°F	2
MA	3
MU	4
U	5
Bar	6
PSI	7
Rh	8
Ph	9

6. To select the control mode, the value between 0 and 8 must be assigned as per the below table:

Control Mode	Serial Value
On/OFF reverse action	0
On/OFF direct action	1
PID direct action	2
PID reverse action	3
Valve Drive direct action	4
Valve Drive reverse action	5
Heat/Cool Linear	6
Heat/Cool Oil	7
Heat/Cool Water	8

7. To select the Output type, the value between 0 and 10 must be assigned as per the below table:

Output Type	Serial Value
Not active	0
Relay	1
Logic	5
0 .. 5 V	6
1 .. 5 V	7
0 .. 10 V	8
0 .. 20 mA	9
4 .. 20 mA	10

8. To select the retransmission content the value between 0 and 2 must be assigned as per the below table:

Retransmission	Serial Value
None	0
P.V.	1
S.P.	2

9. To select the retransmission signal, the value between 6 and 10 must be assigned as per the below table:

Retransmission signal	Serial Value
0 .. 5 V	6
1 .. 5 V	7
0 .. 10 V	8
0 .. 20 mA	9
4 .. 20 mA	10

10. To select the Setpoint type, the value between 0 and 4 must be assigned as per the below table:

Setpoint Type	Serial Value
Local only	0
Remote only	1
Local / Remote	2
Local + Trim	3
Remote + Trim	4

11. To select the Remote Setpoint signal, the value between 11 and 15 must be assigned as per the below table:

Remote Setpoint Signal	Serial Value
0 .. 5 V	11
1 .. 5 V	12
0 .. 10 V	13
0 .. 20 mA	14
4 .. 20 mA	15

12. To select the Access Level, the value between 0 and 2 must be assigned as per the below table:

Access Level	Serial value
Full	0
Operator	1
Edit	2

13. To select the Alarm Function, the value between 0 and 7 must be assigned as per the below table:

Alarm Function	Serial Value
Disabled	0
Absolute active high	1
Absolute active low	2
Deviation active high	3
Deviation active low	4
Band active out	5
Heater break	6
Loop break alarm	7

N.B. Index 7 is available for first alarm output.

14. To select the Alarm output, the value between 1 and 3 must be assigned as per the below table:

Alarm output	Serial Value
OP 1	1
OP 2	2
OP 3	3

15. To select the Digital input function, the value between 0 and 8 must be assigned as per the below table:

Digital Input function	Serial Value
Disabled	0
Local / Remote	1
Auto / Manual	2
1st Mem. Setpoint	3
2nd Mem. Setpoint	4
Keypad lock	5
Slopes Inhibition	6
PV Hold	7
Program Run/Hold	8

16. To select the Program Status, the value between 0 and 4 must be assigned as per the below table:

Program Status	Serial Value
Reset	0
Hold	1
Run	2
Hold Back (note)	3
Program End	4

Note. This function is automatically activated every time the PV exceed the band limits set in each segment of the running program.

17. To select the Time base, the value between 0 and 2 must be assigned as per the below table:

Time Base	Serial Value
Second	0
Minute	1
Hour	2

18. The JbuS 122 + 123 and 124 + 125 addresses contain the strings (of 4 characters) for the product and release codes: each address represents two characters, the most significant byte in the word contains the ASCII code of the second.

19. These particular conditions can be activated if the corresponding outputs are specifically configured for it.

20. To configure the digital outputs status related to the setpoint programmer option, the value between 0 and 2 must be assigned as per the below table:

Digital output Status	Serial Value
OFF	0
Open	1
Close	2

21. To select the Run Program after Hold condition, the value between 0 and 4 must be assigned as per the below table:

Re-start status of the program	Serial Value
Run	0
Reset	1
Ramp	2

10.6 RS-485 Configuration Dip Switch

On the RS485 board a 4 position dip Switch is provided. It enables the correct hardware configuration of the instrument serial comm.s port as follows:

Position	On	OFF
1	Polarisation +5Vcc	Polarisation excluded
2	Termination set	Termination excluded
3	Polarisation 0 Vcc	Polarisation excluded
4	-	-

11. X100 / X400 CONTROLLER

11.1 Bit Zone

Address			
Modbus	**JbuS**	**Variable**	**Type**
0	1	Remote status (0=LOC, 1=REM) [1] or program (0=LOC, 1=RUN) [2]	R/W
1	2	Auto/Man (0 = Auto, 1 = Man) [3]	R/W
2	3	OP4 digital output status (0 = OFF, 1 = ON)	R
3	4	OP1 digital output status (0 = OFF, 1 = ON)	R
4	5	OP2 digital output status (0 = OFF, 1 = ON)	R
5	6	OP3 digital output status (0 = OFF, 1 = ON)	R
6	7	Out of range (0 = Normal, 1 = Safety)	R
7	8	Auto-Tune (0 = OFF, 1 = Run)	R
8	9	Timer status (0 = OFF, 1 = Run) [4]	R/W
9	10	Out of range (0 = Normal, 1 = Safety)	R

10	11	Keypad lock (0 = locked, 1 = unlocked)	R/W
11	12	Outputs lock (0 = locked, 1 = unlocked)	R/W
12	13	IL1 Digital input status (0 = OFF, 1 = ON)	R
13	14	IL2 Digital input status (0 = OFF, 1 = ON)	R
14	15	IL3 Digital input status (0 = OFF, 1 = ON)	R
15	16	-	-

11.2 Read Status

Function 07 Read Status returns an eight bit status with the following meaning:

Bit	Address	Variable
1 (LSB)	1	Remote [1] or program [2] status
2	2	Auto/Man (0 = Auto, 1 = Man) [3]
3	3	OP4 output status (0 = OFF, 1 = ON)
4	4	OP1 output status (0 = OFF, 1 = ON)
5	5	OP2 output status (0 = OFF, 1 = ON)
6	6	OP3 output status (0 = OFF, 1 = ON)
7	7	Out of range (0 = Normal, 1 = Safety)
8 (MSB)	8	Auto-Tune (0 = OFF, 1 = Run)

Notes:

1. Available when configured as Local + Remote Setpoint only
2. Available when configured as programmed Setpoint only.
3. With Timer option only.

11.3 Word Zone - Page 1 Parameters

Address				
Modbus	**JbuS**	**Variable**	**Parameter code**	**Type**
0	1	PV process variable		R
1	2	SP Setpoint		R/W [1]
2	3	MV main control output		R(/W) [2]
3	4	SPT target Setpoint		R/W [1]
4	5	SPL local Setpoint		R/W [3]
5	6	Proportional band (Hysteresis ON - OFF) [4]	P.b. (hy.)	R/W
6	7	Overshoot control	O.C.	R/W
7	8	Integral time	t.i.	R/W
8	9	Derivative time	t.d.	R/W
9	10	Cycle time	t.c.	R/W
10	11	Low range	Sc.Lo	R
11	12	High range	Sc.Hi	R
12	13	AL2 alarm threshold	A2S.P	R/W
13	14	AL3 alarm threshold	A3S.P	R/W
14	15	AL2 alarm hysteresis	A2hy	R/W
15	16	AL3 alarm hysteresis	A3hy	R/W
16	17	Cool relative gain	r.C.Ga	R/W
17	18	Cool output hysteresis (On-OFF only)	Hy. C	R/W
18	19	-	-	-
19	20	Dead band	d.bnd	R/W
20	21	Cool cycle time	t.c. C	R/W
21	22	Cool control output high limit	OP.HC	R/W
22	23	Motor travel time	MU.tM	R/W

23	24	Minimum output step	MU.Hy	R/W
24	25	Timer setting	tiMe	R/W
25	26	Stand-by Setpoint	S.P.Sb	R/W
26	27	Soft-satrt output value	St.OP	R/W
27	28	Soft-start activation time	St.tM	R/W
28	29	Manual reset	M.reS	R/W
29	30	Setpoint low limit	S.P. L	R/W
30	31	Setpoint high limit	S.P. H	R/W
31	32	Error dead band	d.Err	R/W

11.4 Word Zone - Page 2 Parameters

Address				
Modbus	**JbuS**	**Variable**	**Parameter code**	**Type**
32	33	Control output high limit	OP. H	R/W
33	34	Output safety value	SA.OP	R/W
34	35	Setpoint ramp up	Sl. u	R/W
35	36	Setpoint ramp down	Sl. d	R/W
36	37	Filter time constant	t.FiL	R/W
37	38	Input shift	In.Sh	R/W
38	39	Tune run/stop	tune	R/W
39	40	-	-	-
40	41	Serial comm.s address	Addr	R/W
41	42	-	-	-
42	43	Retransmission low range	rt.Lo	R/W
43	44	Retransmission high range	rt.Hi	R/W
44	45	Start-up Setpoint	S.P.S.U	R/W
45	46	Hold time	t.h.S.U	R/W
46	47	Output high limit during Strat-up	OP.HS	R/W
47	48	Timer remaining time	tM.r.	R/W
48	49	Load current in Ampere	t.Cur	R
49	50	Setpoint selection	S.SEL	R
50	51	1st stored Setpoint	S.P. 1	R/W
51	52	2nd stored Setpoint	S.P. 2	R/W
52	53	-	-	-
53	54	Ratio Setpoint	rtio	R/W
54	55	Bias Setpoint	biaS	R/W
55	56	-	-	-
56	57	AL1 alarm threshold	A1S.P	R/W
57	58	AL1 alarm hysteresis	A1hy	R/W
58	59	AL1 latching and blocking functions	A1Lb	R/W [21]
59	60	AL2 latching and blocking functions	A2Lb	R/W [21]
60	61	AL3 latching and blocking functions	A3Lb	R/W [21]
61..63	62..64	-	-	-

11.5 Word Zone - Page 3 Program

Address				
Modbus	**JbuS**	**Variable**	**Parameter code**	**Type**
64	65	Program status	Stat	R/W [8]
65	66	Restart after a power OFF	FaiL	R/W [9]
66	67	Time units	Unit	R/W [10]
67	68	Number of segments	n.Seg	R/W
68	69	Number of program cycles	Cyc.	R/W
69	70	Allowed deviation	band	R/W
70	71	Segment “0” time	ti. 0	R/W
71	72	Segment “0” Setpoint	S.P. 0	R/W
72	73	Segment “0” OP3 digital output	dO. 0	R/W [20]
73	74	Segment “1” time	ti. 1	R/W
74	75	Segment “1” Setpoint	S.P. 1	R/W
75	76	Segment “1” OP3 digital output	dO. 1	R/W [20]
76	77	Segment “2” time	ti. 2	R/W
77	78	Segment “2” Setpoint	S.P. 2	R/W
78	79	Segment “2” OP3 digital output	dO. 2	R/W [20]
79	80	Segment “3” time	ti. 3	R/W
80	81	Segment “3” Setpoint	S.P. 3	R/W
81	82	Segment “3” OP3 digital output	dO. 3	R/W [20]
82	83	Segment “4” time	ti. 4	R/W
83	84	Segment “4” Setpoint	S.P. 4	R/W
84	85	Segment “4” OP3 digital output	dO. 4	R/W [20]
85	86	Segment “5” time	ti. 5	R/W
86	87	Segment “5” Setpoint	S.P. 5	R/W
87	88	Segment “5” OP3 digital output	dO. 5	R/W [20]
88	89	Segment “6” time	ti. 6	R/W
89	90	Segment “6” Setpoint	S.P. 6	R/W
90	91	Segment “6” OP3 digital output	dO. 6	R/W [20]
91	92	Segment “End” Setpoint	S.P. F	R/W
92	93	Segment “End” OP3 digital output	dO. F	R/W [20]
93..99	94..100	-	-	-

11.6 Word Zone - Page 4 Configuration

Address				
Modbus	**JbuS**	**Variable**	**Parameter code**	**Type**
100	101	Remote Setpoint range	rS.In	R/W [5/11]
101	102	1° version configuration	Con.1	R/W [5]
102	103	2° version configuration	Con.2	R/W [5]
103	104	Engineering units	unit	R/W [5/12]
104	105	Number of decimals	Sc.d.d	R/W [5]
105	106	Low range	Sc.Lo	R/W [5]
106	107	High range	Sc.Hi	R/W [5]
107	108	Communications protocol	Prot	R/W [13]
108	109	Baud rate	baud	R/W [14]
109	110	Continuous control output range	retr	R/W [15]
110	111	Retransmission output selection	rtH	R/W [16]

111	112	CT primary high range	Ht.F.S	R/W
112	113	Password	Code	R/W
113	114	Retransm. calibration low range (for Athena Controls only)	CAL.3	R/W
114	115	Retransm. calibration high range (for Athena Controls only)	CAL.4	R/W
115	116	Timer setting	t.Mod	R/W [17]
116	117	Timer action	t.Act	R/W [18]
117	118	IL1 digital input function	IL1	R/W [19]
118	119	IL2 digital input function	IL2	R/W [19]
119	120	IL3 digital input function	IL3	R/W [19]

Address				
Modbus	**JbuS**	**Variable**	**Parameter code**	**Type**
120	121	Manufacturer code (600 for Athena Controls)		R(W) [6]
121	122	Product code ("X1" or X3") note X3=X400 product		R
122	123			R
123	124	Release code (p. es. " 00A") [7]		R
124	125			R
125	126	Custom code		R
126	127	-	-	-
127	128	-	-	-

Notes:

1. Assignment of Setpoint to the addresses JbuS 2 and 4 writes the Computer Setpoint. It is different from the Local Setpoint, which can be in any case set by keypad.
2. Assignment of output at the address JbuS 3 is only possible if the the Auto/Man option if fitted and when the controller is in Manual mode.
3. Assignment of Setpoint to the address JbuS 5 writes the Local Setpoint (the previous value is lost).
4. In case of ON - OFF output (address JbuS 6) the proportional band is substituted by the output hysteresis.
5. All the configuration parameters are accepted, if valid, but not brought into effect. To execute the reconfiguration procedure and bring the changes into effect, the code 55AAh must be written at the address JbuS 121.
6. Address JbuS 121 is read only, but if the code 55AAh (21930d) is written at this address, the configuration is brought into effect.
7. The JbuS 122 + 123 and 124 + 125 addresses contain the strings (of 4 characters) for the product and release codes: each address represents two characters, the most significant byte in the word contains the ASCII code of the second.
8. To select the program status, the value between 0 and 4 must be assigned as per the below table:

Program status	Serial value
Reset	0
Hold	1
Run	2
Hold / Back (note)	3
Program end	4

Note: If the PV controlled input value exceeds the band, the controller switches automatically to this mode.

9. To select the re-start status of the program after a power failure, the value between 0 and 2 must be assigned as per the below table:

Re-start status of the program	Serial value
Continue	0
Reset	1
Ramp	2

10. To select the program time unit, the value between 0 and 2 must be assigned as per the below table:

Program time unit	Serial value
Second	0
Minute	1
Hour	2

11. To select the remote setpoint input type, the value between 0 and 4 must be assigned as per the below table:

Remote Setpoint input type	Serial value
0 .. 5 V	0
1 .. 5 V	1
0 .. 10 V	2
0 .. 20 mA	3
4 .. 20 mA	4

12. To select the engineering unit, the value between 0 and 10 must be assigned as per the below table:

Engineering unit	Serial value
°C	0
°F	1
none	2
nU	3
U	4
nA	5
A	6
bar	7
PSI	8
rh	9
Ph	10

13. To select the protocol type, the value between 0 and 1 must be assigned as per the below table:

Protocol type	Serial value
Modbus	0
JbuS	1

14. To select the serial comm.s baud rate, the value between 0 and 3 must be assigned as per the below table:

Baud Rate	Serial value
1200	0
2400	1
4800	2
9600	3

15. To select the OP5 retransm. output range, the value between 0 and 1 must be assigned as per the below table:

Variable	Serial value
0…20mA	0
4…20mA	1

16. To select the retransmitted variable (PV or SP), a value between 0 and 1 must be assigned as per the below table:

Variable	Serial value
PV	0
SP	1

17. To select the Timer/Start-up operating mode, a value between 0 and 7 must be assigned as per the below table:

Timer/Start-up operating mode	Serial value
Disabled	0
Start-up	1
Counting inside band	2
Counting inside band / End mode OFF	3
Counting when launched	4
Counting when launched / End mode OFF	5
Counting disable when launched	6
Stand-by Setpoint	7

18. To select the Timer action, a value between 0 and 7 must be assigned as per the below table:

Timer action			Serial value
Launch	**OP3 status**	**Time**	
By Keypad	OFF	Second	0
By Keypad	ON	Second	1
Key + at power on	OFF	Second	2
Key + at power on	ON	Second	3
By Keypad	OFF	Minute	4
By Keypad	ON	Minute	5
Key + at power on	OFF	Minute	6
Key + at power on	ON	Minute	7

19. To select the digital input functions, a value between 0 and 9 must be assigned as per the below table:

Digital input function	Serial value
Not used	0
Keypad lock	1
Measure hold	2
Manual mode	3
Remote mode	4
1st stored Setpoint	5
2nd stored Setpoint	6
Local Setpoint	7
Run Timer	8
Run/stop of a program	9

20. The possible OP3 status conditions when related to the program are below listed:

OP3 status when related to the program	Serial value
No action	0
Open	1
Closed	2

21. To select the alarm function, a value between 0 and 3 must be assigned as per the below table:

Alarm function	Serial value
No action	0
Latching	1
Blocking	2
Latching / Blocking	3

11.7 RS-485 Configuration Dip Switch

On the RS485 board a 4 position dip Switch is provided. It enables the correct hardware configuration of the instrument serial comm.s port as follows:

Position	On	OFF
1	Polarisation +5Vcc	Polarisation excluded
2	Termination set	Termination excluded
3	Polarisation 0 Vcc	Polarisation excluded
4	-	-

12.1 Bit zone

Address			
Modbus	**JbuS**	**Variable**	**Type**
0	1	Remote status (0=LOC, 1=REM)	R/W
1	2	Auto / Manual (0 = Auto, 1 = Manual)	R/W
2	3	AL3 alarm status (0 = OFF, 1 = ON)	R
3	4	AL4 alarm status (0 = OFF, 1 = ON)	R
4	5	AL1 alarm status (0 = OFF, 1 = ON)	R
5	6	AL2 alarm status (0 = OFF, 1 = ON)	R
6	7	Out of range (0 = Normal operation, 1 = Safety)	R
7	8	Auto-Tune (0 = Disabled, 1 = Run)	R
8	9	-	-
9	10	Out of range (0 = Normal operation, 1 = Safety)	R
10..11	11..12	-	-
12	13	Local stored Setpoint	R/W
13	14	1st stored Setpoint	R/W
14	15	2nd stored Setpoint	R/W
15	16	3rd stored Setpoint	R/W
16	17	IL1 Digital input status (0=OFF, 1=ON)	R
17	18	IL2 Digital input status (0=OFF, 1=ON)	R
18	19	IL3 Digital input status (0=OFF, 1=ON)	R
19	20	-	-
20	21	Keypad lock (0=locked, 1=unlocked)	R/W
21	22	Slope inhibition by serial comm.s	R/W
22	23	PV Hold by serial comm.s	R/W
23	24	OP1 forced status by serial comm.s(0=OFF, 1=ON)	R/W [1]
24	25	OP2 forced status by serial comm.s(0=OFF, 1=ON)	R/W [1]
25	26	OP3 forced status by serial comm.s(0=OFF, 1=ON)	R/W [1]
26	27	OP4 forced status by serial comm.s(0=OFF, 1=ON)	R/W [1]
27	28	OP5 (logic) forced status by serial comm.s(0=OFF, 1=ON)	R/W [1]
28	29	Output forcing value	R/W
29	30	1st Program Run/Reset	R/W
30	31	2nd Program Run/Reset	R/W
31	32	3rd Program Run/Reset	R/W
32	33	4th Program Run/Reset	R/W

12.2 Read Status

Function 07 (Read Status) returns an eight bit status with the following meanings:

Bit	Address	Variable
1 (LSB)	1	Remote status (0=LOC, 1=REM)
2	2	Auto / Manual (0 = Auto, 1 = Manual)
3	3	OP4 alarm status (0 = OFF, 1 = ON)
4	4	OP3 alarm status (0 = OFF, 1 = ON)
5	5	OP2 alarm status (0 = OFF, 1 = ON)
6	6	OP1 alarm status (0 = OFF, 1 = ON)
7	7	Out of range (0 = Normal operation, 1 = Safety)
8 (MSB)	8	Auto-Tune (0 = Disabled, 1 = Run)

12.3 Word zone - Page 1 Parameters

Address		Variable	Parameter Code	Type
Modbus	JbuS			
0	1	PV process variable	-	R
1	2	SP Setpoint	-	R
2	3	MV Main control output	-	R(/W) [2]
3	4	SPL local Setpoint	-	R/W [3]
4	5	SPL local Setpoint	-	R/W [3]
5	6	Proportional band (Hysteresis ON - OFF)	P.b. (hy.)	R/W
6	7	Overshoot control	O.C.	R/W
7	8	Integral time	t.i.	R/W
8	9	Derivative time	t.d.	R/W
9	10	Cycle time	t.c.	R/W
10	11	Low range	Sc.Lo	R
11	12	High range	Sc.Hi	R
12	13	AL1 alarm threshold	A1S.P	R/W
13	14	AL2 alarm threshold	A2S.P	R/W
14	15	AL3 alarm threshold	A3S.P	R/W
15	16	AL4 alarm threshold	A4S.P	R/W
16	17	AL1 alarm high hysteresis	hy.1u	R/W
17	18	AL1 alarm low hysteresis	hy.1d	R/W
18	19	AL2 alarm high hysteresis	hy.2u	R/W
19	20	AL2 alarm low hysteresis	hy.2d	R/W
20	21	AL3 alarm high hysteresis	hy.3u	R/W
21	22	AL3 alarm low hysteresis	hy.3d	R/W
22	23	AL4 alarm high hysteresis	hy.4u	R/W
23	24	AL4 alarm low hysteresis	hy.4d	R/W
24	25	Cool proportional band	P.b. C	R/W
25	26	Cool integral time	t.i. C	R/W
26	27	Cool derivative time	t.d. C	R/W
27	28	Cool cycle time	t.c. C	R/W
28	29	Minimum output step	MU.Hy	R/W
29	30	Setpoint low limit	S.P. L	R/W
30	31	Setpoint high limit	S.P. H	R/W
31	32	Control ouput low limit	OP. L	R/W
32	33	Control output high limit	OP. H	R/W
33	34	Cool control output high limit	OP.C.H	R/W
34	35	Slope up	Sl. u	R/W
35	36	Slope down	Sl. d	R/W
36	37	Filter time constant	t.FiL	R/W
37	38	Input Shift	In.Sh	R/W
38	39	AutoTune (0 = Stop, 1 = Run)	tune	R/W
39	40	Adaptive Tune (0 = Stop, 1 = Run)	AdPt	R/W
40	41	Serial comm.s SLAVE address	Add.S	R/W
41	42	Serial comm.s SLAVE protocol	Pro.S	R/W
42	43	SLAVE baud rate	bdr.S	R/W
43	44	Remote Setpoint	-	R
44	45	Soft-Start activation time	St.tM	R/W
45	46	Soft-Start output value	St.OP	R/W
46	47	Control output maximum speed	OP.r	R/W
47	48	Cool Control output maximum speed	OP.rC	R/W

48	49	Control output forcing value	F.Out	R/W
49	50	Sampling time	t.San	R/W
50	51	Manual Reset	M.reS	R/W
51	52	Configuration Password	C.PASS	R/W
52	53	Internal servomotor position	-	R
53	54	Dead band	d.bnd	R/W
54	55	Password Level access	A.PASS	R/W
55	56	Adaptive Proportional band	P.b.	R [4]
56	57	Adaptive Integral time	t.i.	R [4]
57	58	1st stored Setpoint	S.P. 1	R/W
58	59	2nd stored Setpoint	S.P. 2	R/W
59	60	3rd stored Setpoint	S.P. 3	R/W
60	61	Remote Setpoint Bias	biaS	R/W
61	62	Ratio Setpoint	rtio	R/W
62	63	Motor travel time	MU.tM	R/W
63	64	SPT Target Setpoint	t.S.P.	R
64	65	Read Status	-	R
65	66	MASTER enable	MaSt	R/W
66	67	MASTER baud rate	bdr.M	R/W
67	68	Serial comm.s MASTER protocol	Pro.M	R/W
68	69	Profibus Dp address	Add.P	R/W
69	70	Cold junction temperature (for TC only)	-	R
70	71	Running program status	-	R [5]
71	72	Program selection	-	R
72	73	Running program number	-	R
73	74	1st Program Run/Reset	-	R/W [6]
74	75	2nd Program Run/Reset	-	R/W [6]
75	76	3rd Program Run/Reset	-	R/W [6]
76	77	4th Program Run/Reset	-	R/W [6]
77..78	78..79	-	-	-
79	80	Error dead band	d.Err	R/W
80..99	81..100	-	-	-

12.4 Word zone - Page 2 Configuration

Address				
Modbus	**JbuS**	**Variable**	**Parameter Code**	**Type**
100	101	Input type	In P.	R/W [7]
101	102	Square root (0 = OFF, 1 = On)	5Mr	R/W
102	103	N° of decimals	5c.dd	R/W
103	104	Low range	5c.Lo	R/W
104	105	High range	5c.Hi	R/W
105	106	Engineering units	Unit	R/W [8]
106	107	Control type	Cn.ty	R/W [9]
107	108	Main output (Heat)	M.COP	R/W [10]
108	109	Secondary output (Cool)	S.C.OP	R/W [11]
109	110	1st retransmitted output selection	rt. 1	R/W [12]
110	111	1st retransmission output	O.r.t.1	R/W [13]
111	112	1st retransmission low range	rt.L.1	R/W
112	113	1st retransmission high range	rt.H.1	R/W
113	114	Auto / Manual (0 = OFF, 1 = On)	E.AMn	R/W
114	115	Remote Setpoint input	r5.In	R/W [14]
115	116	Setpoint type	S.P.ty	R/W [15]

116	117	Store Setpoint Tracking	S.P.tr	R/W
117	118	Level access	Ac.Le	R/W [16]
118	119	OP5 Cool output (0 = No, 1 = Yes)	C.O.P.S	R/W
119	120	Main output safety value	S.Out	R/W
120	121	Factory code (600 = Athena Controls)	-	R
121	122	1st byte product code (X5)	-	R [17]
122	123	2nd byte product code	-	R [17]
123	124	1st byte release code	-	R [17]
124	125	2nd byte release code	-	R [17]
125	126	Customer code	-	R
126	127	AL1 alarm type	AL. 1	R/W [18]
127	128	AL1 addressing	A1.0u	R/W [19]
128	129	AL1 alarm Latching	Ltch	R/W
129	130	AL1 alarm Blocking	bLoc	R/W
130	131	AL2 alarm type	AL. 2	R/W [18]
131	132	AL2 addressing	A2.0u	R/W [19]
132	133	AL2 alarm Latching	Ltch	R/W
133	134	AL2 alarm Blocking	bLoc	R/W
134	135	AL3 alarm type	AL. 3	R/W [18]
135	136	AL3 addressing	A3.0u	R/W [19]
136	137	AL3 alarm Latching	Ltch	R/W
137	138	AL3 alarm Blocking	bLoc	R/W
138	139	AL4 alarm type	AL. 4	R/W [18]
139	140	AL4 addressing	A4.0u	R/W [19]
140	141	AL4 alarm Latching	Ltch	R/W
141	142	AL4 alarm Blocking	bLoc	R/W
142	143	IL1 digital input function	IL 1	R/W [20]
143	144	IL2 digital input function	IL 2	R/W [20]
144	145	Time unit of Setpoint slope	S.P.tM	R/W [21]
145	146	CT alarm configuration (0 = OFF 1= On)	Ht.On	R/W
146	147	-	-	-
147	148	Linearisation (0 = OFF 1= On)	Char	R/W
148	149	IL3 digital input function	IL 3	R/W [20]
149	150	2nd retransmitted output selection	rt. 2	R/W [22]
150	151	2nd retransmission output	O.r.t.2	R/W [23]
151	152	2nd retransmission low range	rt.L.2	R/W
152	153	2nd retransmission high range	rt.H.2	R/W
153..179	154..180	-	-	-

12.5 Word zone - Page 3 Programmer

Address				
Modbus	**JbuS**	**Variable**	**Parameter Code**	**Type**
180	181	**Prog. 1** Power Failure	FAiL	R/W [24]
181	182	**Prog. 1** Time units	Unit	R/W [25]
182	183	**Prog. 1** cycles	Cyc.	R/W
183	184	**Prog. 1** n° of segments	n.Seg	R/W
184	185	**Prog. 1** Allowed deviation	band	R/W
185	186	Prog. 1 segment 0 - Time	ti. 0	R/W
186	187	Prog. 1 segment 0 - Setpoint	S.P. 0	R/W
187	188	Prog. 1 segment 0 - OP3 digital output	OP. 3	R/W [26]
188	189	Prog. 1 segment 0 - OP4 digital output	OP. 4	R/W [26]

189	190	Prog. 1 segment 1 - Time	ti. 1	R/W
190	191	Prog. 1 segment 1 - Setpoint	S.P. 1	R/W
191	192	Prog. 1 segment 1 - OP3 digital output	OP. 3	R/W [26]
192	193	Prog. 1 segment 1 - OP4 digital output	OP. 4	R/W [26]
193	194	Prog. 1 segment 2 - Time	ti. 2	R/W
194	195	Prog. 1 segment 2 - Setpoint	S.P. 2	R/W
195	196	Prog. 1 segment 2 - OP3 digital output	OP. 3	R/W [26]
196	197	Prog. 1 segment 2 - OP4 digital output	OP. 4	R/W [26]
197	198	Prog. 1 segment 3 - Time	ti. 3	R/W
198	199	Prog. 1 segment 3 - Setpoint	S.P. 3	R/W
199	200	Prog. 1 segment 3 - OP3 digital output	OP. 3	R/W [26]
200	201	Prog. 1 segment 3 - OP4 digital output	OP. 4	R/W [26]
201	202	Prog. 1 segment 4 - Time	ti. 4	R/W
202	203	Prog. 1 segment 4 - Setpoint	S.P. 4	R/W [26]
203	204	Prog. 1 segment 4 - OP3 digital output	OP. 3	R/W [26]
204	205	Prog. 1 segment 4 - OP4 digital output	OP. 4	R/W
205	206	Prog. 1 segment 5 - Time	ti. 5	R/W
206	207	Prog. 1 segment 5 - Setpoint	S.P. 5	R/W
207	208	Prog. 1 segment 5 - OP3 digital output	OP. 3	R/W [26]
208	209	Prog. 1 segment 5 - OP4 digital output	OP. 4	R/W [26]
209	210	Prog. 1 segment 6 - Time	ti. 6	R/W
210	211	Prog. 1 segment 6 - Setpoint	S.P. 6	R/W
211	212	Prog. 1 segment 6 - OP3 digital output	OP. 3	R/W [26]
212	213	Prog. 1 segment 6 - OP4 digital output	OP. 4	R/W [26]
213	214	Prog. 1 segment 7 - Time	ti. 7	R/W
214	215	Prog. 1 segment 7 - Setpoint	S.P. 7	R/W
215	216	Prog. 1 segment 7 - OP3 digital output	OP. 3	R/W [26]
216	217	Prog. 1 segment 7 - OP4 digital output	OP. 4	R/W [26]
217	218	Prog. 1 segment 8 - Time	ti. 8	R/W
218	219	Prog. 1 segment 8 - Setpoint	S.P. 8	R/W
219	220	Prog. 1 segment 8 - OP3 digital output	OP. 3	R/W [26]
220	221	Prog. 1 segment 8 - OP4 digital output	OP. 4	R/W [26]
221	222	Prog. 1 segment 9 - Time	ti. 9	R/W
222	223	Prog. 1 segment 9 - Setpoint	S.P. 9	R/W
223	224	Prog. 1 segment 9 - OP3 digital output	OP. 3	R/W [26]
224	225	Prog. 1 segment 9 - OP4 digital output	OP. 4	R/W [26]
225	226	Prog. 1 segment 10 - Time	ti.10	R/W
226	227	Prog. 1 segment 10 - Setpoint	S.P.10	R/W
227	228	Prog. 1 segment 10 - OP3 digital output	OP. 3	R/W [26]
228	229	Prog. 1 segment 10 - OP4 digital output	OP. 4	R/W [26]
229	230	Prog. 1 segment 11 - Time	ti.11	R/W
230	231	Prog. 1 segment 11 - Setpoint	S.P.11	R/W
231	232	Prog. 1 segment 11 - OP3 digital output	OP. 3	R/W [26]
232	233	Prog. 1 segment 11 - OP4 digital output	OP. 4	R/W [26]
233	234	Prog. 1 segment 12 - Time	ti.12	R/W
234	235	Prog. 1 segment 12 - Setpoint	S.P.12	R/W
235	236	Prog. 1 segment 12 - OP3 digital output	OP. 3	R/W [26]
236	237	Prog. 1 segment 12 - OP4 digital output	OP. 4	R/W [26]
237	238	Prog. 1 segment 13 - Time	ti.13	R/W
238	239	Prog. 1 segment 13 - Setpoint	S.P.13	R/W
239	240	Prog. 1 segment 13 - OP3 digital output	OP. 3	R/W [26]

240	241	Prog. 1 segment 13 - OP4 digital output	OP. 4	R/W [26]
241	242	Prog. 1 segment 14 - Time	ti.14	R/W
242	243	Prog. 1 segment 14 - Setpoint	S.P.14	R/W
243	244	Prog. 1 segment 14 - OP3 digital output	OP. 3	R/W [26]
244	245	Prog. 1 segment 14 - OP4 digital output	OP. 4	R/W [26]
245	246	Prog. 1 segment F - Setpoint	S.P. F	R/W
246	247	Prog. 1 segment F - OP3 digital output	OP. 3	R/W [26]
247	248	Prog. 1 segment F - OP4 digital output	OP. 4	R/W [26]
248	249	**Prog. 2** Power Failure	FAiL	R/W [24]
249	250	**Prog. 2** Time units	Unit	R/W [25]
250	251	**Prog. 2** cycles	Cyc.	R/W
251	252	**Prog. 2** n° of segments	n.Seg	R/W
252	253	**Prog. 2** Allowed deviation	band	R/W
253	254	Prog. 2 segment 0 - Time	ti. 0	R/W
254	255	Prog. 2 segment 0 - Setpoint	S.P. 0	R/W
255	256	Prog. 2 segment 0 - OP3 digital output	OP. 3	R/W [26]
256	257	Prog. 2 segment 0 - OP4 digital output	OP. 4	R/W [26]
257	258	Prog. 2 segment 1 - Time	ti. 1	R/W
258	259	Prog. 2 segment 1 - Setpoint	S.P. 1	R/W
259	260	Prog. 2 segment 1 - OP3 digital output	OP. 3	R/W [26]
260	261	Prog. 2 segment 1 - OP4 digital output	OP. 4	R/W [26]
261	262	Prog. 2 segment 2 - Time	ti. 2	R/W
262	263	Prog. 2 segment 2 - Setpoint	S.P. 2	R/W
263	264	Prog. 2 segment 2 - OP3 digital output	OP. 3	R/W [26]
264	265	Prog. 2 segment 2 - OP4 digital output	OP. 4	R/W [26]
265	266	Prog. 2 segment 3 - Time	ti. 3	R/W
266	267	Prog. 2 segment 3 - Setpoint	S.P. 3	R/W
267	268	Prog. 2 segment 3 - OP3 digital output	OP. 3	R/W [26]
268	269	Prog. 2 segment 3 - OP4 digital output	OP. 4	R/W [26]
269	270	Prog. 2 segment 4 - Time	ti. 4	R/W
270	271	Prog. 2 segment 4 - Setpoint	S.P. 4	R/W
271	272	Prog. 2 segment 4 - OP3 digital output	OP. 3	R/W [26]
272	273	Prog. 2 segment 4 - OP4 digital output	OP. 4	R/W [26]
273	274	Prog. 2 segment 5 - Time	ti. 5	R/W
274	275	Prog. 2 segment 5 - Setpoint	S.P. 5	R/W
275	276	Prog. 2 segment 5 - OP3 digital output	OP. 3	R/W [26]
276	277	Prog. 2 segment 5 - OP4 digital output	OP. 4	R/W [26]
277	278	Prog. 2 segment 6 - Time	ti. 6	R/W
278	279	Prog. 2 segment 6 - Setpoint	S.P. 6	R/W
279	280	Prog. 2 segment 6 - OP3 digital output	OP. 3	R/W [26]
280	281	Prog. 2 segment 6 - OP4 digital output	OP. 4	R/W [26]
281	282	Prog. 2 segment 7 - Time	ti. 7	R/W
282	283	Prog. 2 segment 7 - Setpoint	S.P. 7	R/W
283	284	Prog. 2 segment 7 - OP3 digital output	OP. 3	R/W [26]
284	285	Prog. 2 segment 7 - OP4 digital output	OP. 4	R/W [26]
285	286	Prog. 2 segment 8 - Time	ti. 8	R/W
286	287	Prog. 2 segment 8 - Setpoint	S.P. 8	R/W
287	288	Prog. 2 segment 8 - OP3 digital output	OP. 3	R/W [26]
288	289	Prog. 2 segment 8 - OP4 digital output	OP. 4	R/W [26]
289	290	Prog. 2 segment 9 - Time	ti. 9	R/W
290	291	Prog. 2 segment 9 - Setpoint	S.P. 9	R/W

291	292	Prog. 2 segment 9 - OP3 digital output	OP. 3	R/W [26]
292	293	Prog. 2 segment 9 - OP4 digital output	OP. 4	R/W [26]
293	294	Prog. 2 segment 10 - Time	ti.10	R/W
294	295	Prog. 2 segment 10 - Setpoint	S.P.10	R/W
295	296	Prog. 2 segment 10 - OP3 digital output	OP. 3	R/W [26]
296	297	Prog. 2 segment 10 - OP4 digital output	OP. 4	R/W [26]
297	298	Prog. 2 segment 11 - Time	ti.11	R/W
298	299	Prog. 2 segment 11 - Setpoint	S.P.11	R/W
299	300	Prog. 2 segment 11 - OP3 digital output	OP. 3	R/W [26]
300	301	Prog. 2 segment 11 - OP4 digital output	OP. 4	R/W [26]
301	302	Prog. 2 segment 12 - Time	ti.12	R/W
302	303	Prog. 2 segment 12 - Setpoint	S.P.12	R/W
303	304	Prog. 2 segment 12 - OP3 digital output	OP. 3	R/W [26]
304	305	Prog. 2 segment 12 - OP4 digital output	OP. 4	R/W [26]
305	306	Prog. 2 segment 13 - Time	ti.13	R/W
306	307	Prog. 2 segment 13 - Setpoint	S.P.13	R/W
307	308	Prog. 2 segment 13 - OP3 digital output	OP. 3	R/W [26]
308	309	Prog. 2 segment 13 - OP4 digital output	OP. 4	R/W [26]
309	310	Prog. 2 segment 14 - Time	ti.14	R/W
310	311	Prog. 2 segment 14 - Setpoint	S.P.14	R/W
311	312	Prog. 2 segment 14 - OP3 digital output	OP. 3	R/W [26]
312	313	Prog. 2 segment 14 - OP4 digital output	OP. 4	R/W [26]
313	314	Prog. 2 segment F - Setpoint	S.P. F	R/W
314	315	Prog. 2 segment F - OP3 digital output	OP. 3	R/W [26]
315	316	Prog. 2 segment F - OP4 digital output	OP. 4	R/W [26]
316	317	**Prog. 3** Power Failure	FAiL	R/W [24]
317	318	**Prog. 3** Time units	Unit	R/W [25]
318	319	**Prog. 3** cycles	Cyc.	R/W
319	320	**Prog. 3** n° of segments	n.Seg	R/W
320	321	**Prog. 3** Allowed deviation	band	R/W
321	322	Prog. 3 segment 0 - Time	ti. 0	R/W
322	323	Prog. 3 segment 0 - Setpoint	S.P. 0	R/W
323	324	Prog. 3 segment 0 - OP3 digital output	OP. 3	R/W [26]
324	325	Prog. 3 segment 0 - OP4 digital output	OP. 4	R/W [26]
325	326	Prog. 3 segment 1 - Time	ti. 1	R/W
326	327	Prog. 3 segment 1 - Setpoint	S.P. 1	R/W
327	328	Prog. 3 segment 1 - OP3 digital output	OP. 3	R/W [26]
328	329	Prog. 3 segment 1 - OP4 digital output	OP. 4	R/W [26]
329	330	Prog. 3 segment 2 - Time	ti. 2	R/W
330	331	Prog. 3 segment 2 - Setpoint	S.P. 2	R/W
331	332	Prog. 3 segment 2 - OP3 digital output	OP. 3	R/W [26]
332	333	Prog. 3 segment 2 - OP4 digital output	OP. 4	R/W [26]
333	334	Prog. 3 segment 3 - Time	ti. 3	R/W
334	335	Prog. 3 segment 3 - Setpoint	S.P. 3	R/W
335	336	Prog. 3 segment 3 - OP3 digital output	OP. 3	R/W [26]
336	337	Prog. 3 segment 3 - OP4 digital output	OP. 4	R/W [26]
337	338	Prog. 3 segment 4 - Time	ti. 4	R/W
338	339	Prog. 3 segment 4 - Setpoint	S.P. 4	R/W
339	340	Prog. 3 segment 4 - OP3 digital output	OP. 3	R/W [26]
340	341	Prog. 3 segment 4 - OP4 digital output	OP. 4	R/W [26]
341	342	Prog. 3 segment 5 - Time	ti. 5	R/W

342	343	Prog. 3 segment 5 - Setpoint	S.P. 5	R/W
343	344	Prog. 3 segment 5 - OP3 digital output	OP. 3	R/W [26]
344	345	Prog. 3 segment 5 - OP4 digital output	OP. 4	R/W [26]
345	346	Prog. 3 segment 6 - Time	ti. 6	R/W
346	347	Prog. 3 segment 6 - Setpoint	S.P. 6	R/W
347	348	Prog. 3 segment 6 - OP3 digital output	OP. 3	R/W [26]
348	349	Prog. 3 segment 6 - OP4 digital output	OP. 4	R/W [26]
349	350	Prog. 3 segment 7 - Time	ti. 7	R/W
350	351	Prog. 3 segment 7 - Setpoint	S.P. 7	R/W
351	352	Prog. 3 segment 7 - OP3 digital output	OP. 3	R/W [26]
352	353	Prog. 3 segment 7 - OP4 digital output	OP. 4	R/W [26]
353	354	Prog. 3 segment 8 - Time	ti. 8	R/W
354	355	Prog. 3 segment 8 - Setpoint	S.P. 8	R/W
355	356	Prog. 3 segment 8 - OP3 digital output	OP. 3	R/W [26]
356	357	Prog. 3 segment 8 - OP4 digital output	OP. 4	R/W [26]
357	358	Prog. 3 segment 9 - Time	ti. 9	R/W
358	359	Prog. 3 segment 9 - Setpoint	S.P. 9	R/W
359	360	Prog. 3 segment 9 - OP3 digital output	OP. 3	R/W [26]
360	361	Prog. 3 segment 9 - OP4 digital output	OP. 4	R/W [26]
361	362	Prog. 3 segment 10 - Time	ti.10	R/W
362	363	Prog. 3 segment 10 - Setpoint	S.P.10	R/W
363	364	Prog. 3 segment 10 - OP3 digital output	OP. 3	R/W [26]
364	365	Prog. 3 segment 10 - OP4 digital output	OP. 4	R/W [26]
365	366	Prog. 3 segment 11 - Time	ti.11	R/W
366	367	Prog. 3 segment 11 - Setpoint	S.P.11	R/W
367	368	Prog. 3 segment 11 - OP3 digital output	OP. 3	R/W [26]
368	369	Prog. 3 segment 11 - OP4 digital output	OP. 4	R/W [26]
369	370	Prog. 3 segment 12 - Time	ti.12	R/W
370	371	Prog. 3 segment 12 - Setpoint	S.P.12	R/W
371	372	Prog. 3 segment 12 - OP3 digital output	OP. 3	R/W [26]
372	373	Prog. 3 segment 12 - OP4 digital output	OP. 4	R/W [26]
373	374	Prog. 3 segment 13 - Time	ti.13	R/W
374	375	Prog. 3 segment 13 - Setpoint	S.P.13	R/W
375	376	Prog. 3 segment 13 - OP3 digital output	OP. 3	R/W [26]
376	377	Prog. 3 segment 13 - OP4 digital output	OP. 4	R/W [26]
377	378	Prog. 3 segment 14 - Time	ti.14	R/W
378	379	Prog. 3 segment 14 - Setpoint	S.P.14	R/W
379	380	Prog. 3 segment 14 - OP3 digital output	OP. 3	R/W [26]
380	381	Prog. 3 segment 14 - OP4 digital output	OP. 4	R/W [26]
381	382	Prog. 3 segment F - Setpoint	S.P. F	R/W
382	383	Prog. 3 segment F - OP3 digital output	OP. 3	R/W [26]
383	384	Prog. 3 segment F - OP4 digital output	OP. 4	R/W [26]
384	385	**Prog. 4** Power Failure	FAiL	R/W [24]
385	386	**Prog. 4** Time units	Unit	R/W [25]
386	387	**Prog. 4** cycles	Cyc.	R/W
387	388	**Prog. 4** n° of segments	n.Seg	R/W
388	389	**Prog. 4** Allowed deviation	band	R/W
389	390	Prog. 4 segment 0 - Time	ti. 0	R/W
390	391	Prog. 4 segment 0 - Setpoint	S.P. 0	R/W
391	392	Prog. 4 segment 0 - OP3 digital output	OP. 3	R/W [26]
392	393	Prog. 4 segment 0 - OP4 digital output	OP. 4	R/W [26]

393	394	Prog. 4 segment 1 - Time	ti. 1	R/W
394	395	Prog. 4 segment 1 - Setpoint	S.P. 1	R/W
395	396	Prog. 4 segment 1 - OP3 digital output	OP. 3	R/W [26]
396	397	Prog. 4 segment 1 - OP4 digital output	OP. 4	R/W [26]
397	398	Prog. 4 segment 2 - Time	ti. 2	R/W
398	399	Prog. 4 segment 2 - Setpoint	S.P. 2	R/W
399	400	Prog. 4 segment 2 - OP3 digital output	OP. 3	R/W [26]
400	401	Prog. 4 segment 2 - OP4 digital output	OP. 4	R/W [26]
401	402	Prog. 4 segment 3 - Time	ti. 3	R/W
402	403	Prog. 4 segment 3 - Setpoint	S.P. 3	R/W
403	404	Prog. 3 segment 3 - OP3 digital output	OP. 3	R/W [26]
404	405	Prog. 3 segment 3 - OP4 digital output	OP. 4	R/W [26]
405	406	Prog. 3 segment 4 - Time	ti. 4	R/W
406	407	Prog. 3 segment 4 - Setpoint	S.P. 4	R/W
407	408	Prog. 3 segment 4 - OP3 digital output	OP. 3	R/W [26]
408	409	Prog. 3 segment 4 - OP4 digital output	OP. 4	R/W [26]
409	410	Prog. 3 segment 5 - Time	ti. 5	R/W
410	411	Prog. 3 segment 5 - Setpoint	S.P. 5	R/W
411	412	Prog. 3 segment 5 - OP3 digital output	OP. 3	R/W [26]
412	413	Prog. 3 segment 5 - OP4 digital output	OP. 4	R/W [26]
413	414	Prog. 3 segment 6 - Time	ti. 6	R/W
414	415	Prog. 3 segment 6 - Setpoint	S.P. 6	R/W
415	416	Prog. 3 segment 6 - OP3 digital output	OP. 3	R/W [26]
416	417	Prog. 3 segment 6 - OP4 digital output	OP. 4	R/W [26]
417	418	Prog. 3 segment 7 - Time	ti. 7	R/W
418	419	Prog. 3 segment 7 - Setpoint	S.P. 7	R/W
419	420	Prog. 3 segment 7 - OP3 digital output	OP. 3	R/W [26]
420	421	Prog. 3 segment 7 - OP4 digital output	OP. 4	R/W [26]
421	422	Prog. 3 segment 8 - Time	ti. 8	R/W
422	423	Prog. 3 segment 8 - Setpoint	S.P. 8	R/W
423	424	Prog. 3 segment 8 - OP3 digital output	OP. 3	R/W [26]
424	425	Prog. 3 segment 8 - OP4 digital output	OP. 4	R/W [26]
425	426	Prog. 3 segment 9 - Time	ti. 9	R/W
426	427	Prog. 3 segment 9 - Setpoint	S.P. 9	R/W
427	428	Prog. 3 segment 9 - OP3 digital output	OP. 3	R/W [26]
428	429	Prog. 3 segment 9 - OP4 digital output	OP. 4	R/W [26]
429	430	Prog. 3 segment 10 - Time	ti.10	R/W
430	431	Prog. 3 segment 10 - Setpoint	S.P.10	R/W
431	432	Prog. 3 segment 10 - OP3 digital output	OP. 3	R/W [26]
432	433	Prog. 3 segment 10 - OP4 digital output	OP. 4	R/W [26]
433	434	Prog. 3 segment 11 - Time	ti.11	R/W
434	435	Prog. 3 segment 11 - Setpoint	S.P.11	R/W
435	436	Prog. 3 segment 11 - OP3 digital output	OP. 3	R/W [26]
436	437	Prog. 3 segment 11 - OP4 digital output	OP. 4	R/W [26]
437	438	Prog. 3 segment 12 - Time	ti.12	R/W
438	439	Prog. 3 segment 12 - Setpoint	S.P.12	R/W
439	440	Prog. 3 segment 12 - OP3 digital output	OP. 3	R/W [26]
440	441	Prog. 3 segment 12 - OP4 digital output	OP. 4	R/W [26]
441	442	Prog. 3 segment 13 - Time	ti.13	R/W
442	443	Prog. 3 segment 13 - Setpoint	S.P.13	R/W
443	444	Prog. 3 segment 13 - OP3 digital output	OP. 3	R/W [26]

444	445	Prog. 3 segment 13 - OP4 digital output	OP. 4	R/W [26]
445	446	Prog. 3 segment 14 - Time	ti.14	R/W
446	447	Prog. 3 segment 14 - Setpoint	S.P.14	R/W
447	448	Prog. 3 segment 14 - OP3 digital output	OP. 3	R/W [26]
448	449	Prog. 3 segment 14 - OP4 digital output	OP. 4	R/W [26]
449	450	Prog. 3 segment F - Setpoint	S.P. F	R/W
450	451	Prog. 3 segment F - OP3 digital output	OP. 3	R/W [26]
451	452	Prog. 3 segment F - OP4 digital output	OP. 4	R/W [26]

Notes:

1. This function may be used only with a suitable configuration outputs are set properly.
2. The OP1 value can be only assigned when the controller is working in Manual mode.
3. The Local Setpoint (Wloc) can be read at the both JbuS addresses 4 and 5. It only depend on the compatibility with the other Athena Controls instruments.
4. The above parameters can only be read when the Adaptive Tuning is launched. The Td derivative time is not shown but it can be simply calculated as the ¼ of the Ti integral time (Td = Ti/4).
5. When the Program status is requested, the instrument replies as per the below table:

Program status	Serial value
Reset	0
Run	1
Hold	2
Automatic Hold	3
Program End	4

6. To select the Program command, the value between 0 and 1 must be assigned as per the below table:

Program command	Serial value
Reset	0
Start	1

7. To select the input type, the value between 0 and 24 must be assigned as per the below table:

Input type	Serial value
TC J	0
TC K	1
TC L	2
TC S	3
TC R	4
TC T	5
TC B	6
TC N	7
TC NI	8
TC W3%	9
TC W5%	10
TC E	11
Custom	12
RTD 1	13

RTD 2	14
Delta T	15
0 .. 50 mV	16
0 .. 300 mV	17
0 .. 5 V	18
1 .. 5 V	19
0 .. 10 V	20
0 .. 20 mA	21
4 .. 20 mA	22
2 KHz Frequency	23
20 KHz Frequency	24

8. To select the engineering unit, the value between 0 and 10 must be assigned as per the below table:

Engineering unit	Serial value
none	0
°C	1
°F	2
mA	3
mV	4
V	5
bar	6
PSI	7
rh	8
Ph	9
Hz	10

9. To select the Control type & action, the value between 0 and 8 must be assigned as per the below table:

Control type	Action	Serial value
On / OFF	Reverse	0
On / OFF	Direct	1
P.I.D.	Direct	2
P.I.D.	Reverse	3
Valve drive P.I.D.	Direct	4
Valve drive P.I.D.	Reverse	5
Heat/Cool	Linear	6
Heat/Cool	Oil	7
Heat/Cool	Water	8

10. To select the Main output (Heat), the value between 0 and 11 must be assigned as per the below table:

Main output (Heat)	Serial value
none	0
Relay / Triac	1
Logic	6
0 .. 5 V	7
1 .. 5 V	8
0 .. 10 V	9
0 .. 20 mA	10
4 .. 20 mA	11

11. To select the Secondary output (Cool), the value between 0 and 11 must be assigned as per the below table:

Secondary output (Cool)	Serial value
none	0
Relay / Triac	2
Logic	6
0 .. 5 V	7
1 .. 5 V	8
0 .. 10 V	9
0 .. 20 mA	10
4 .. 20 mA	11

12. To select the 1st retransmitted output selection, the value between 0 and 2 must be assigned as per the below table

1st retransmitted output selection	Serial value
none	0
Provess variable	1
Setpoint	2

13. To select the 1st retransmission output, the value between 7 and 11 must be assigned as per the below table:

1st retransmission output	Serial value
0 .. 5 V	7
1 .. 5 V	8
0 .. 10 V	9
0 .. 20 mA	10
4 .. 20 mA	11

14. To select the remote Setpoint input, the value between 18 and 22 must be assigned as per the below table:

Remote Setpoint input	Serial value
0 .. 5 V	18
1 .. 5 V	19
0 .. 10 V	20
0 .. 20 mA	21
4 .. 20 mA	22

15. To select the Setpoint type, the value between 0 and 5 must be assigned as per the below table:

Setpoint type	Serial value
Local only	0
Remote only	1
Local/Remote only	2
Local - Trim	3
Remote - Trim	4
Setpoint Programmer (option)	5

16. To select the Access level, the value between 0 and 2 must be assigned as per the below table:

Access level	Serial value
Full	0
Operator	1
Edit	2

17. The JbuS 122 + 123 and 124 + 125 addresses contain the strings (of 4 characters) for the product and release codes: each address represents two characters, the most significant byte in the word contains the ASCII code of the second.

18. To select the alarm type, the value between 0 and 6 must be assigned as per the below table:

Alarm type	Serial value
Not used	0
Absolute High active	1
Absolute Low active	2
Deviation High active	3
Deviation Low active	4
Band Out active	5
Loop Break Alarm	6

19. To select the output assignment, the value between 1 and 4 must be assigned as per the below table:

Output assignment	Serial value
OP1	1
OP2	2
OP3	3
OP4	4

20. To select the Digital input function, the value between 0 and 15 must be assigned as per the below table:

Digital input function	Serial value
Not used	0
Local/Remote	1
Auto/Manual	2
1st stored Setpoint	3
2nd stored Setpoint	4
3rd stored Setpoint	5
Keypad lock	6
Setpoint slopes disable	7
Measure Hold	8
Output forcing mode	9
1st Program selection	10
2nd Program selection	11
3rd Program selection	12
4th Program selection	13
Program Run/Stop	14
Program Reset	15

21. To select the slopes time unit, the value between 0 and 2 must be assigned as per the below table:

Slopes time unit	Serial value
Second	0
Minute	1
Hour	2

22. To select the 2nd retransmitted output selection, the value between 0 and 2 must be assigned as per the below table:

2nd retransmitted output selection	Serial value
None	0
Process variable	1
Setpoint	2

23. To select the 2nd retransmission output, the value between 7 and 11 must be assigned as per the below table:

2nd retransmission output	Serial value
0 .. 5 V	7
1 .. 5 V	8
0 .. 10 V	9
0 .. 20 mA	10
4 .. 20 mA	11

24. To select the Power fail, the value between 0 and 2 must be assigned as per the below table:

Power Fail	Serial value
Continue	0
Reset	1
Ramp	2

25. To select the Segment time basis, the value between 0 and 2 must be assigned as per the below table:

Segment time basis	Serial value
Second	0
Minute	1
Hour	2

26. To select the logic output status of segment #, the value between 0 and 2 must be assigned as per the below table:

Logic output status of segment #	Serial value
Closed	0
Open	1
disabled	2

12.6 RS-485 Configuration Dip Switch

On the RS485 board a 4 position dip Switch is provided. It enables the correct hardware configuration of the instrument serial comm.s port as follows:

Position	On	OFF
1	Polarisation +5Vcc	Polarisation excluded
2	Termination set	Termination excluded
3	Polarisation 0 Vcc	Polarisation excluded
4	-	-

13. Configuration software for Platinum controllers

The configuration software **APG2SW4** can be used with all the Platinum® instruments: **C10**, **M10, M300, M400**, **M5000, X100**, **X400** and **X5000**, even those without the RS 485 communications option.

Instruments **C10, M10, M300** and **M400** without the RS 485 communications option can be configured using this software, but the special cable APG2SCI, (available separately), will be required to interface between the computer port and the instrument.

For instruments **C10, M10, M300** and **M400** without the RS 485 communications option, connect the special cable APG2SCI to a spare port on the computer and the crimp connectors to terminals 10 – brown and 11 – black on the instrument. The computer and the instrument should be turned off during this procedure.

For instruments **C10, M10, M300** and **M400**, terminals 10 and 11 are also the SSR drive voltage output. To avoid a communication error, open circuit the sensor input terminals, to prevent the SSR drive output from turning on. Also, for previously configured instruments, ensure that the configuration code, 'ConF' ends in a '0' e.g. 2000, i.e. Alarm 2 is turned off and that the SSR drive voltage output is not used as main output.

13.1 Use of instruments with the RS 485 communications option

For instruments **C10, M10, M300** and **M400** with the RS 485 communications option, the connection must be made using an isolated RS 232C to RS 485 (2 wires) converter and a standard RS 232C cable.
To use instruments **C10, M10, M300** and **M400** with the RS 485 communications option using an RS 232C to RS 485 converter, connect a standard RS 232C cable between a spare port on the computer and the RS 232C port of the converter. Connect the RS 485 terminals of the converter to terminals 7 (+) and 8 (–) of the instrument. Please note that the converter must be isolated and handle the RTS signal. The **Athena 223A001401** RS 232C to RS 485 converters is suitable to perform this function. The computer, converter and the instrument should be turned off during this procedure.
For instruments **M5000, X100, X400, and X5000** with the RS 485 communications option, connect a standard RS 232C cable between the computer and an isolated RS 232C to RS 485 converter as above. The computer and the converter should be turned off during this procedure.
When running RS 485 cables a long distance, up to 1200 meters, a specific data transfer cable should be used with a low capacitance per metre. As lower is the capacitance per metre, as longer can be the cable length. Suitable cables are as follows:

Belden type 9729	Impedance 100Ω	Capacitance = 41pF/m
Belden type 9502	Impedance 150Ω	Capacitance = 98pF/m

For instruments **M5000, X100, X400, and X5000** with the RS 485 communications option, connect the RS 485 terminals of the RS 232C to RS 485 converter to the terminals of the instrument as shown in the table below. The computer, the converter and the instrument should be turned off during this procedure.

Controller	Instrument terminal N°	RS-485 terminal
M5000	7	+
M5000	8	-
M5000	9	Common
X100	1	+
X100	2	-
X100	3	Common
X400	1	+
X400	2	-
X400	3	Common
X5000	13	+
X5000	14	-
X5000	15	Common

For instruments **M5000, X100, X400** and **X5000** without the RS 485 communications option, connect a standard RS232C cable to a spare port on the computer and the appropriate wires to the instrument as shown in the table below. The computer and the instrument should be turned off during this procedure.

Controller	Instrument terminal N°	9-Way port Pin N°	25-Way port Pin N°
M5000	7	2	3
M5000	8	3	2
M5000	9	5	7
X100	1	2	3
X100	2	3	2
X100	3	5	7
X400	1	2	3
X400	2	3	2
X400	3	5	7
X5000	13	2	3
X5000	14	3	2
X5000	15	5	7

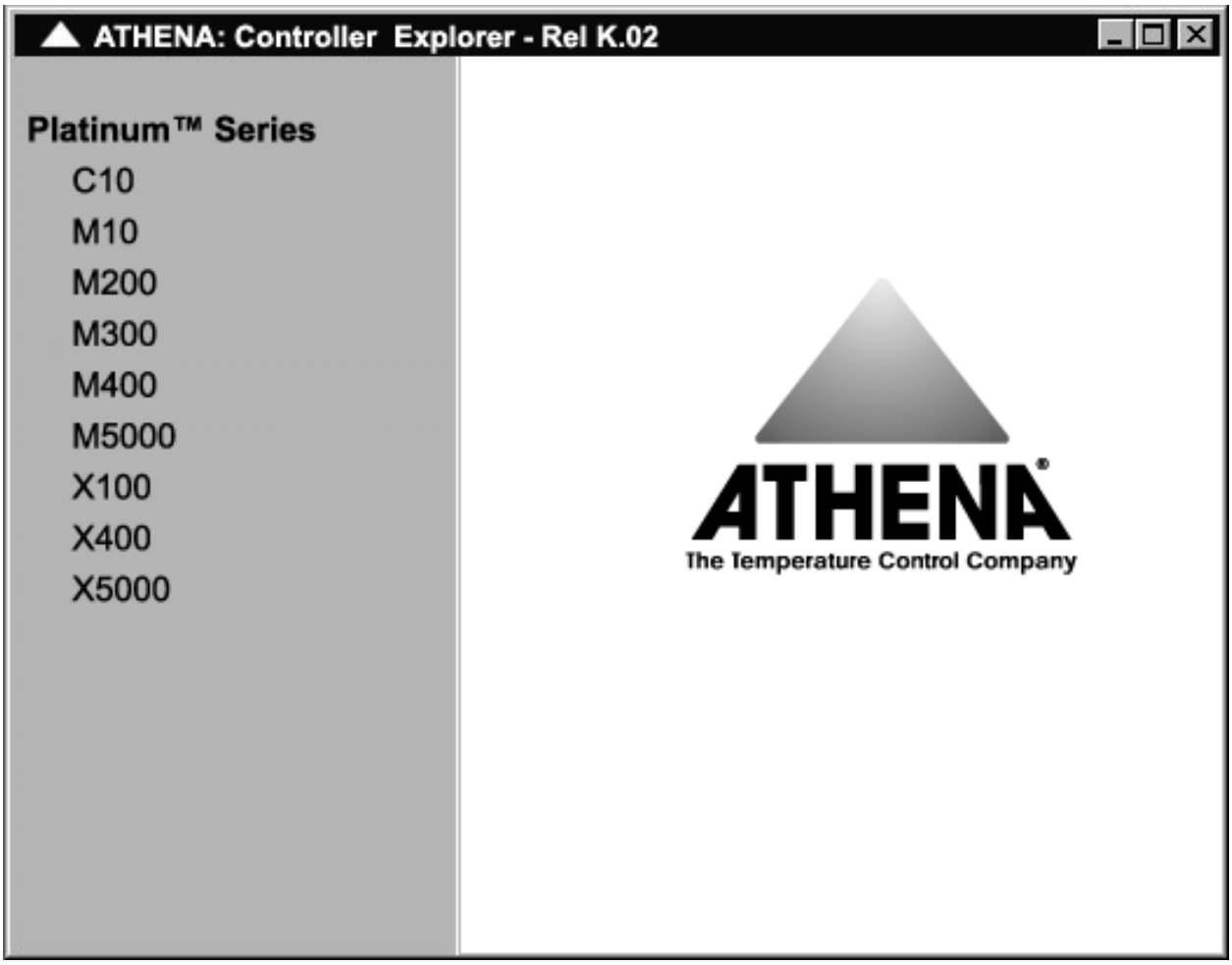
Turn on the power to the computer and the instrument (and the RS 232C to RS 485 converter if used).

13.2 To load the software

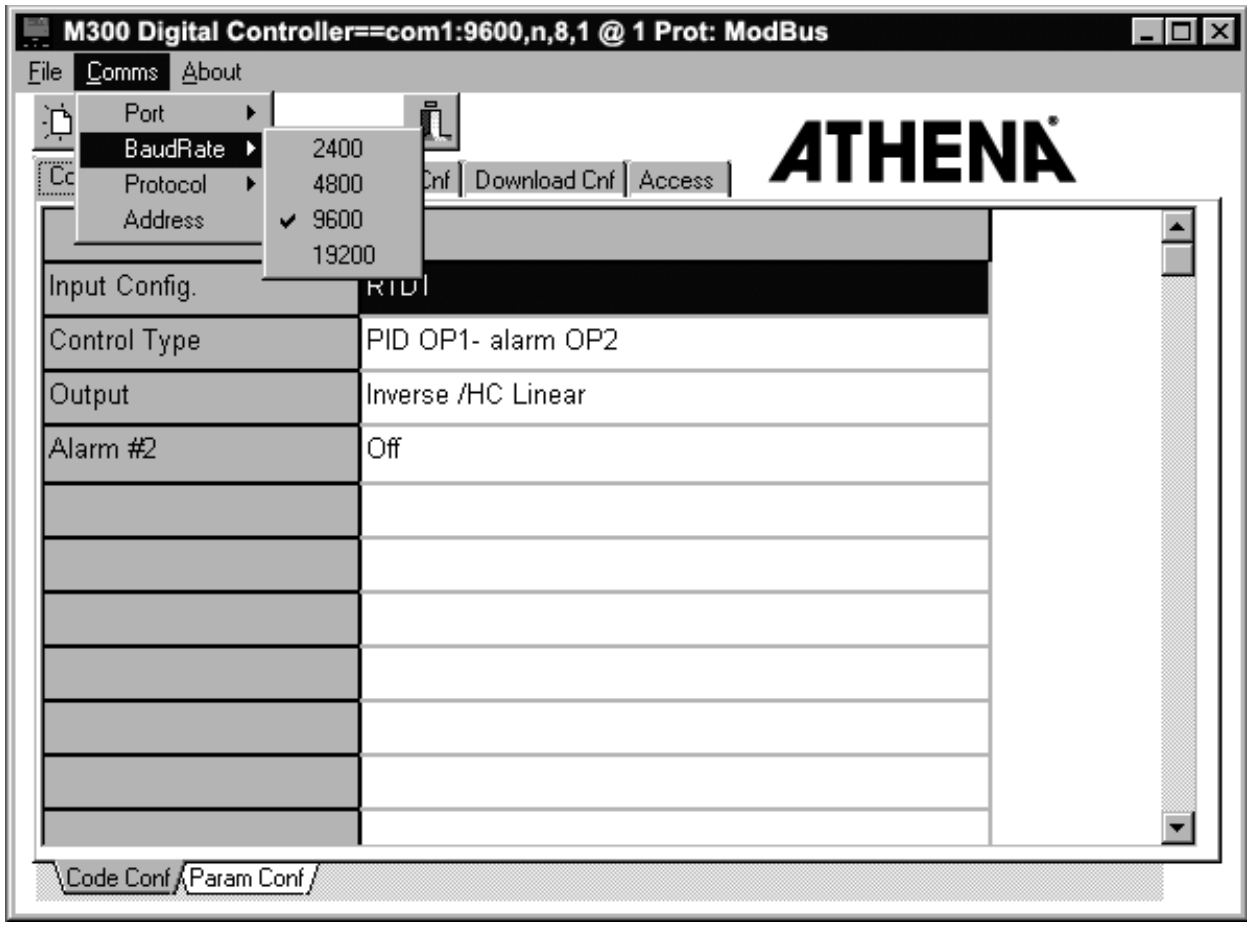
Insert the CD-ROM. The installation page should open automatically if autorun is active; if not, access your CD-ROM and double click the “install.exe” icon file.

13.3 To enter the configuration software

After loading the software, enter the program by clicking: 'Start'; 'Programs'; 'Athena Controls DIN Controllers' and then clicking on the required instrument, e.g. 'M300'.



Click on '**Comms'** and '**Port'** and ensure that the port number corresponds to the one being used on the computer. Click on the correct port number if there is a check mark by the wrong setting.
Click on '**Comms'** and '**BaudRate'** and ensure that it is set to 9600 for instruments without the RS 485 communications option. For instruments with RS 485, ensure that the setting in the configuration software is the same as in the instrument. Correct if there is a check mark by the wrong value.



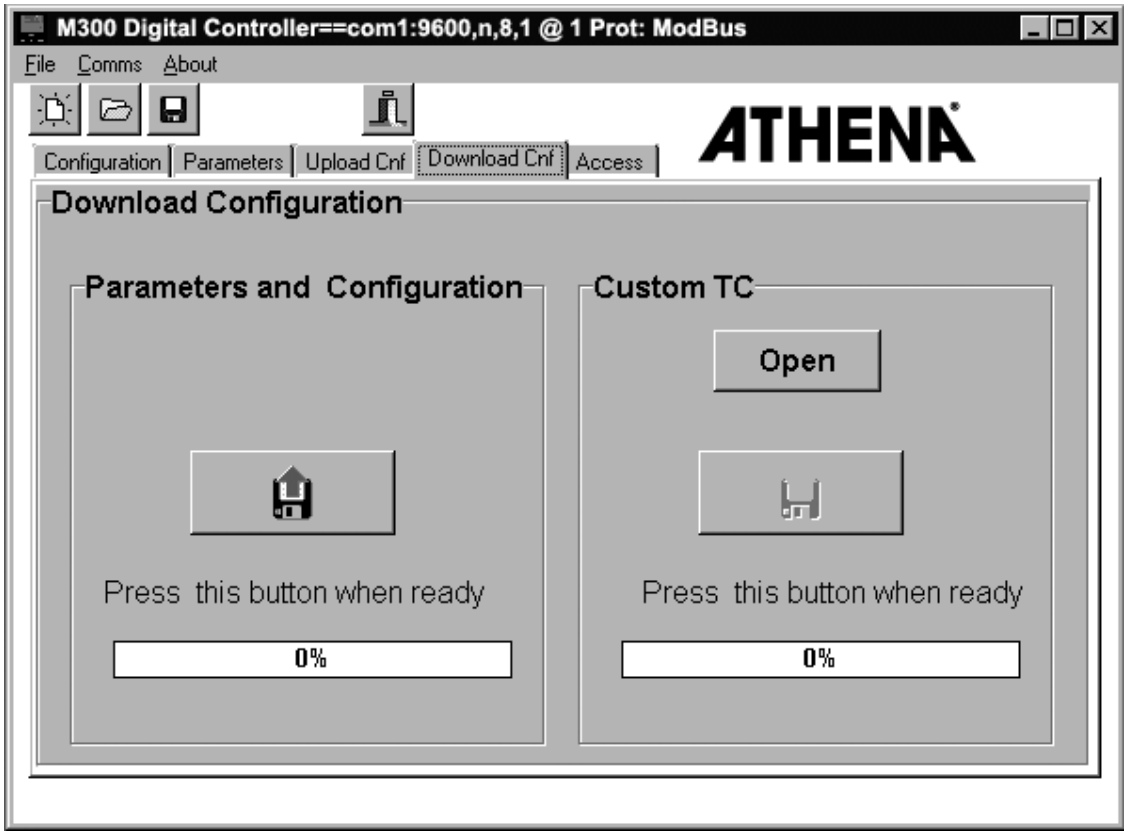
Click on '**Comms'** and '**Protocol'** and ensure that it is set to 'Jbus' for instruments without the RS 485 communications option. For instruments with RS 485, ensure that the setting in the configuration software is the same as in the instrument. Correct if there is a mark by the wrong setting.
Click on the tabs '**Configuration'**, '**Parameters'** and '**Access'** and select the settings required.
For a detailed description of all parameters, please see the instrument instruction manual.

13.5 To store the screen settings into the instrument

Click on the tab '**Download Cnf'**. Click on the floppy disk 'icon' under the heading 'Parameters and Configuration' to store the screen settings into the instrument.

13.6 To load a custom sensor configuration

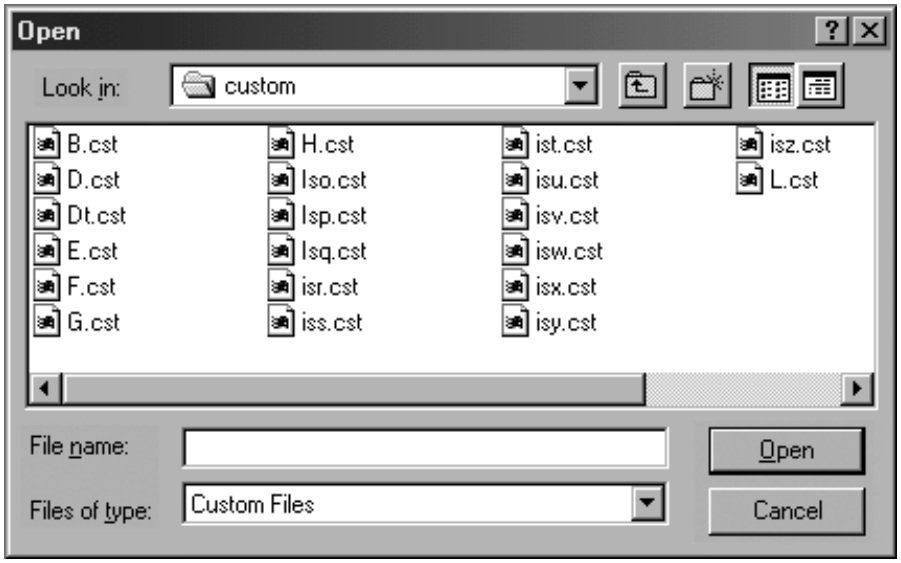
Click on the tab '**Download Cnf'**. Click on '**Open'** under the heading '**Custom TC**' if it is required to load a custom sensor configuration from the selection of stored characteristics.



The following custom sensor file options are available:

File name	Sensor Type	Range	Instrument
b.cst	ΔT (2 x RTD Pt100)	-50 .. +50 °C	no M5000,X5000,X7000
d.cst	Thermocouple type B	0 .. 1800 °C	
e.cst	Thermocouple type N	0 .. 1300 °C	
f.cst	RTD Pt100	0.0 .. 200.0 °C	no M5000,X5000,X7000
g.cst	Thermocouple type E	-200…+400 °C	
h.cst	TC constant reading = 50	0 .. 100 °C	no M5000,X5000,X7000
l.cst	RTD Pt100	-99.9 .. 600.0 °C	no M5000,X5000,X7000
isn.cst	ZIS-01/KR0.200	-50 .. 200 °C	
isr.cst	ZIS-01/KR 0.200	0 .. 200 °C	
iss.cst	ZIS-1X/KS 0.650 ZIS-3X/KS 0.650	0 .. 650 °C 0 .. 650 °C	
isy.cst	ZIS-01/KR 0.200	0 .. 400 °C	
m.cst	Thermocouple type J	0.0 .. 50.0 °C	no M5000
i.cst	custom configuration		
iso.cst	custom IR sensor		
isp.cst	custom IR sensor		
isq.cst	custom IR sensor		
ist.cst	custom IR sensor		
isu.cst	custom IR sensor		
isv.cst	custom IR sensor		
isw.cst	custom IR sensor		
isx.cst	custom IR sensor		
isz.cst	custom IR sensor		

Click on the required configuration and select '**OK**'. Click on the floppy disk 'icon' under the heading '**Custom TC**' to store the new custom sensor configuration into the instrument.

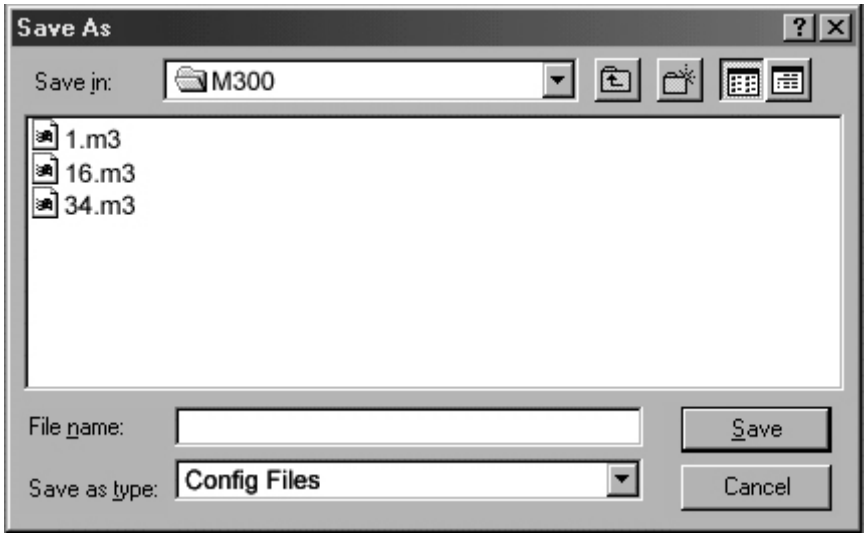


13.7 To clone several instruments

To clone several instruments from one that has been programmed with required values, connect this instrument to the computer according to the instructions above. Click on the tab 'Upload Cnf'. Click on the floppy disk 'icon' under the heading 'Upload Configuration', to copy the instrument settings onto the screen. Turn off the power to the instrument, un-plug it from its housing, plug-in a new instrument and turn on the power. Click on the tab 'Download Cnf'. Click on the floppy disk 'icon' under the heading 'Parameters and Configuration' to store the screen settings into the instrument. Another new instrument can be plugged in and the floppy disk 'icon' clicked again if required.

13.8 To store the screen settings as a file

To store the screen settings as a file, which can be saved as a permanent record and used at a later date to copy into another controller, click on 'File' and then 'Save', or click on the save 'icon' at the top of the window. In either case, a 'Save as' window will open, with a highlighted file name shown as *.M300 (for M300 controller), *.M400 (for M400 controller), *.c10 (for C10 or M10 controllers), *.M5000 (for M5000 controllers), etc. Over-type the * with the filename required, leaving the .m300, .c10, etc. as the file extension, as in normal Windows® practice. Click 'OK'. In any case the program sets automatically the suffix of the corresponding instrument.



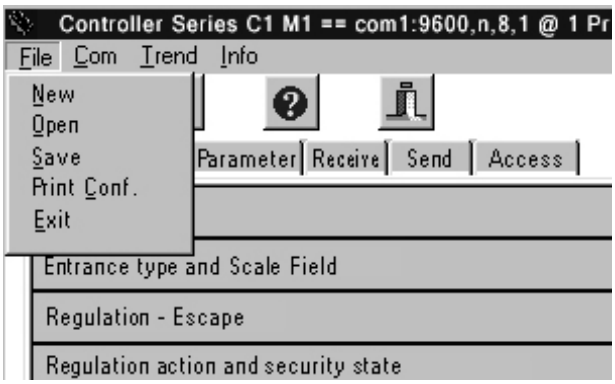
Simultaneously when saving the binary format of the configuration, the program writes, with the same path, a text file which includes the configuration parmeters.

13.9 To recall a previously stored file

To recall a previously stored file, click on 'File' and then 'Open', or click on the open 'icon' at the top of the window. In either case, an 'Open' window will appear, which will list all previously stored file names with the file extension appropriate to the controller as listed above. Click on the file required and then click 'OK'. The file can be downloaded to a controller if required, as described above.

13.10 Printing of the configuration

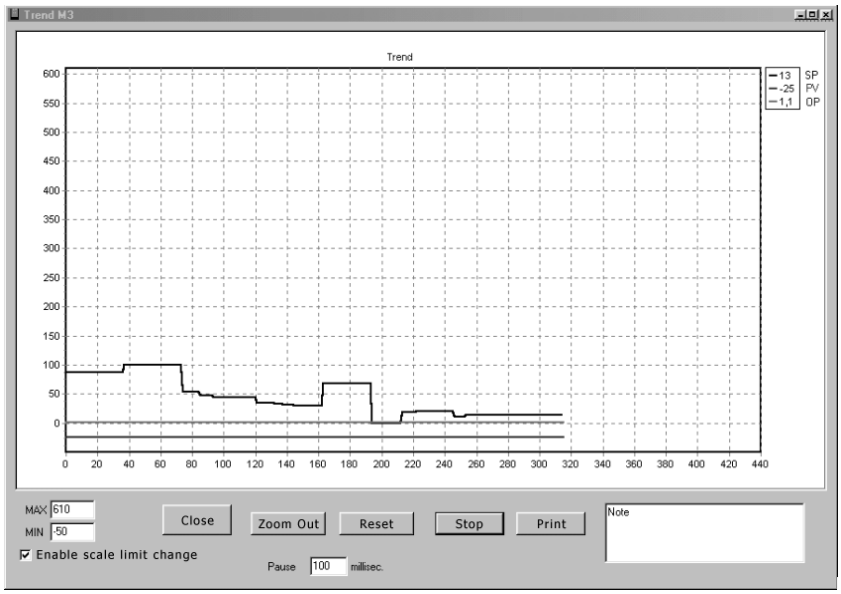
To print the present configuration of the instrument: select “file” from the main window, select “Print Conf” from the menu



The following will be printed: all the configuration tab sheets; all the parameter tab sheets; the Access page.
The printing will be equal to the “print screen”.

13.11 Trend Menu

The trend menu is available on the main page of the configuration software. The trend menu allows to visualise the time trend (the time scale is available as “number of acquisitions”) of the process variable (PV), of the Set point and of the Output of the connected instrument on a graphic page.



The trend scale can be set by using the “MAX” and “MIN” values.
The time scale is available as “number of acquisitions”.
The time interval between two acquisitions (milliseconds) can be set under the “Timeout” function.

Functions of the buttons:

- **Close**
  return to the configuration software main window
- **Zoom out**
  Visualization from the start of the data acquisition till the present time. The time scale is changed automatically
- **Reset**
  the data acquisition starts again. The old data are lost.
- **Stop**
  the data acquisition is stopped. The old data are maintained.
- **Print**
  the visualised trend page is printed

The trend scale can be set by using the “MAX” and “MIN” values..

Max: Trend scale High Limit
Min: Trend scale Low Limit

Enable scale limits change: if enabled, in case one of the monitored variables exceeds the trend scale “MAX” / “MIN” limits, the scale is automatically expanded.

Timeout: time interval between two acquisitions from the instrument (milliseconds).
Note: Area available for the user notes. Notes can be printed. Notes are lost when the configuration software is closed.

When the configuration software is closed all the trend data and the notes are lost.

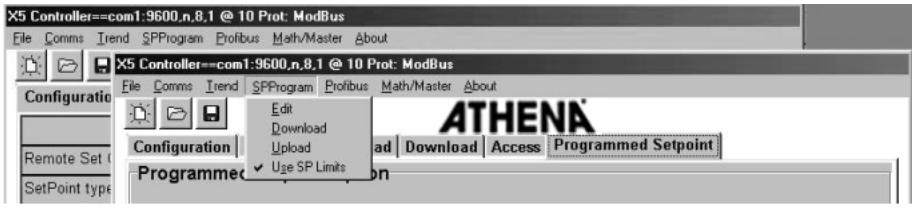
13.12 Programmed setpoint *(only if the program option is present)*

13.12.1 M5000 Controller

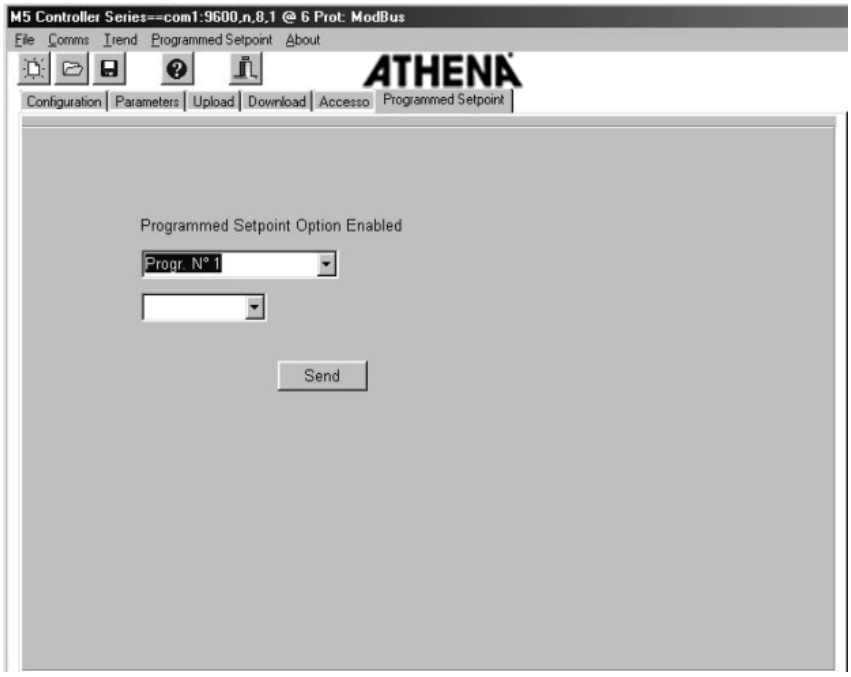
New program

1 configure the serial communication parameters.
2 select the “Programmed setpoint” card push-button:

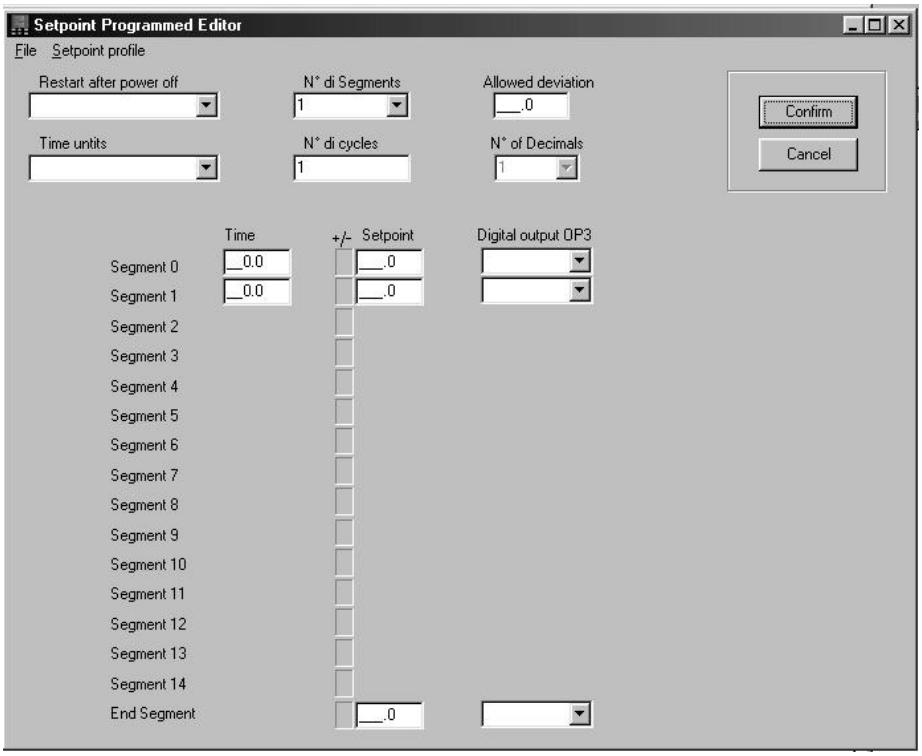
the Programmed Setpoint menu is displayed:



and the commands to select the program state appear in the "Programmed Setpoint" card:



From the "Programmed setpoint" menu select New/Modify



New Setpoint programs can be created and saved in this window or already existing programs loaded from the Menu File, for any modifications.

To create a new program:

1. select one of the items of the “Recover action after blackout” parameter
2. select an item of the “time unit” parameter
3. select the number of segments which make up the program (minimum 1, maximum 14)
4. select the number of program cycles (from 0 to 9999, where 0 indicates infinite cycles) and enter the dead band value.

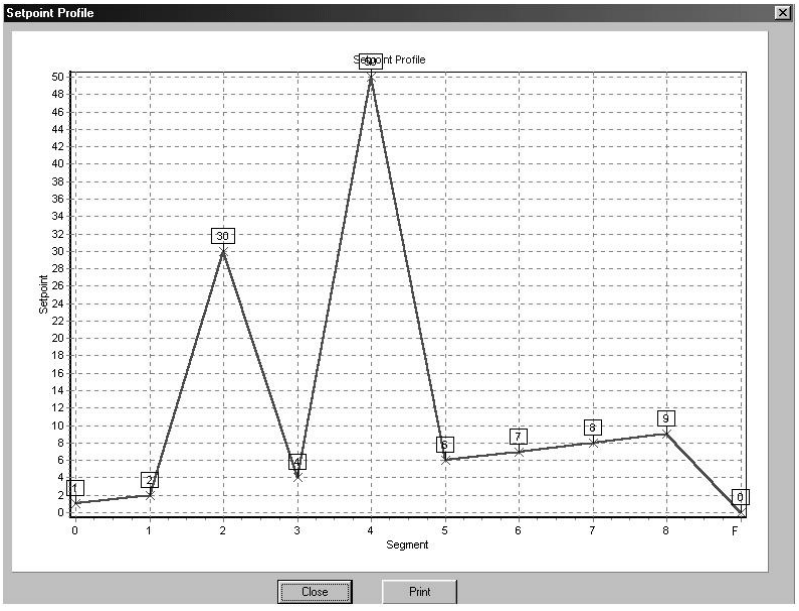
The decimals number, as already set in the Configuration – Config. Configurator input, is also displayed.

To limit the Setpoint to the full programmed setpoint range select “SP limit full range” from the Programmed setpoint menu.

For each segment set:
- time
- Setpoint value
- OP3 output state.

At the end of the setting press:
- ***Enter***: to validate the data entered
- ***Cancel***: to quit the screen without saving
- ***Print***: to print the window containing the data entered.

Or **select** Setpoint Profile from the menu.To display the window of the setpoint profile of the data entered in the New/Modify page program:

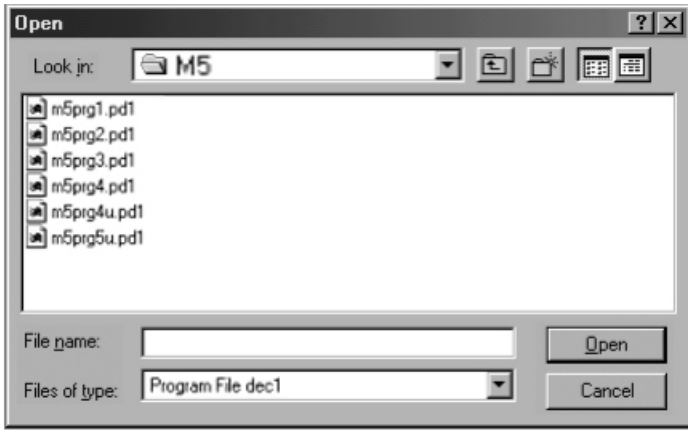


Press “Print” to print the window.

Enter program to the instrument

On selecting Enter on the Programmed setpoint menu the Setpoint program can be sent to instrument M5000. The window will display:

On selecting the Enter button the following window displays:



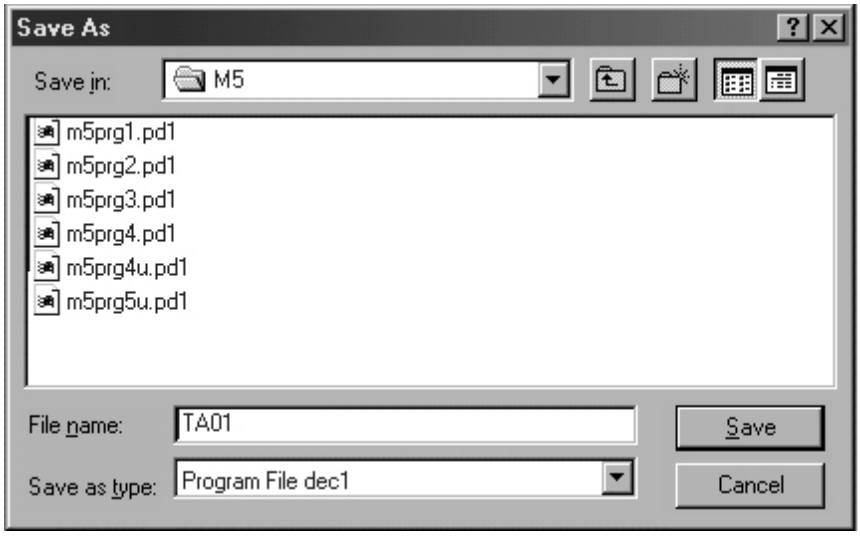
Once the enter phase has finished the window is displayed

Receiving program at the instrument

On selecting Receive from the Programmed setpoint menu the Setpoint program can be received from instrument M5000. The window dislays:

When the reception has finished the window is displayed

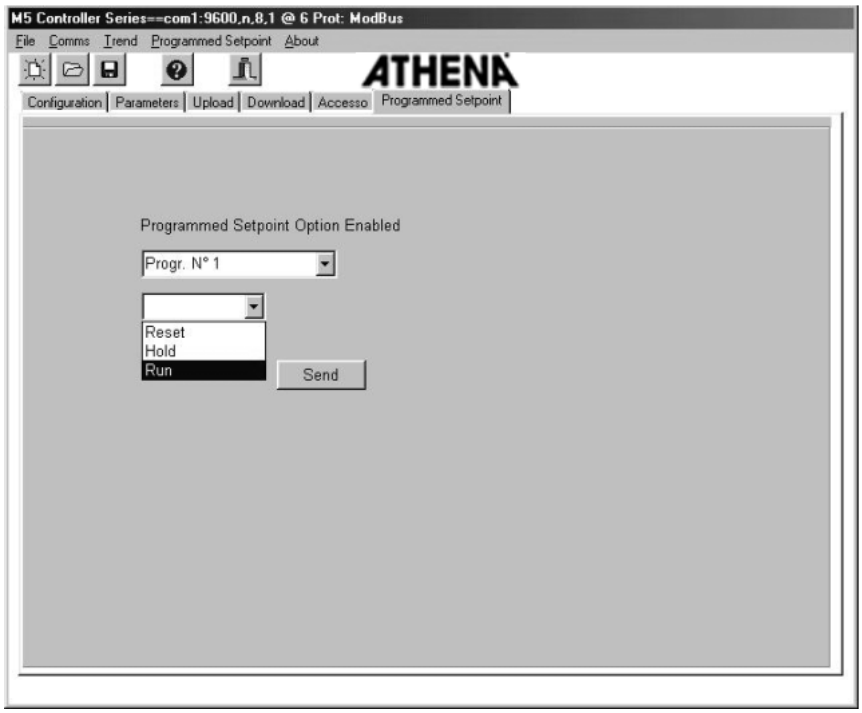
and then :



where a name can be assigned to the file which will contain the program just received.

Programmed setpoint card

The Programmed setpoint card contains the commands to run, pause or stop the program.

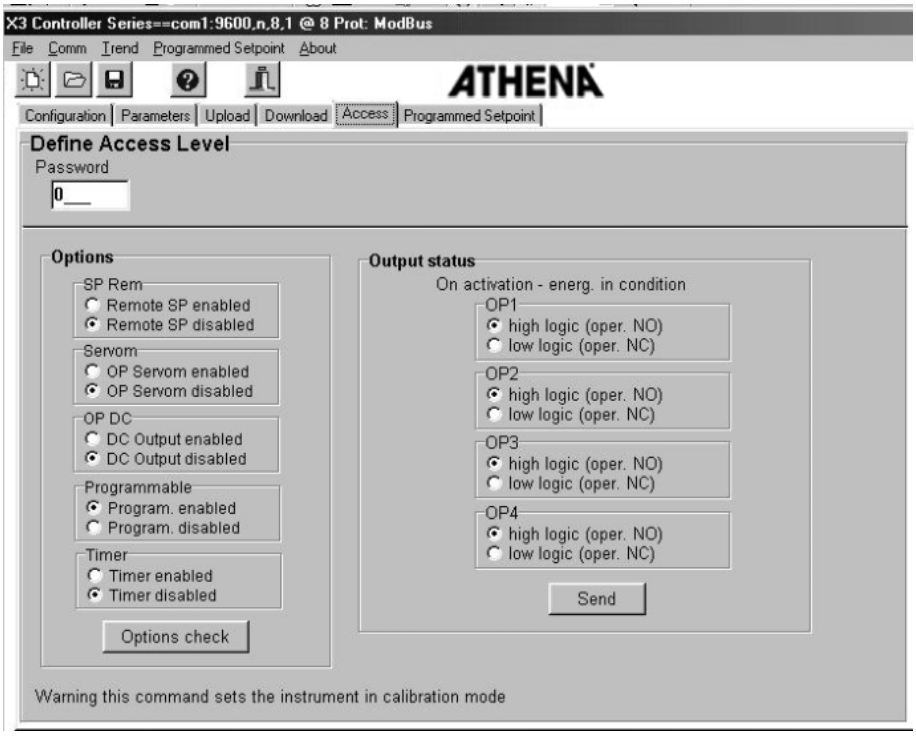


Select the corresponding command and press “Enter” to run it.

13.12.2 X400 Controller

New program

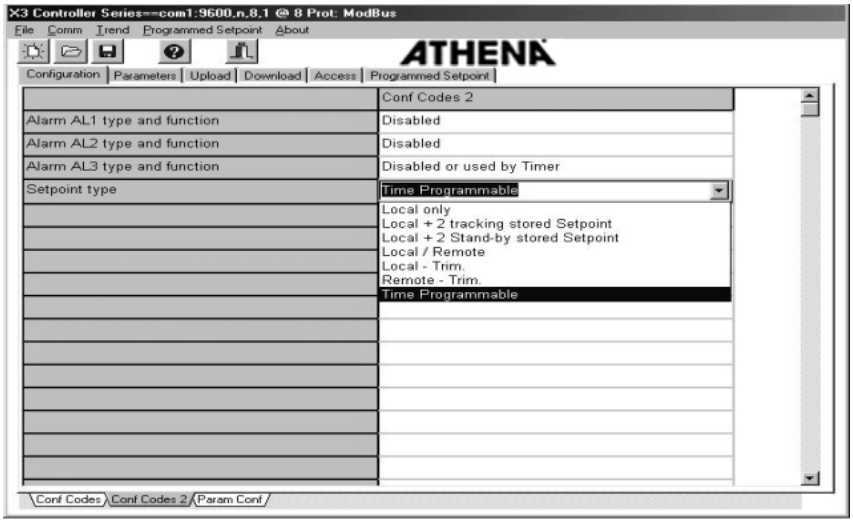
1. configure the serial communication parameters.
2. check that there is the "Programmed setpoint" option:



To check the active options:

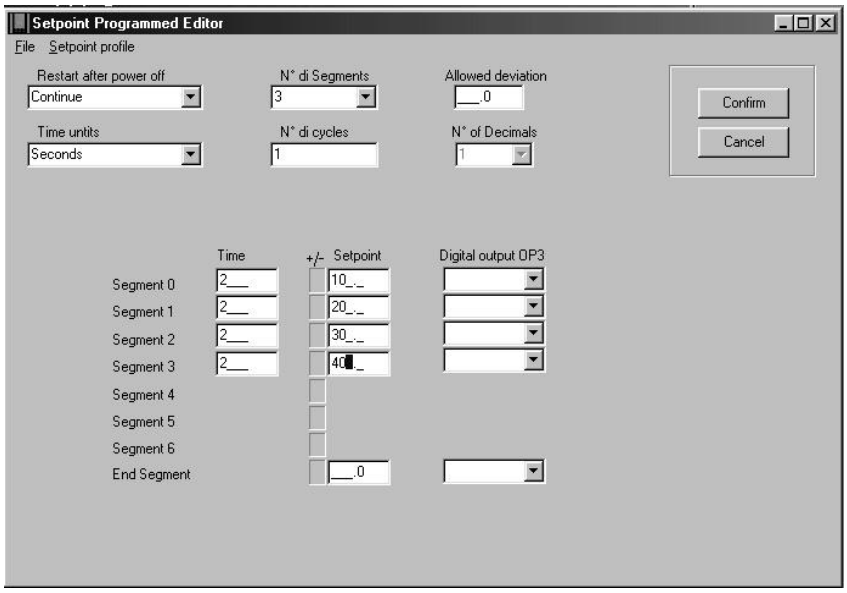
1. select the "Accesses" card
2. press "Check options": if "Program Enabled" is present.
3. select the "Receive" card and detect the configuration

In the Configuration – Conf Codes 2 card, select Programmable in the Setpoint Type parameter.



When the selection has been made the Programmed Setpoint menu is enabled.

From the “Programmed setpoint” menu select New/Modify.



New Setpoint programs can be created and saved in this window or already existing programs loaded from the Menu File, for any modifications.

To create a new program:
1. select one of the items of the “Recover action after blackout” parameter
2. select an item of the “time unit” parameter
3. select the number of segments which make up the program (minimum 1, maximum 6)
4. select the number of program cycles (from 0 to 9999, where 0 indicates infinite cycles) and enter the dead band value.

The decimals number, as already set in the Configuration – Config. Configurator input, is also displayed.

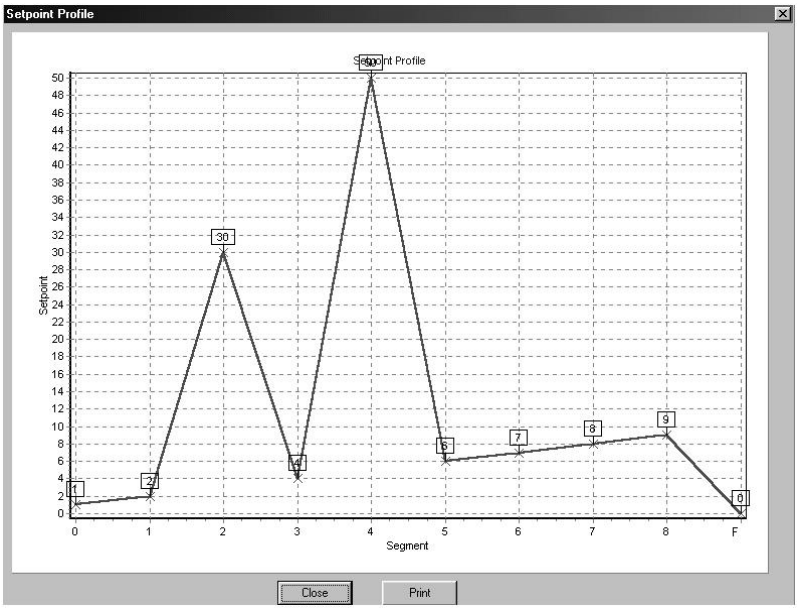
To limit the Setpoint to the full programmed setpoint range select “SP limit full range” from the Programmed setpoint menu.

For each segment set:
- time
- Setpoint value
- OP3 output state.

At the end of the setting press:
- ***Enter***: to validate the data entered
- ***Cancel***: to quit the screen without saving
- ***Print***: to print the window containing the data entered.

Or **select** Setpoint Profile from the menu.

To display the window of the setpoint profile of the data entered in the New/Modify page program:



Press “Print” to print the window.

Enter program to the instrument

On selecting Enter on the Programmed setpoint menu the Setpoint program can be sent to instrument X400. The window will display:

On selecting the Enter button the following window displays:

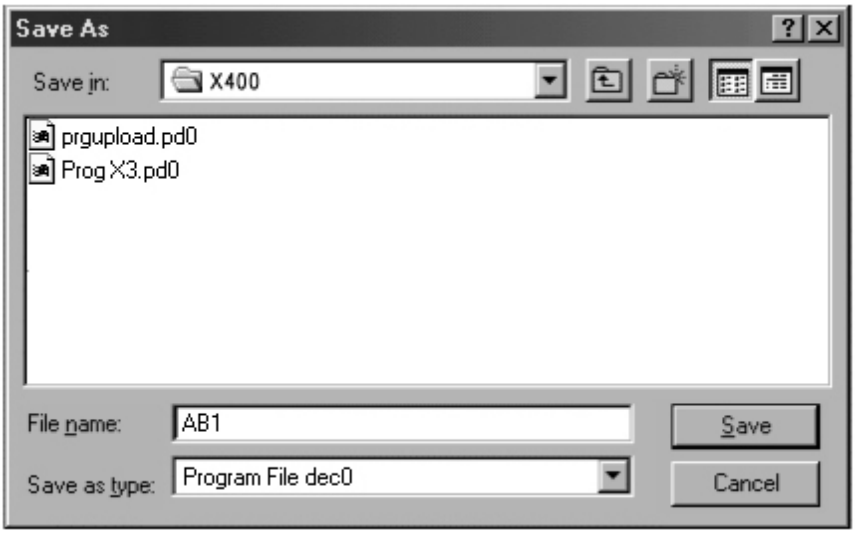
Once the enter phase has finished the window is displayed

Receiving program at the instrument

On selecting Receive from the Programmed setpoint menu the Setpoint program can be received from instrument X400. The window dislays:

When the reception has finished the window is displayed

and then:



where a name can be assigned to the file which will contain the program just received.

Programmed setpoint card

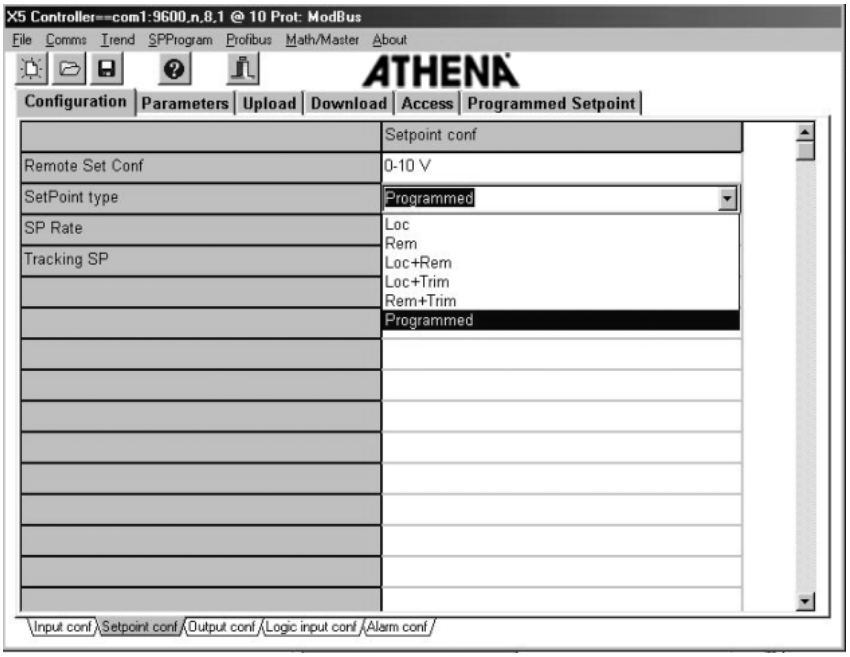
The Programmed setpoint card contains the commands to run, pause or stop the program.

Select the corresponding command and press “Enter” to run it.

13.12.3 X5000 Controller

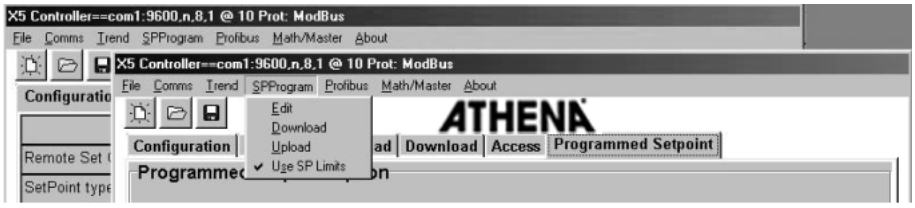
New program

1. configure the serial communication parameters.
2. select the “Receive configuration” card: if the instrument has the program option, in the Configuration – Config. Setpoint card the Type of Programmed Setpoint can also be selected

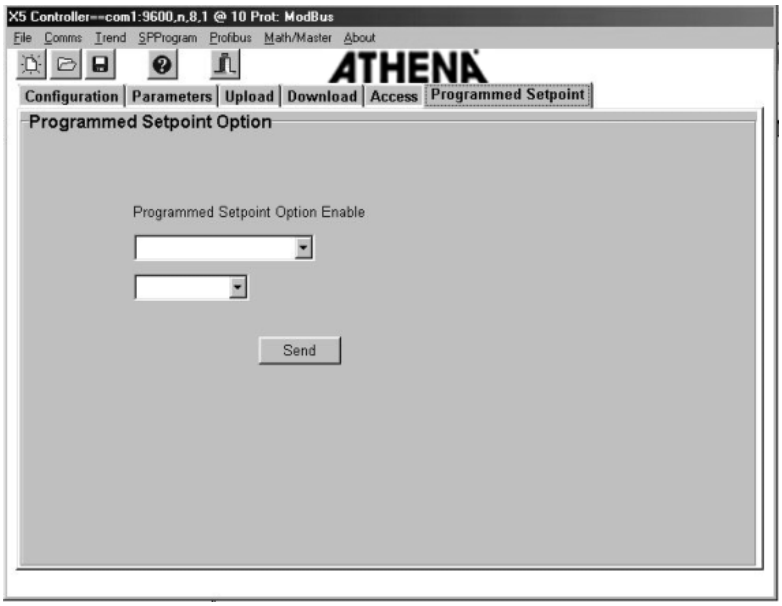


3 select the “Programmed setpoint” card”:

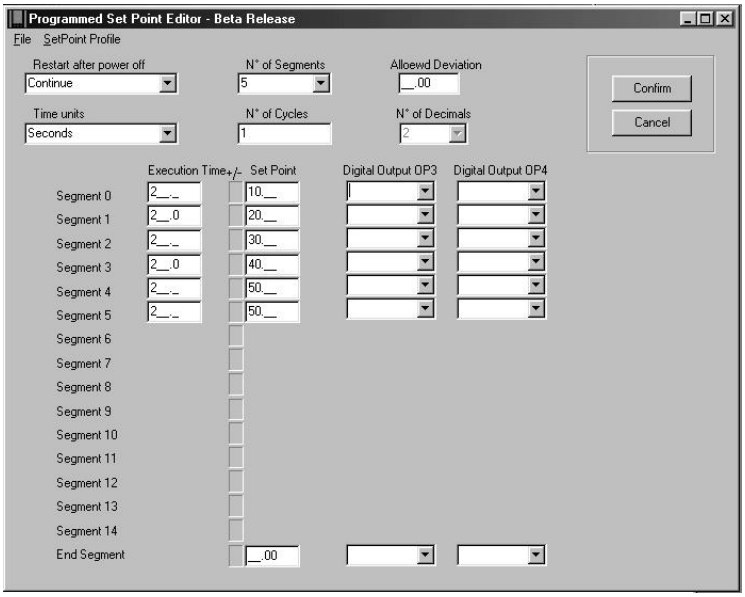
The Programmed Setpoint menu is displayed:



and the commands to select the program state appear in the "Programmed Setpoint" card:



From the "Programmed setpoint" menu select New/Modify



New Setpoint programs can be created and saved in this window or already existing programs loaded from the Menu File, for any modifications.

To create a new program:

1. select one of the items of the "Recover action after blackout" parameter
2. select an item of the "time unit" parameter
3. select the number of segments which make up the program (minimum 1, maximum 14)
4. select the number of program cycles (from 0 to 9999, where 0 indicates infinite cycles) and enter the dead band value.

The decimals number, as already set in the Configuration – Config. Configurator input, is also displayed.

To limit the Setpoint to the full programmed setpoint range select “SP limit full range” from the Programmed setpoint menu.*For each segment set:*

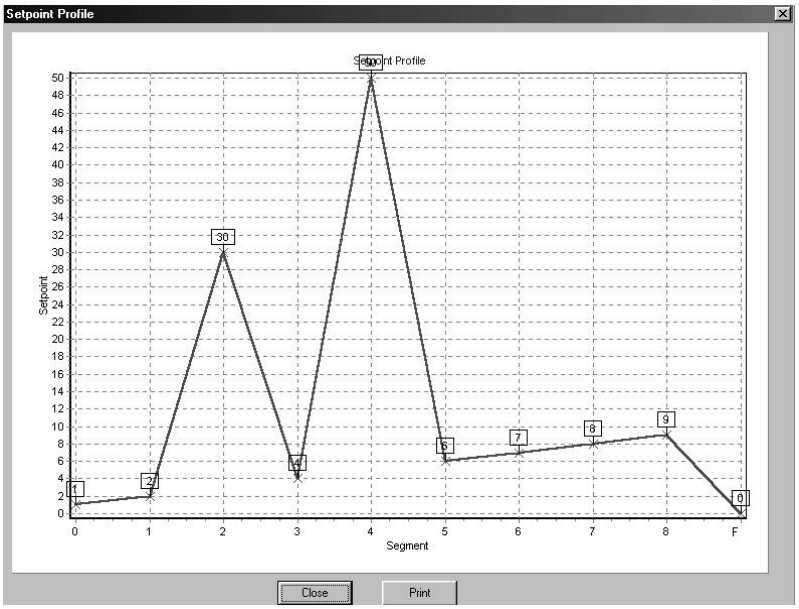
- time
- Setpoint value
- OP3 and OP4 output state.

At the end of the setting press:

- ***Enter***: to validate the data entered
- ***Cancel***: to quit the screen without saving
- ***Print***: to print the window containing the data entered.

Or **select** Setpoint Profile from the menu.

To display the window of the setpoint profile of the data entered in the New/Modify page program:

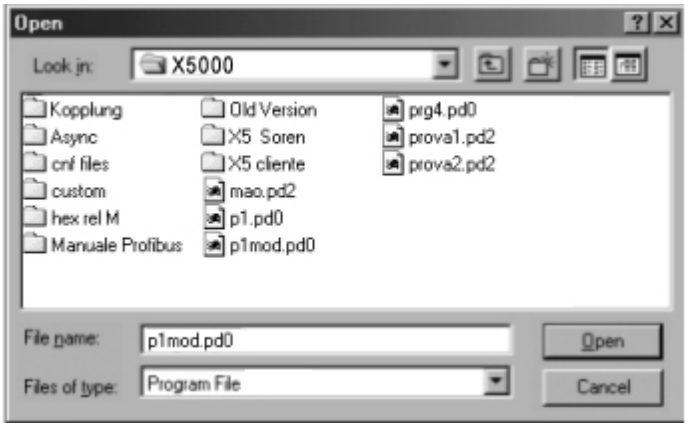


Press “Print” to print the window.

Enter program to the instrument

On selecting Enter on the Programmed setpoint menu the Setpoint program can be sent to instrument X5000. The window will display:

On selecting the Enter button the following window displays:



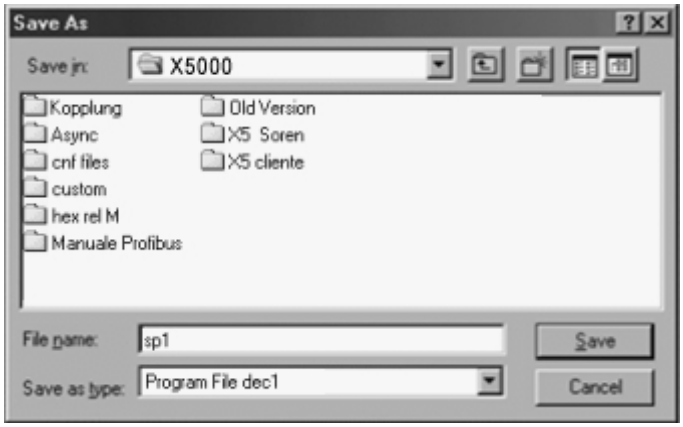
Once the enter phase has finished the window is displayed

Receiving program at the instrument

On selecting Receive from the Programmed setpoint menu the Setpoint program can be received from instrument X5000. The window dislays:

When the reception has finished the window is displayed

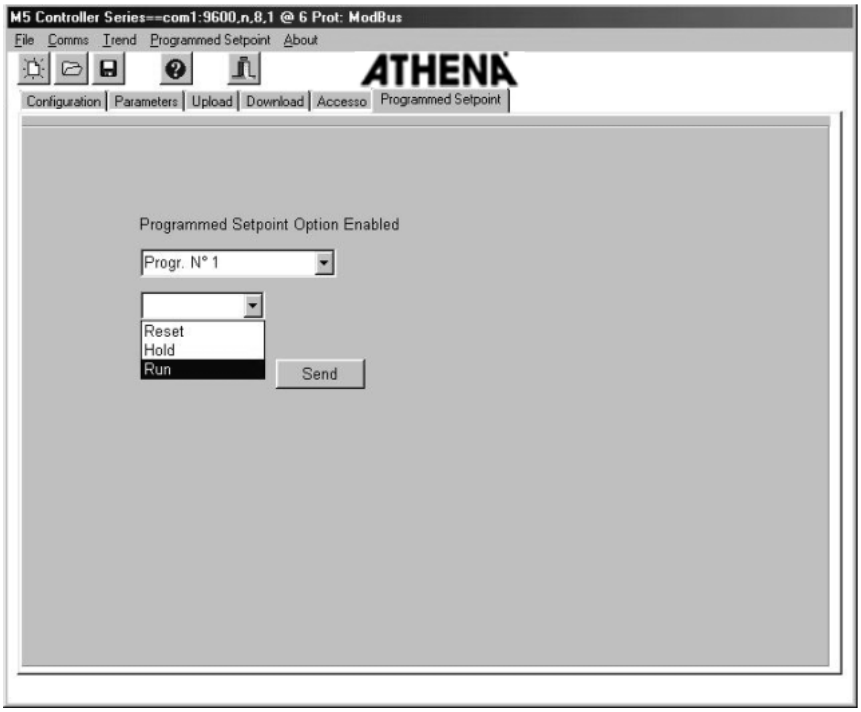
and then:



where a name can be assigned to the file which will contain the program just received.

Programmed setpoint card

The Programmed setpoint card contains the commands to run, pause or stop the program.

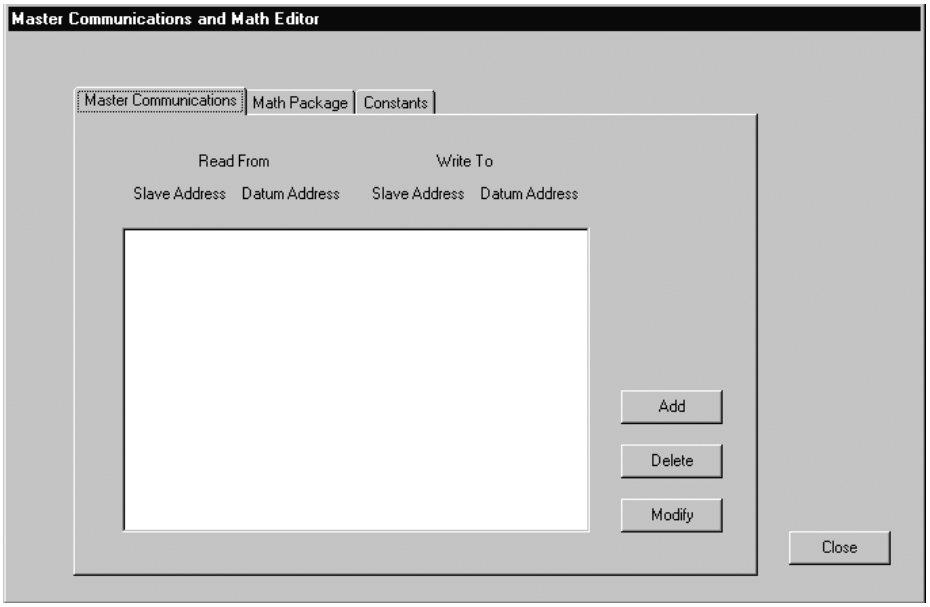


Select the corresponding command and press “Enter” to run it.

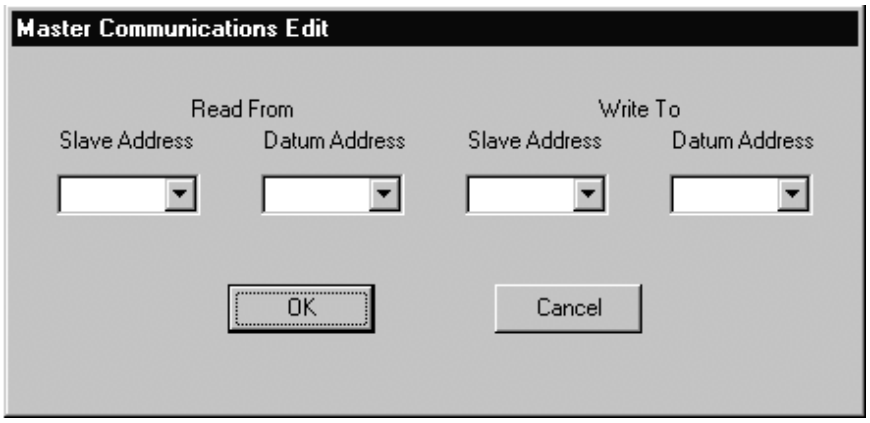
13.13 Configuration of the Master communications (only X5000)

Select the menu "Math/ Master". Is visualized the window "Master Communications and Math Editor".

Select the card "Master Communications".
Select in the list "Slave Address" under "Write To" the address of the device on which you want to transfer the parameter.



To insert a new connection activate the button "Add".



Select in the list "Slave Address" under "Read From" the address of the device from which a parameter wants to be read (N.B. the admitted addresses are between 1 and 247; 256 is the address of the device master!).

Select in the list "Datum Address" under "Read From" the address of the parameter that wants to be read on the device.

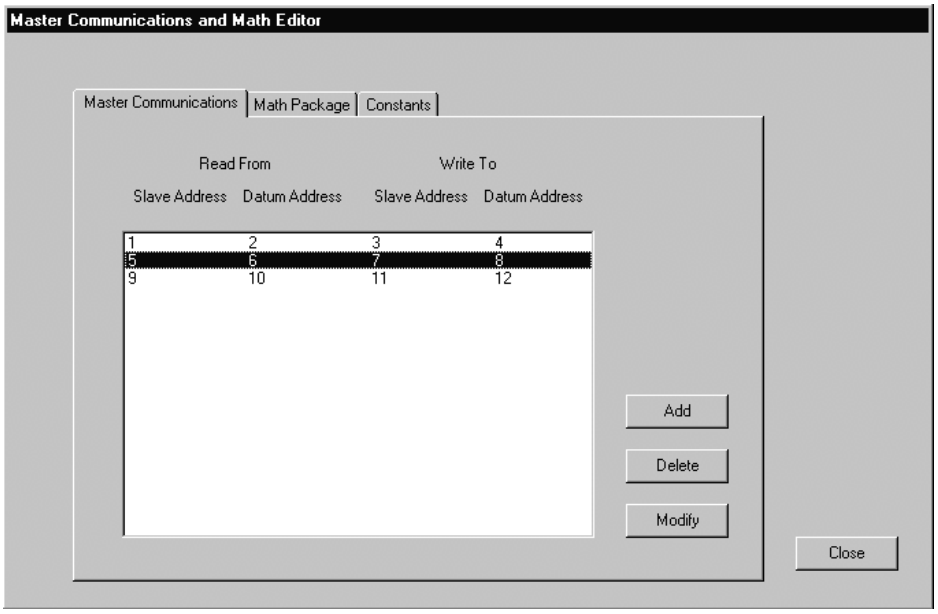
N.B. The admitted addresses are between 1 and 256 (modbus) or between 0 and 255 (jbus); besides are visualized the variable (VAR_1..VAR_16) and the constants configurated (CONST_1..CONST_16).

N.B. The admitted addresses are between 1 and 247; 256 is the address of the device master; 0 is the BROADCAST address for transfer the parameter to all the connected devices!

Select in the list "Datum Address" under "Write To" the address where you want to transfer the parameter.
N.B. The admitted addresses are between 1 and 256 (modbus) or between 0 and 255 (jbus); besides are visualized the variable configurated (VAR_1..VAR_16).

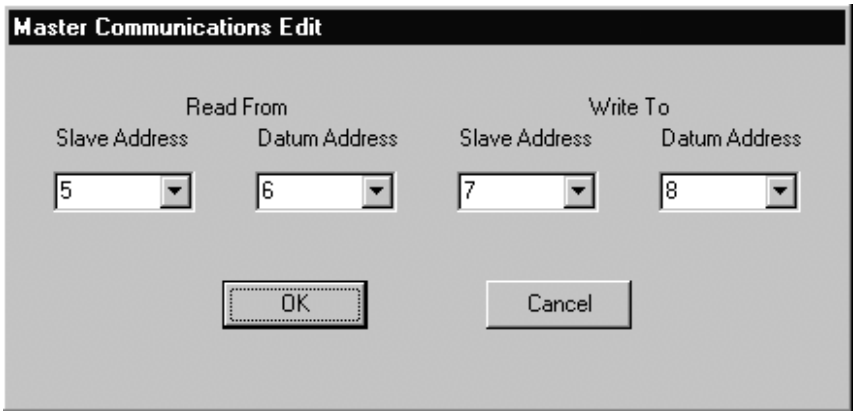
Press the button "OK" for confirm the immission or press the button "CANCEL" for cancel the immission.

To modify the values of a connection previously introduced, select it with a click of the mouse.



Press the button "Modify".

Is visualized the window "Master Communications Edit" with the values of the selected connection.



Modify the values as in demand, acting in the same way for the insertion of a new connection.

At the end press the button "OK" to confirm the modifications or press the button "CANCEL" to cancel it.

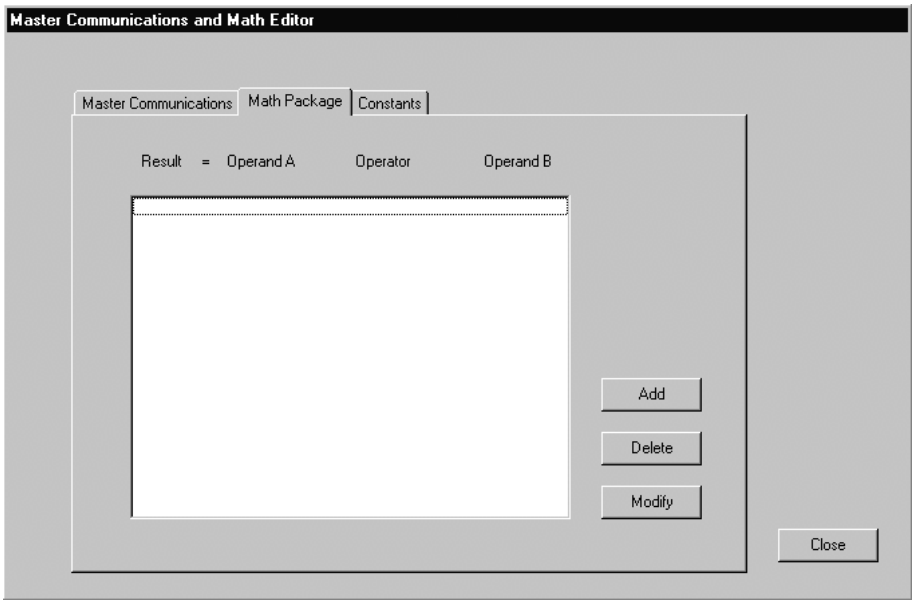
To eliminate a connection previously introduced, select it with a click of the mouse in the same way for the modification and press the button "Delete".

At the end of the configuration of the Master communications, press the button "CLOSE" to return to the window of the configurator.

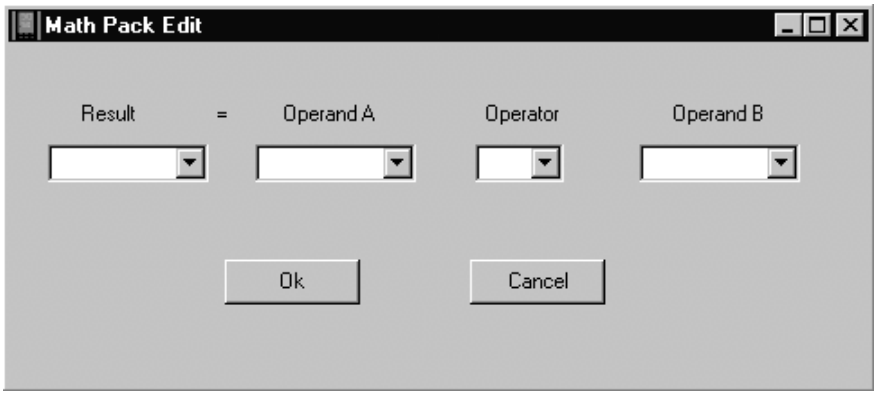
13.14 Configuration of the mathematical / logics operations

Select the menu "Math/ Master." The "Master Communications and Math Editor" window appears .

Select the card "Math Package".



To insert a new operation activate the button "Add".



Select in the list "Result" the address of the variable in which the result of the operation wants to be memorized: the admitted addresses are between 1 and 256 (modbus) or between 0 and 255 (jbus); besides are visualized the variable (VAR_1..VAR_16) to disposition.

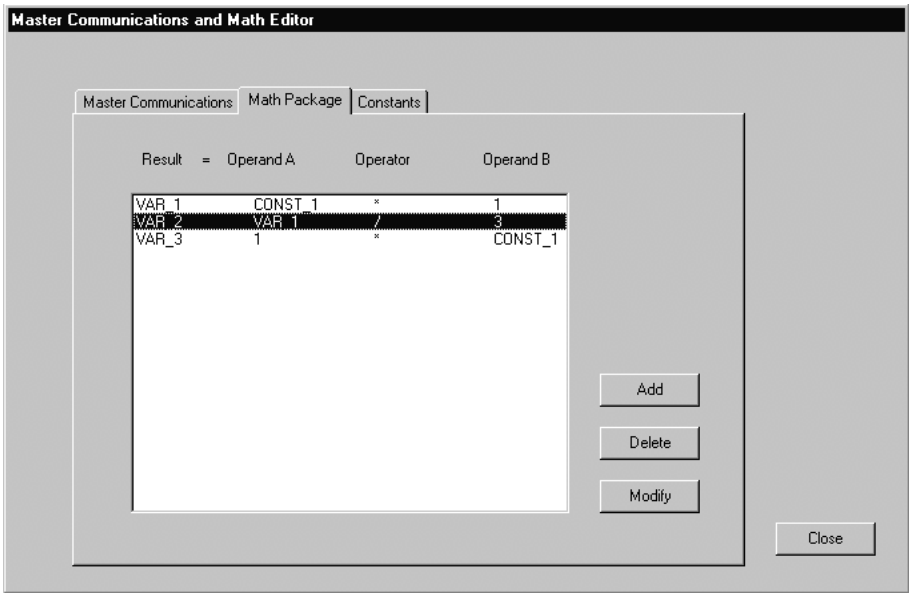
Select in the list "Operand A" the address of the parameter that wants to be used like first operand: the admitted addresses are between 1 and 256 (modbus) or between 0 and 255 (jbus); besides are visualize the variabled (VAR_1..VAR_16) and the constants configured (CONST_1..CONST_16).

Select in the list "Operator" the symbol of the desired operation; the possible operations are: sum (+), subtraction (-), multiplication (*), division (/), greater than (>) and less than (<).

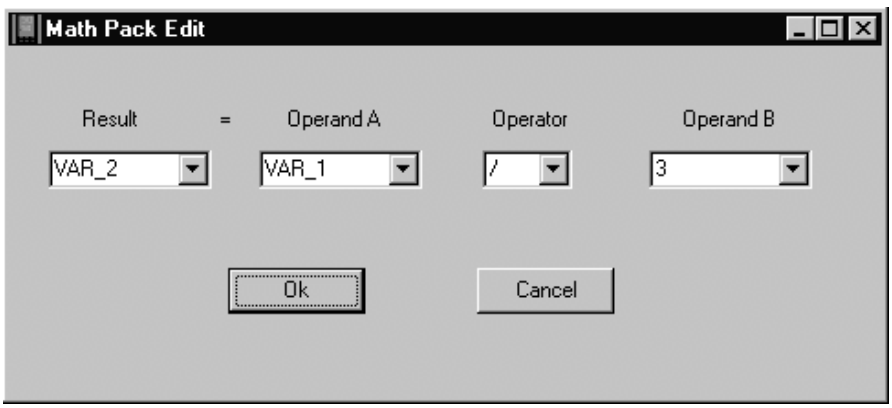
Select in the list "Operand B" the address of the parameter that wants to be used like second operand: the admitted addresses are between 1 and 256 (modbus) or between 0 and 255 (jbus); besides are visualized the variable (VAR_1..VAR_16) and the constants configured (CONST_1..CONST_16).

Press the button "OK" confirm the immission or press the button "CANCEL" to cancel the immission.

For modify the operands of an operation previously introduced, select it with a click of the mouse.



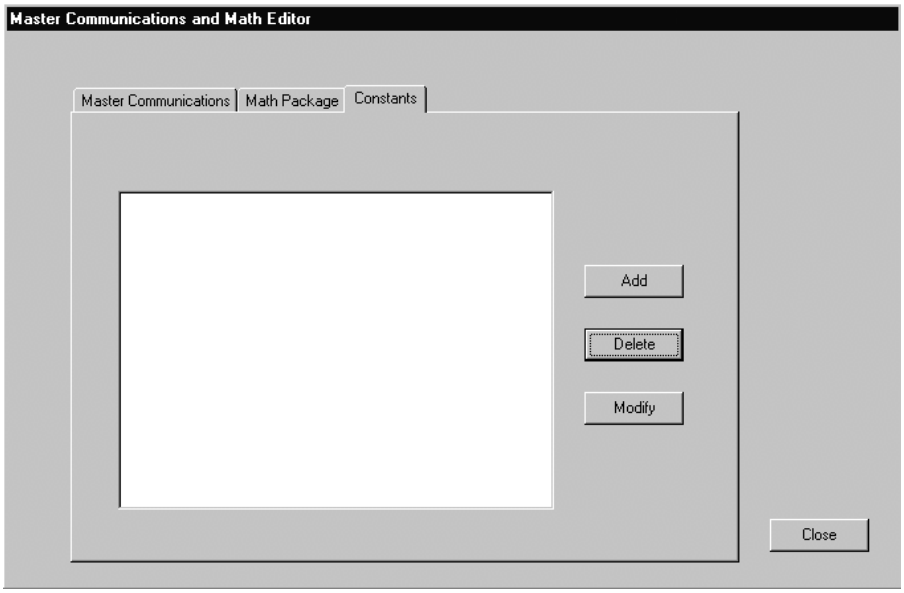
Press the button "Modify".
Is visualized the window "Math Pack Edit" with the values of the selected operation.



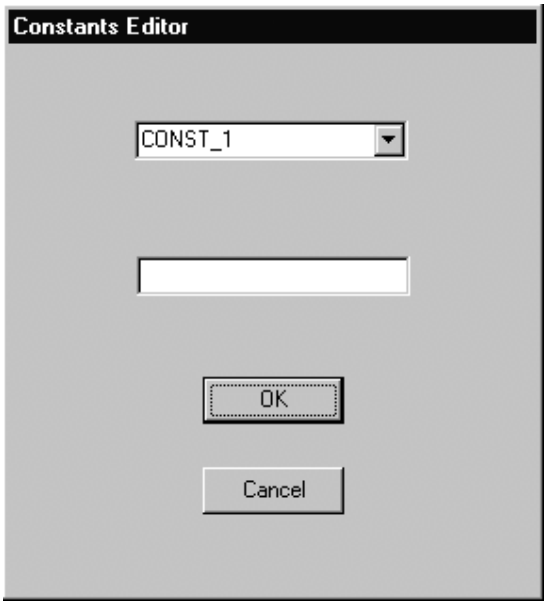
Modify the values as in demand, acting in the same way for the insertion of a new operation.
At the end press the button "OK" to confirm the modifications or press the button "CANCEL" to cancel it.
To eliminate an operation previously introduced, select it with a click of the mouse like for the modification and press the button "Delete".
At the end of the configuration of the mathematical packet, press the button "Close" to return to the window of the configurator.

13.15 Configuration of the numerical constants

Select the menu "Math/ Master." The window appears "Master Communications and Math Editor".
Select the card "Constants".



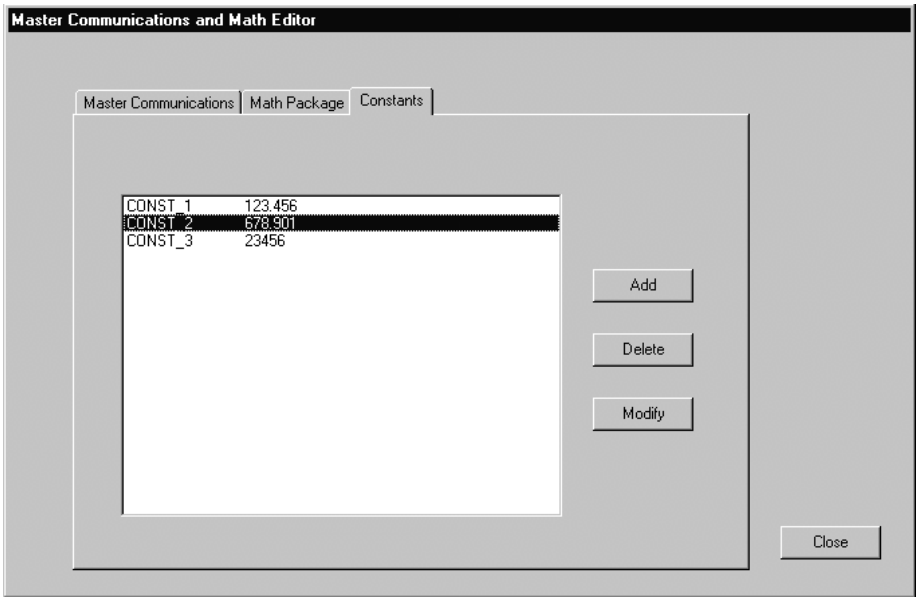
Activate the button "Add" for **insert a new constant**.



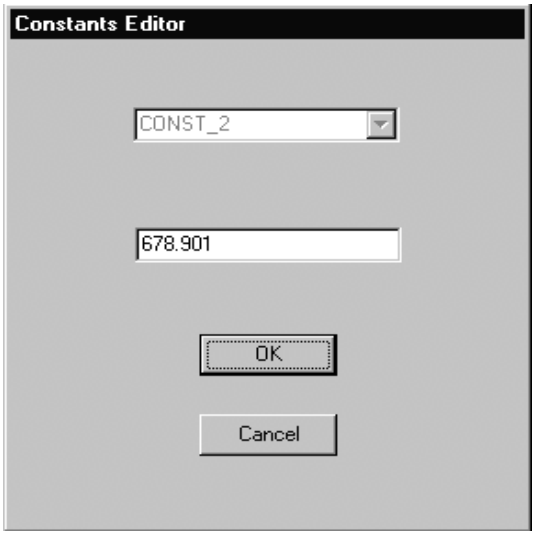
Select one of the 16 constants (CONST_1_CONST_16) to define in the list and insert his value in the underlying window (N.B. in the case of real values pay attention to the symbol shaped in Windows like decimal separator: point for the Italian versions, comma for the others!) Press the button "OK" to confirm the immission.
Press the button "CANCEL" to cancel the immission.

13.15.1 To modify the value of a constant

To modify the value of a constant previously introduced, select it with a click of the mouse.



Press the button "Modify".
Is visualized the window "Constants Editor" with the value of the selected constant.



Insert the new value requested (N.B. it is not possible modify the name of the constant).
At the end press the button "OK" to confirm the modifications or press the button "CANCEL" to cancel it.

13.15.2 To eliminate a constant

To eliminate a constant previously introduced, select it with a click of the mouse like for the modification and press the button "Delete".
At the end of the configuration of the mathematical constants, press the button "Close" for return to the window of the configurator.

13.15.3 Reading/writing of the configuration of the mathematical packet in the device

The download of the configuration of the mathematical packet and of the master communications comes effected automatically when you take place the download of the configuration and of the parametrizzation (see what explained above).

13.15.4 Save the configuration of the mathematical packet on files

The saving on files of the configuration of the mathematical packet and of the master communications comes effected automatically when you take place the saving of the configuration and of the parametrizzation (see what explained above).

13.16 Definition of the Profibus parameters *(X5000 controller only)*

The definition of the parameters consists to define the packet of supervision of the PLC or of the PC: define the parameters that will be read and write.
This phase is done using the software of configuration of the Profibus. This software cretes two file:

1) one for the master: the GSD file
2) one for the regulator X5000

The GSD file of the master must be used in the software of configuration of the same master.
The file for the instrument X5000 must be sended by serial comunication to the regulator.
For perform the software of configuration of the Profibus, after have started the Configurator, it is necessary select the Configuration voice from the Profibus menu (see figure 1).

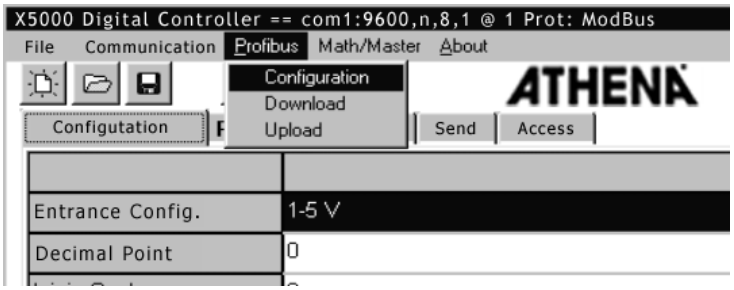


Figure 1

It comes as visualized the principal window of the program.
From the menu File select:
the New voice for create a new configuration, the Open voice for open a created configuration previously (see figure 2).

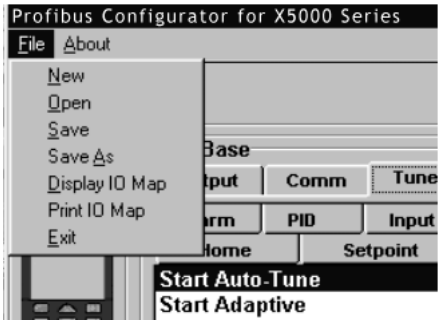


Figure 2

If the Open voice is selected appears the following window (figure 3)

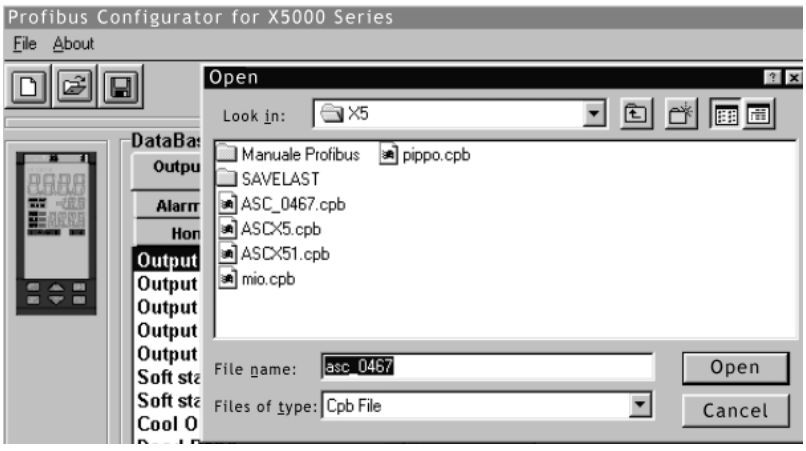


Figure 3

Select the desired line and press the button Open

13.16.1 How to insert the parameters in the configuration *(X5000 controller only)*

From the Data Base of the variable select the parameter interested with a click of the left key of the mouse.

If the selected parameter will be red press the button > set under the Read writing.

If the selected parameter will be written press the button > set under the Write writing (figure 4).

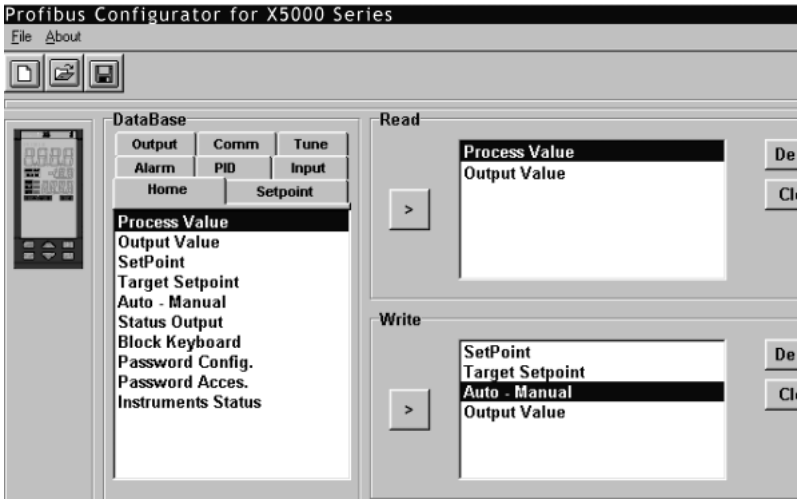


Figure 4

To eliminate a parameter inserted select the parameter and press the Delete button (see figure 5):

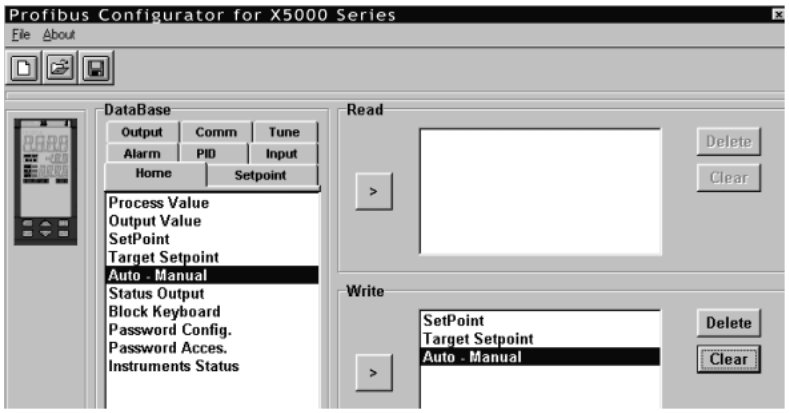


Figure 5

For eliminate all the inserted parameters press the Clear button (figure 6):

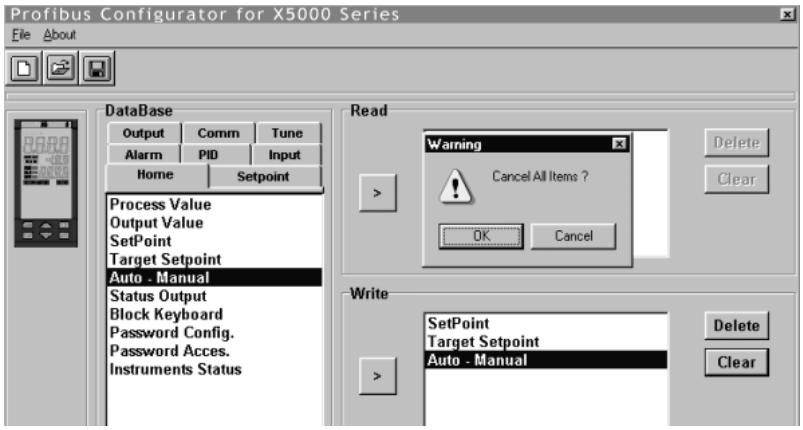


Figure 6

Confirm pressing the OK button or annul the operation pressing the Cancel button.

13.16.2 Parameters of the Data Base *(X5000 controller only)*

In succession have brought the available parameters divided for groups.
Home parameters (figure 7):

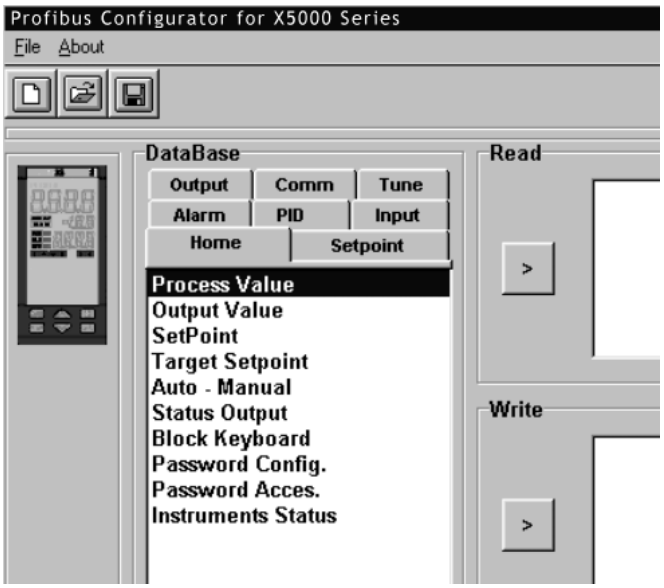


Figure 7

Parameters Setpoint (figure 8):

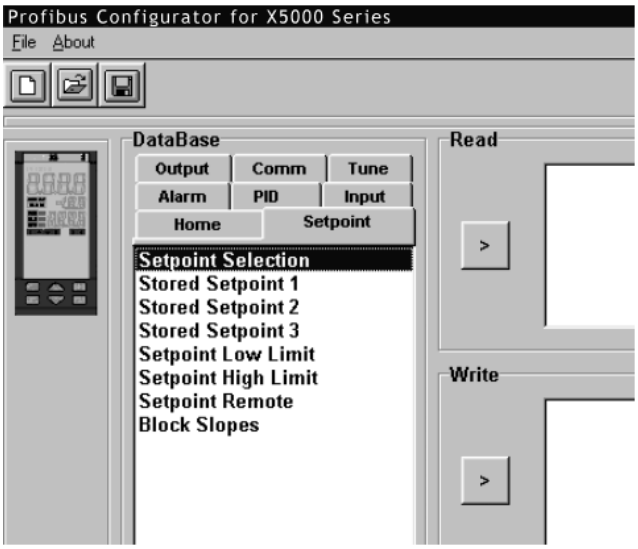


Figure 8

Parameters Alarm (figure 9):

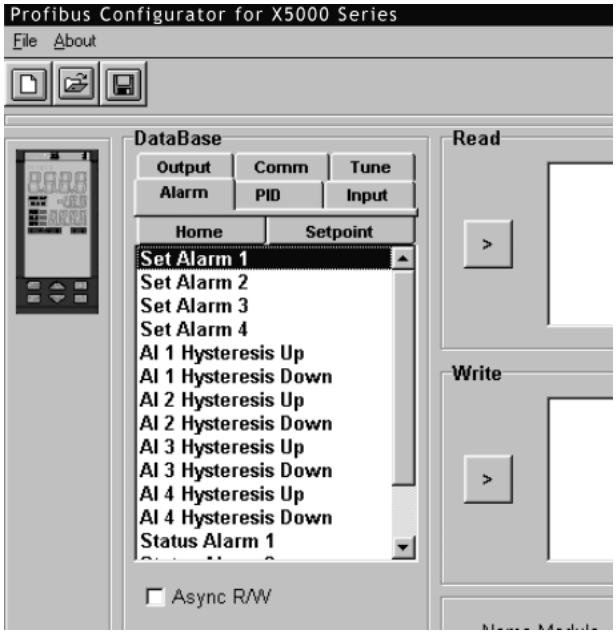


Figure 9

PID Parameters (figure 10):

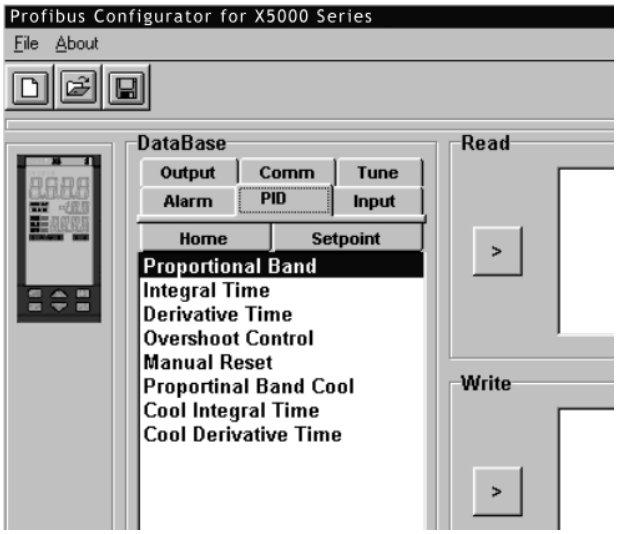


Figure 10

Input Parameters (figure 11):

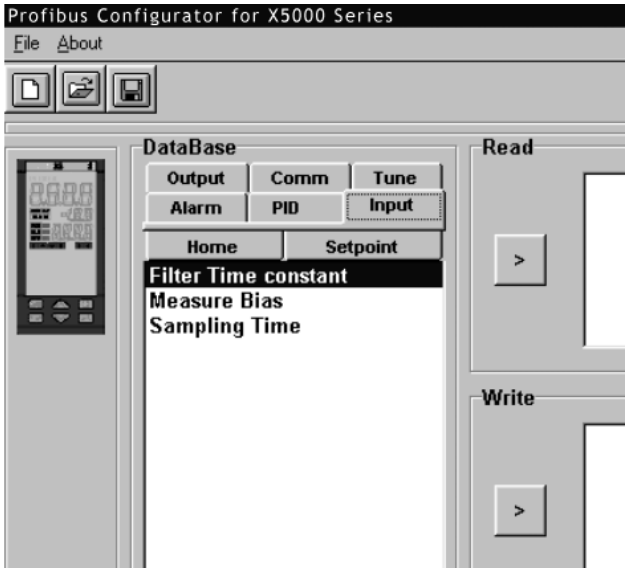


Figure 11

Output Parameters (figure 12):

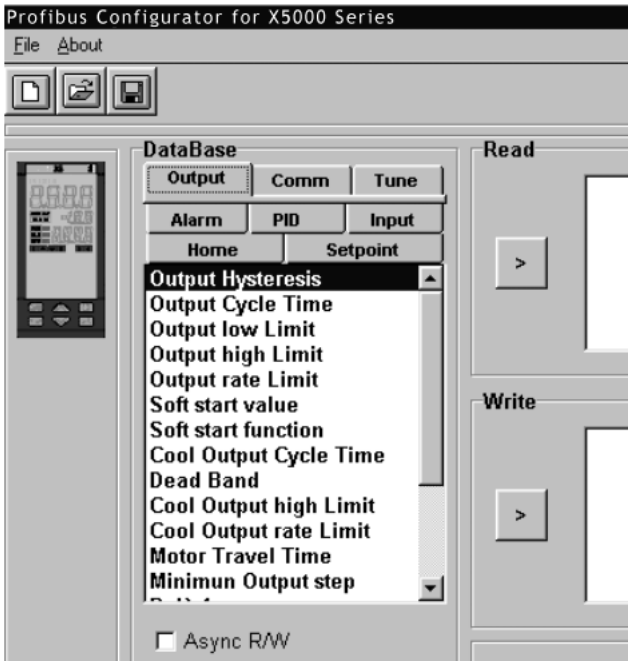


Figure 12

Comm Parameters (figure 13):

Figure 13

Tune Parameters (figure 14):

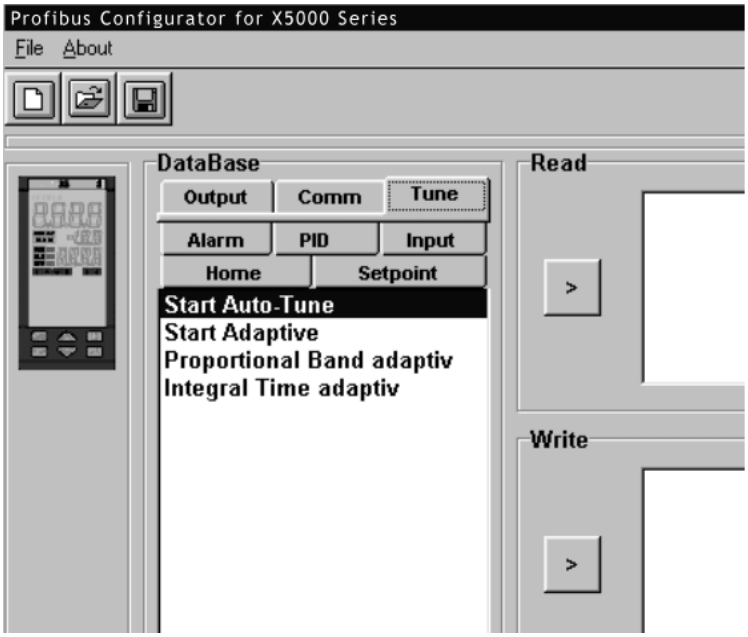


Figure 14

It is also possible visualize the map of the selected parameters.

From the menu file select the Display I/O Map voice (figure 15)

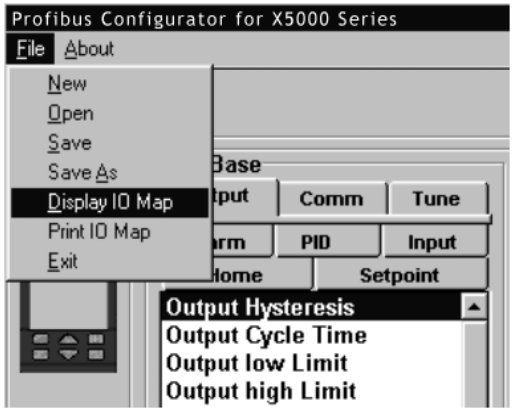


Figure 15

It will come visualized the following window (figure 16):

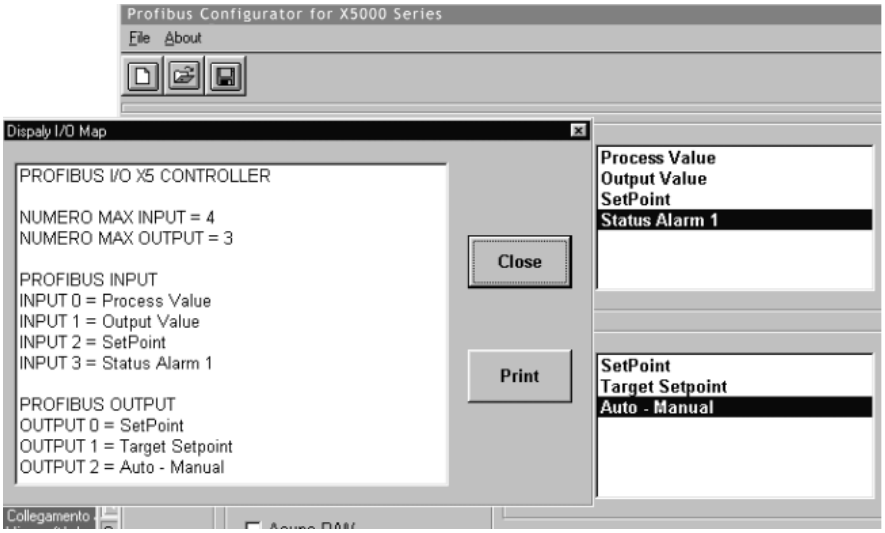


Figure 16

It is possible print the map of the selected parameters pressing the Print button or selecting the Print I/o Map voice from the menu File (figure 17):

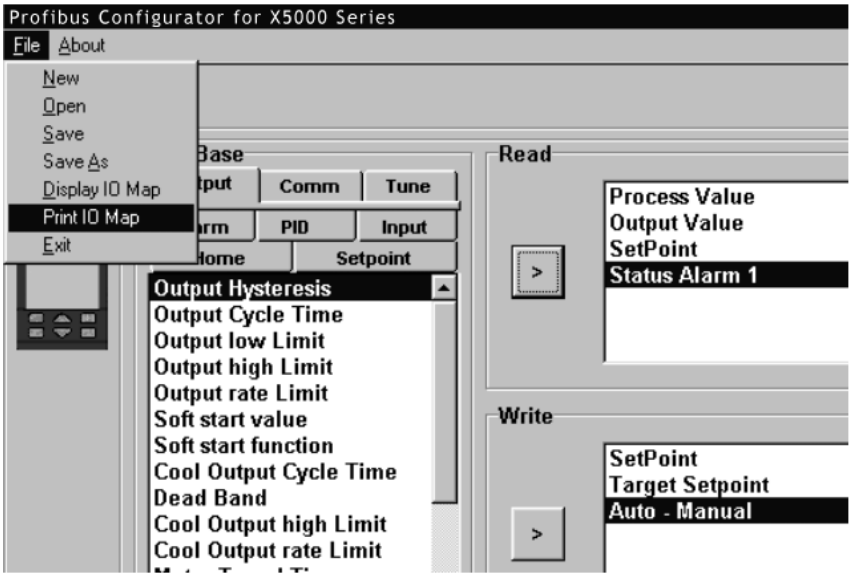


Figure 17

Selecting the option Async R/ W are enabled the asyncronous services of the Profibus (figure 18):

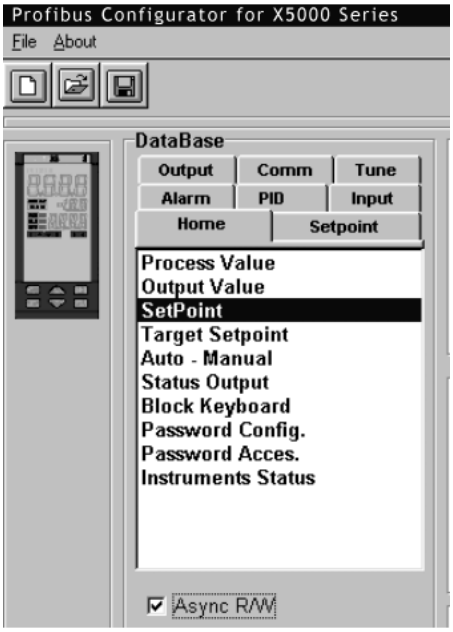


Figure 18

13.16.3 How to save the configuration *(X5000 controller only)*

From the menu File select the Save voice or Save As (figure 19):

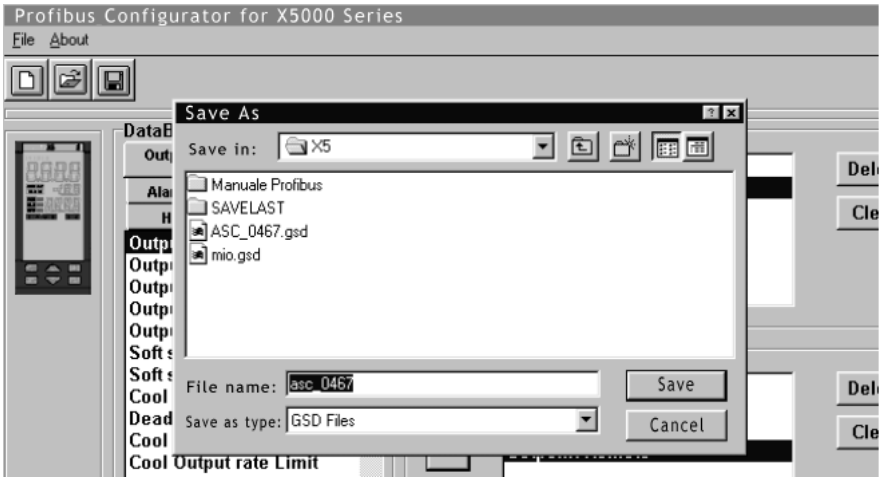


Figure 19

Insert the name of the line and press the button Save.

13.16.4 How to send the configuration of the Profibus parameters *(X5000 controller only)*

To send the configuration of the Profibus parameters it is sufficient select the Download voice from the Profibus menu of the Configuratore of the instrument X5 (see figure 20):

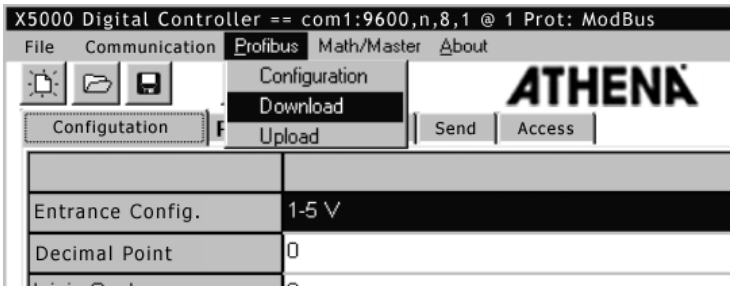


Figure 20

It will come visualized the following window (figure 21):

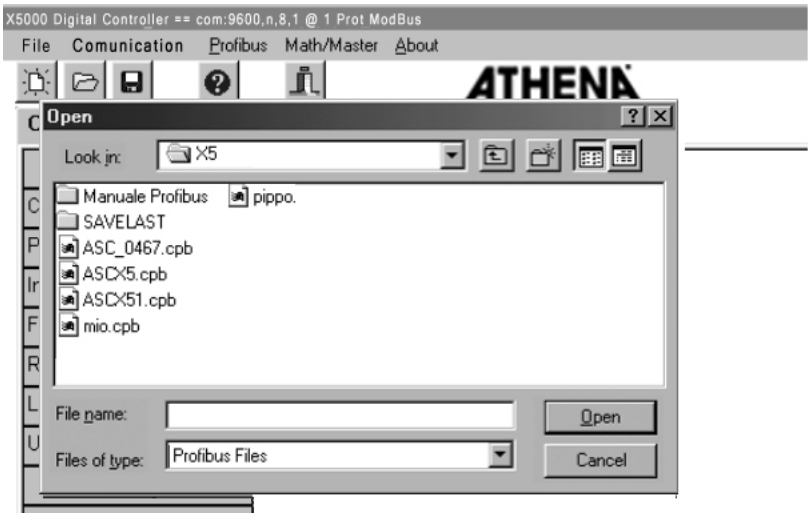


Figure 21

Select the file of the configuration to send and press the button Open. The configuration will come as sent to the tool.

13.16.5 How to receive the configuration of the Profibus parameters *(X5000 controller only)*

To receive the configuration of the Profibus parameters from the tool X5 it is sufficient select the Upload voice from the Profibus menu of the Configurator of the instrument X5000 (see figure 22):

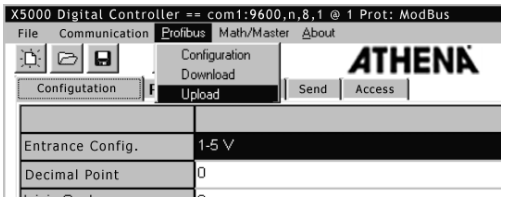


Figure 22

It will come visualized the following window (figure 23):

Figure 23

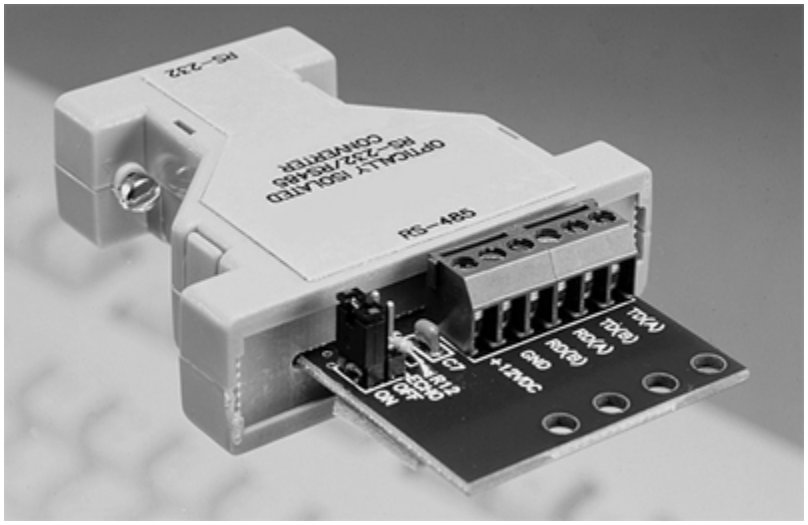
Insert the name of the desired file and press the button Save.
The file is now available to have visualized and modified through the software of configuration of the Profibus

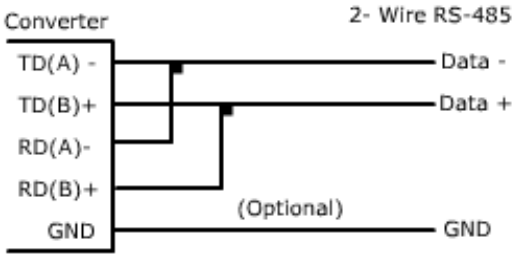
14. Recommended RS-232 to RS-485 Converter

14.1 Athena Part# 223A001401 RS-232 to RS-485 Optically Isolated Communications Converter

This product is used to convert unbalanced, full-duplex RS-232 signals to half-duplex (2-wire) RS-485 signals. It also provides optical isolation of data lines and ground between the RS-232 and RS-485 equipment.

- Includes 120 Vac to 12 Vdc power pack
- No handshaking required to control RS-485 driver
- Receiver disabled when transmitting to prevent echo back to the RS-232 device





Controller Wiring Terminal Identification Table for 2-Wire RS-485 Connections		
Cotroller Line	**Positive Terminal (+)**	**Negative Terminal (+)**
C10, M10, M300, M400,	7	8
M5000, X100, X400, X5000	1	5
Master, X5000 Slave	13	14

14.2 General Information

The converter may be plugged directly into the 9-pin serial port of a PC or connected via a standard 9-pin to 9-pin PC serial cable.

The echo jumper must be in the “off” position and will configure the converter for RS-485 two-wire (only) mode. Up to 32 receivers can be driven by any one RS-485 driver, allowing you to put together large systems with many drop points. Termination resistors are recommended - they should be located at opposite ends of the system and should be AC-coupled terminations as noted on page 17, figure 2.3 of the converter manual.

No wire type or maximum run length is listed in the RS-485 standard.

The polarity of the two RS-485 lines must be correct. With no data being sent, the RS-232 line should be negative and the RS-485 “A” terminal should be negative with respect to the “B” terminal. If your equipment uses a “+” and “-” naming scheme, in most cases, the “A” line will be connected to the “-” and the “B” line will be connected to the “+”. Connect the “A” line from the converter to the (-) terminal on the controller. Disregard any “A” and “B” labels on the controller and only refer to the “+” or “-” polarity on the label of the controller. Connect the “B” line of the converter to the (+) terminal of the controller. See the Contact Identification Table above for the correct contact terminals on the controller.