

**Communication Driver AS511**

Driver for serial communication with Siemens devices using PG-PORT

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# 1 Introduction

The AS511 driver enables communication between Studio system and some of the SIEMENS S5 devices using their AS511 protocol by RS 232, in accordance with the characteristics covered in this document.

This document contains 8 parts, as follows:

- **Introduction:** Provides an overview of the driver documentation.
- **General characteristics:** Provides information necessary to identify all the required components (hardware and software) necessary to implement the communication and global characteristics about the communication.
- **Installation:** Explains the procedures that must be followed to install the software and hardware required for the communication.
- **Driver configuration:** Provides the required information to configure the communication driver such as the different permutations for configuration and its default values.
- **Execution:** Explain the steps to test whether the driver was correctly installed and configured.
- **Troubleshooting:** Supplies a list of the most common error codes for this protocol and the procedures to fix them.
- **Application Sample:** Provides a sample application for testing the configuration the driver.
- **History of versions:** Provides a log of all the modifications done in driver.


 **Note:** This document presumes that the user has read the chapter *Driver Configuration* of the Studio's Technical reference manual.

## 2 General Characteristics

### 2.1 Device Characteristics

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- **Manufacturer:** SIEMENS
- **Compatible Equipment**
  - S5 SERIES CPU 943/944/945
- **SIEMENS S5 PLC programmer software:** STEP 5.

 **Tip:** Please refers to section 2.4 to see the Equipment used in the standard conformance tests for this driver.

### 2.2 Link Characteristics


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- **Device communication port:** PG port
- **Physical protocol:** RS232
- **Logic protocol:** AS511 Protocol
- **Device Runtime software:** None
- **Specific PC Board:** None
- **Adapters / Converters:** None.
- **Cable Wiring:** It must exactly the same Siemens cable used to communicate the Step 5 with the CPU. For example: *PC / RS232 Siemens Converter 6ES5 734-1BD20.*

### 2.3 Driver Characteristics


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- **Operating System:**
  - Windows 9x
  - Windows 2000
  - Windows NT
  - Windows CE ( x86 / SH3 / SH4 / MIPs / ARM / PPC )

 **Tip:** Please refer to section 2.4 to see the Operating System used in the conformance tests for this driver.

The driver is composed of the following files:

- **AS511.INI:** Internal file of the driver, it should not be modified by the user.
- **AS511.MSG:** Error messages for each error code. It should not be modified.
- **AS511.PDF:** Provides detailed documentation about the driver.
- **AS511.DLL:** Compiled driver.

 **Note:** All the files above must to be in the subdirectory /DRV of the Studio's installation directory.

- **Supported Registers:**

Register Type	Length	Write	Read	Bit	Integer	Float
I or E (Input)	1 Byte	–	•	•	•	–
Q or A (Output)	1 Byte	•	•	•	•	–
M or F (Flag)	2 Bytes	•	•	•	•	–
DB (Data Block)	2 bytes	•	•	•	•	–

## 2.4 Information about conformance testing

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- **Equipment:** PLC S5 115U CPU944R
- **Configuration:**
  - Baud Rate: 9600
  - Protocol: AS511
  - Data Bits: 8
  - Stop Bits: 1
  - Parity: Even
  - COM port: COM1
- **Cable:** PC / RS232 Siemens Converter 6ES5 734-1BD20
- **Operating System (development):** Windows NT 4.0 + Service pack 4
- **Operating System (target):** Windows NT 4.0 + Service Pack 4; Windows CE v2.11
- **Studio Version:** 3.0
- **Driver version:** 11.01

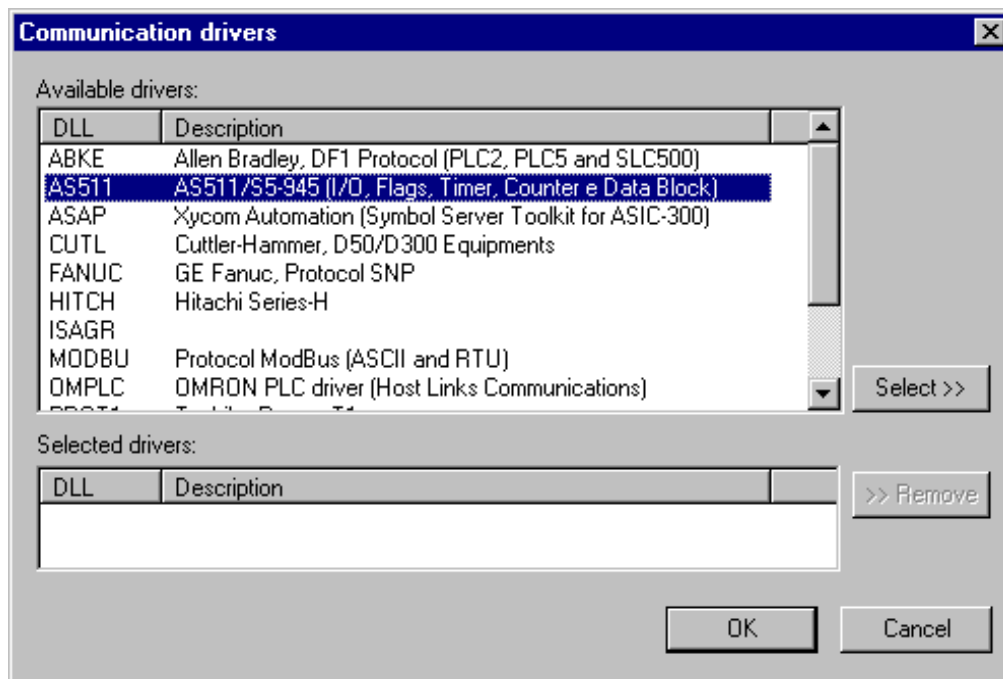
## 3 Installation

### 3.1 Installing the Driver

When you install the Studio v3.0 or higher, the communication drivers are already installed. You need now to select the driver at the applications where it will be used.

The steps to select the driver inside an application are:

1. Execute the Studio and select the proper application.
2. Select the menu *Insert + Driver...*
3. In the column **Available Drivers**, select the **AS511 Driver** and push the button **ADD>>>** (the driver AS511 must appear in the column **Selected Drivers**).
4. Press **OK**.



### 3.2 Other software requirements

It is not necessary to install any other software in the PC to enable the communication between the Studio and the Device. However, to download the custom program to the device, it is necessary to install one of the Siemens programmer software, for example, Step 5. Please see the Step5 documentation about the procedure to install their software.

**⚠ Caution:** Special cautions must be taken when installing the physical hardware. Refer to the hardware manufacturer documentation for specific instructions in this area.

## 4 Driver Configuration

After the driver is installed and selected in the Studio (see section 3.1), you should proceed to the driver configuration.

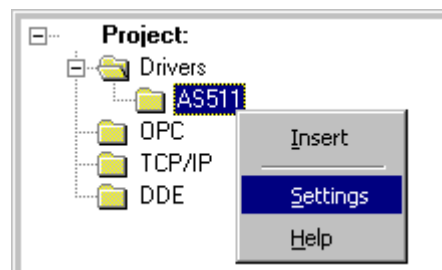
The driver configuration is two parts:

- The Settings or Communication parameters, it is only one configuration to the whole driver;
- The communication tables or Driver Worksheets, where the communication tags are defined.

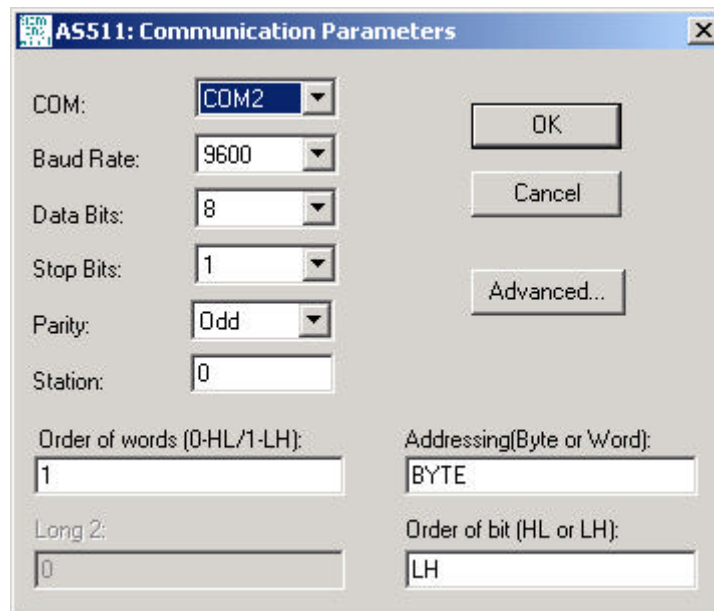
### 4.1 Settings - Communication Parameters

These parameters are valid for all driver worksheets configured in the system. To open the window for configuring the **Communication parameters**, follow these steps:

1. In the **Workspace** of the Studio environment, select the **Comm** table.
2. Expand the folder **Drivers** and select the subfolder **AS511**.
3. Right click on the **AS511** subfolder and select the option **Settings**.



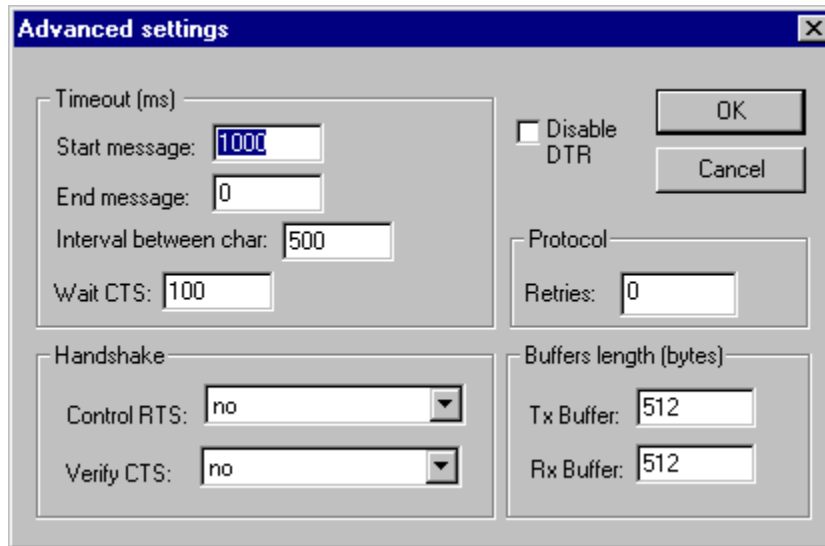
When selecting the Settings, there is the following dialog to configure:



Parameter	Default Value	Valid values	Description
Station	-	-	Not used for the driver
Addressing (Byte or Word)	BYTE	BYTE or WORD	Choose between addressing by BYTE or WORD. For Example, if we choose BYTE and type Header "F:0" we will be addressing from the FY0 on, and if we choose "WORD", we will be addressing from FW0 on. So, we can only address BYTES or WORDs, and not both. So, if you are going to use DBs on your configuration we recommend using WORD option.
Order of Word	1	0 or 1	This field just makes sense to the word WRITING. Here we choose if the most-significative byte will be the LOW byte or the HIGH byte.
Order of bit	LH	LH or HL	This field just makes sense to the bit WRITING. If you choose "WORD" on the filed above, we will have two bytes in each word. Here we choose if the most-significative byte will be the LOW byte or the HIGH byte. For example, if we type a Header like "F:0", WORD, and choose LH, we will be writing on the order FY0 FY1. If we choose HL, it will be FY1 FY0. To bit reading this order is always defined by the PLC, and, in the 115U is always HL.

**Note:** The device **MUST** be configured with the **SAME** values defined in the **Communication Parameters** window of the AS511 driver.

By clicking on the button **Advanced...** in the window **Communication Parameters**, you open additional communication parameters.



The Advanced setting parameters are explained at the Studio Technical Reference Manual, and you should keep the default values to all fields. Only the field described at the next table should be configured:

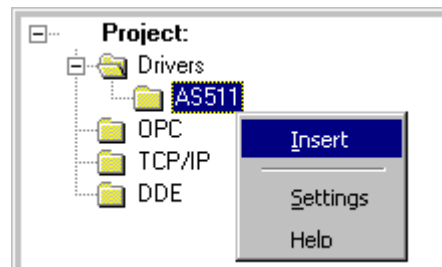
Parameter	Default Value	Valid values	Description
<b>Control RTS</b>	No	no, yes or yes + echo	Define if the handshake signal of RTS (Request to Send) is set before communication and if there is an echo in the communication. If we are using Windows 95 or CE with the right RS 232 – RS 485 Converter (without RTS Control), choose the option “ <b>no</b> ”. But, if we are under Windows NT and if the Cutler Hammer RS232 – 485 adapter is used, the choice must be “ <b>yes</b> ”. <b>Important:</b> Wrong settings on this field will not let the driver work, having the Timeout waiting start a message error.

**Tip:** Usually, these parameters must be changed when using a DCE (Data Communication Equipment) - converter (232/485, for example), modem, etc - between the PC, driver and the host. It is necessary to know the characteristics of the DCE before adjust these parameters.

## 4.2 Driver Worksheet

It is possible to configure many driver worksheets, each one will be composed of a Header and Body. To create a new driver worksheet, follow these steps:

1. In the **Workspace** of the Studio environment, select the table **Comm**.
2. Expand the folder **Drivers** and select the subfolder **AS511**.
3. Right click on the **AS511** subfolder and select the option **I**nsert.



**Tip:** To optimize communication and ensure better performance for the system, it is important to tie the tags in different driver sheets according to the events that must trigger the communication of each group of tags and the periodicity for which each group of tags must be written or read. In addition, it is recommended to configure the addresses of communication in sequential blocks.

When creating a communication table, you have the following window:

	Tag Name	Address	Div	Addr
1	TAG_I[0].W	0		
2	TAG_I[0].b0	0.0		
3	TAG_I[0].b1	0.1		
4	TAG_I[0].b2	0.2		
5	TAG_I[0].b3	0.3		

All entries at the Driver Worksheet, exception by the **Station**, **Header** and **Address** are standard to all communication drivers. You should refer to Studio Communication Driver documentation about the configuration of the standard fields. This document describes the Station, Header and Address fields, which are specific to each communication driver.

### 4.3 Station and Header configuration

Parameter	Default Value	Valid values	Description
Header	DB0:0	See next table	Defines the type of variable to be read or written from or to the device and the reference of the initial address.

The **Header** field defines the type of variables that will be read or written from or to the device. It complies with the syntax:

- To Flags, Inputs and Outputs :  
**<Type> <Format>:<AddressReference>** (e.g.: MW:1)
- To Data-Blocks:  
**<Type><TypeGroup>:<AddressReference>** (e.g.: DB2:1)

- **Type**: Register type (M or F=Flags ; E or Q=Inputs ; A or O=Outputs ; DB=Data Blocks);  
- **Format**: Defines the treatment of the value read/written from/to the device (B=Byte ; W=Word). This parameter is optional and when it's omitted, the value configured in the **Addressing (Byte or Word)** is used as default. Notice that Data-Block registers (DB) does not accept this parameter. The Word format is always used for DB registers;  
- **AddressReference**: Initial Address (reference) of the group configured. This number ALWAYS refers to the **Byte Address Number**. See next table.

Header Address	Siemens Address		
Byte Address Number	Byte Address Number	Word Address Number	
Byte 0	Byte 0	W0	W1
Byte 1	Byte 1		
Byte 2	Byte 2	W2	W3
Byte 3	Byte 3		
Byte 4	Byte 4	W4	W5
Byte 5	Byte 5		
Byte 6	Byte 6	W6	W7
Byte 7	Byte 7		
Byte 8	Byte 8	W8	W9
Byte 9	Byte 9		
Byte 10	Byte 10	W10	
Byte 11	Byte 11		

Information regarding the parameter “Header”			
Type	Sample of syntax	Valid range of initial Address	Comment
Input	I:0, E:0, IB:0, IW:0, EB:0 or EW:0	Vary according to the equipment. (E.g. I0 to I127 for the 115U 944 PLC)	Physical Inputs. We can read its status from words or from bytes and we can, but should not, write on them.
Output	Q:0, A:0, QB:0, QW:0, AB:0 or AW:0	Vary according to the equipment. (E.g. Q0 to Q127 for the 115U 944 PLC)	Physical Outputs. We can read its status from words or from bytes and we can, but should not, write on them.
Flag	F:0, M:0, FY:0, FW:0, MY:0 or MW:0	Vary according to the equipment. (E.g. F0 to F255 for the 115U 944 PLC)	Internal Auxiliary Flag. Can be read or written by words, bytes or bits. Just take care about the “Order of bit writing” field at the Communication Parameters
Data Block	DB1:0	Vary according to the equipment. (E.g. DB0:0 to DB255:255 for the 115U 944 PLC)	We can read and write the whole data word from a Data Block and we can also read and write its block, always taking care with the “Order of bit writing” on the Communication Parameters window. In the Header, always type the DB number, followed by the initial data word number after the colon.

#### 4.4 Address Configuration

The body of the driver worksheet allows you to associate each tag to its respective address in the device. In the column **Tag Name**, you must type the tag from your application database. This tag will receive or send values from or to an address on the device. The address cells complies to the following syntax:

**<AddressOffset>.<Bit>** (e.g.: 10.2)

- **AddressOffset**: This parameter is added to the **AddressReference** (configured in the **Header** field) to compose the address of the group configure in the **Header** field;
- **Bit**: bit number (from 0 up to 15 from the word address - Data-Blocks; or from 0 up to 7 to the Inputs, Outputs and Flags). It's an optional parameter;

Sample of Addressing Configuration (Using WORD addressing)		
Address on the PLC	Header Field	Address Field
IW0	I:0	0
IW10	I:0	10
IW10	I:10	0
I0.0	I:0	0.0
I0.7	IB:0	0.7
I1.0	IW:1	0.0
I1:5	I:1	0.7
QW0	Q:0	0
QW10	QW:0	10
QW10	Q:10	0
Q0.0	QB:0	0.0
Q0.7	QW:0	0.7
Q1.0	Q:1	0.0
Q1:5	Q:1	0.7
FW0	FW:0	0
FW10	F:0	10
FW10	F:10	0
F0.0	F:0	0.0
F0.7	FW:0	0.7
F1.0	FB:1	0.0
F1:5	F:1	0.7
DB100, DW 0	DB100:0	0
DB100, DW 100	DB100:0	100
DB100, DW 100	DB100:100	0

**⚠ Caution:** It's not allowed to configure in the same worksheet a range of addresses greater than the maximum block size (data buffer length) supported by each PLC (255 bytes).

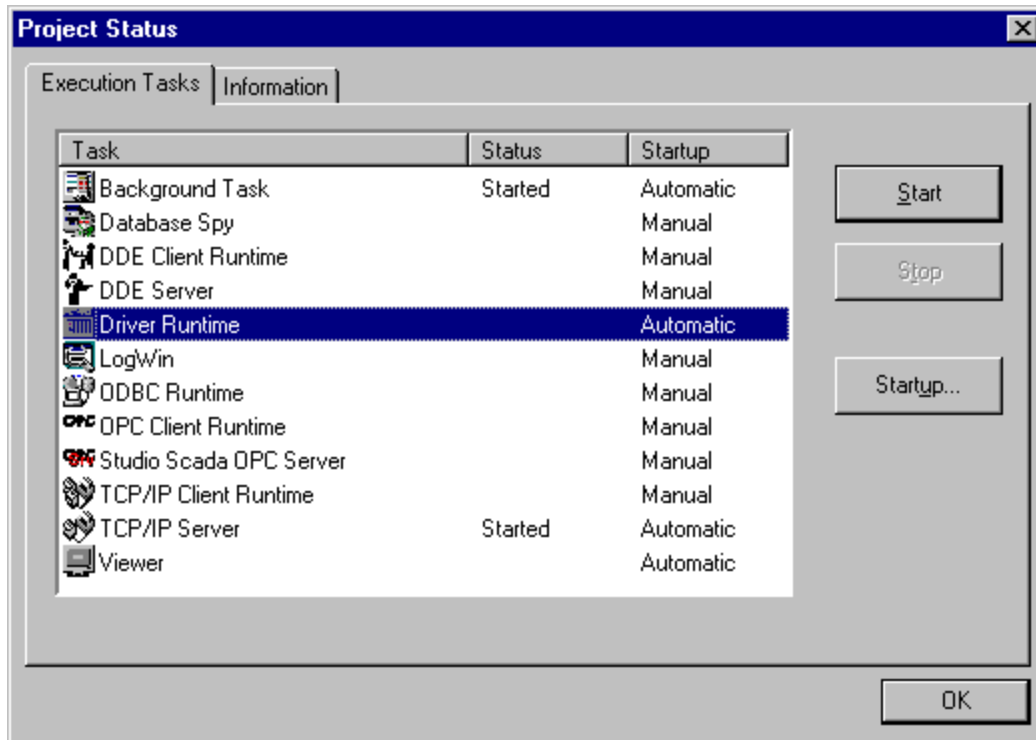
## 4.5 Device Configuration

The Siemens Step 5 Programmable Controller Manual indicates the following serial communication settings:

Baud Rate: 9600  
 Data bits: 8  
 Stop bits: 1  
 Parity: Even  
 Protocol: AS511  
 Status: Run

## 5 Execution

When installing the driver, it is automatically selected to execute when you start-up the Runtime Environment. To verify the if the driver is correctly enabled to start, use the menu option **Project + Status...**, and verify the task Driver Runtime




## 6 Troubleshooting

After each attempt to communicate using this driver, the tag configured in the field **Read Status** or **Write Status** will receive the error code regarding the kind of failure that occurred. The error messages are:

Error Code	Description	Possible causes	Procedure to solve
0	OK	Communication without problems	None.
1	Station number must always be 0	Wrong station number typed	Check on the driver configuration's worksheet that is getting this error if the configured station is different then. If so, correct it.
2	Only I, Q, F, DB1 – DB255 as allowed entries	An invalid Header has been typed or the tag that is inside this field has an invalid configuration.	Type a valid Header either on the header field or on the tag value. A lot of different valid headers are shown on the section IV.2
3	Only decimal values and bits allowed	An invalid Address has been typed.	Sometimes people type bit addressing with letters (0 to 9 and then A to F). This driver requires 0 to 15 or 0 to 7 as bit addressing. Take a look at the driver worksheet and correct it.
4	Block size exceeded	Block size is greater than 255	The highest allowed offset is 255. Reconfigure your Driver worksheet.
5	Protocol error	<ul style="list-style-type: none"> <li>- Fail in the protocol</li> <li>- Timeout waiting start a message</li> <li>- Cable not connected</li> <li>- PLC without a program</li> <li>- Non-existent address in the PLC</li> <li>- Incomplete answer sent by the PLC</li> </ul>	There is something wrong with the communication. Check the communication parameters, the PLC settings, cable, etc... Sometimes the PLC does not send a complete answer when the message is too big
6	Checksum error	Fail in the protocol	There is something wrong with the communication. Check the communication parameters and the PLC settings.
7	Non-existent module	Wrong header, station number, etc...	Check the Header and the values. It must be one of the valid.
8	Bit writing forbidden	It is not allowed to write bits.	Maybe we are trying to write a bit where it is not possible
9	Write blocks only in continuous areas!	We are trying to write with the Write trigger and the worksheet has spaces between the addresses	Correct the worksheet without letting any space between the addresses. To write group all the addresses areas must be continuous.
10	Wrong Interface to the Transfer Mode	Problems with the serial ports	If you are using the transit mode with a number different than 0, so you are using another COM port. To get this error you must have declared a wrong COM port on the "Transit mode from COMx" Communication Parameters field

11	Invalid Addressing Mode: Type BYTE or WORD	When configuring the Communication parameters we have typed another string but WORD or BYTE in the “Addressing” field	Type WORD or BYTE in the “Addressing” field, on the Communication Parameters Dialog.
12	Invalid bit writing order: use LH or HL	When configuring the Communication parameters we have typed another string but LH or HL in the “Writing bit order” field	Type LH or HL in the “Writing bit order” field, on the Communication Parameters Dialog.
-15	Timeout waiting start a message.	- Disconnected cables - PLC turned off, or in Stop or error mode - Wrong Station number - Wrong RTS/CTS control settings.	- Check the cable wiring - Check the PLC state. It must be RUN - Check the station number. - Check the right configuration. See on the section 2.2 the different RTS/CTS valid configurations.
-17	Timeout between rx char.	- PLC in stop or error mode - Wrong station number - Wrong parity - Wrong RTS/CTS configuration settings	- Check the cable wiring - Check the PLC state. It must be RUN - Check the station number. - Check the right configuration. See on the section 2.2 the different RTS/CTS valid configurations.

 **Tip:** The communication status can be verified by the **output** Window of the Studio’s environment or by the **LogWin** module. To set a log of events for **Field Read Commands**, **Field Write Commands** and **Serial Communication** click with the right button of the mouse on the output window and chose the option setting to select these log events. When testing under a Windows CE target, you can enable the log at the unit (Tools/Logwin) and verify the file celog.txt created at the target unit.

When you are not able to establish the communication with the PLC, first of all establish the communication between the PLC Programming Tool and the PLC. Very frequently the communication is not possible due to a hardware or cable problem, or due an error or lack of configuration at the PLC. Only after the communication between the PLC Programming Software and the PLC is working fine, you can test again the supervisory driver.

When testing the communication with the Studio, you should first use the application sample described at item 7 (if it’s available), instead of the new application that you are creating.

If is required to contact technical support, please have the following information available:

- Operating System (type and version): To find this information use the Tools/System Information option
- Project information: It is displayed using the option Project/Status from the Studio menu
- Driver version and communication log: Available from Studio Output when running the driver
- Device model and boards: please refer to hardware manufacture’s documentation

## 7 Application Sample

Studio provides a configured project to test the driver. It is strongly recommended to do some tests with this application before beginning the configuration of the customized project, for the follow reasons:


- To understand better the information covered in section 4 of this document.
- To verify that your configuration is working.
- To certify that the hardware used in the test (device + adapter + cable + PC) is in working conditions before beginning the configuration of the applications.

 **Note:** The Application Sample is not available for all drivers.

The Studio application is in the directory: **/COMMUNICATION EXAMPLES/<Driver Name>**

To perform the test, you need to follow these steps:

- Configure the device communication parameters using manufacturer programmer software.
- Open the application **/COMMUNICATION EXAMPLES/<Driver Name>**
- Execute the application
- To display the following screen with some information about the communication, please execute the Viewer module in the Studio.

 **Tip:** The application for testing may be used like a maintenance screen for the custom application.

## 8 History of Versions

Version	By	Date	Description of changes
11.01	Roberto V. Junior	30-jul-1999	<ul style="list-style-type: none"><li>▪ First driver version</li><li>▪ Driver available for Windows CE</li></ul>
11.02	Roberto V. Junior	19-Apr-2000	<ul style="list-style-type: none"><li>▪ Implemented consistence tests when communicating with DBs</li></ul>
11.03	José L. Teodoro	20-Jul-2001	<ul style="list-style-type: none"><li>▪ Fixed problems with Windows CE</li></ul>
11.04	José L. Teodoro	14-Nov-2001	<ul style="list-style-type: none"><li>▪ Inserted the word order option</li></ul>