

**SRTP Communication Driver**

Driver for TCP/IP Communication with GE FANUC Devices  
Using the Service Request Transfer Protocol (SRTP)

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## Introduction

The SRTP driver enables TCP/IP communication between the Studio system and GE FANUC devices using the Service Request Transfer Protocol (SRTP), according to the specifications discussed in this document.

This document will help you to select, configure and execute the SRTP driver, and it is organized as follows:

- **Introduction:** This section, which provides an overview of the document.
- **General Information:** Identifies all of the hardware and software components required to implement communication between the Studio system and the target device.
- **Selecting the Driver:** Explains how to select the SRTP driver in the Studio system.
- **Configuring the Device:** Describes how the target device must be configured to receive communication from the SRTP driver.
- **Configuring the Driver:** Explains how to configure the SRTP driver in the Studio system, including how to associate database tags with device registers.
- **Executing the Driver:** Explains how to execute the SRTP driver during application runtime.
- **Troubleshooting:** Lists the most common errors for this driver, their probable causes, and basic procedures to resolve them.
- **Sample Application:** Explains how to use a sample application to test the SRTP driver configuration
- **Revision History:** Provides a log of all changes made to the driver and this documentation.

### Notes:

- This document assumes that you have read the “Development Environment” chapter in Studio’s *Technical Reference Manual*.
- This document also assumes that you are familiar with the Microsoft Windows NT/2000/XP environment. If you are not familiar with Windows, then we suggest using the **Help** feature (available from the Windows desktop **Start** menu) as you work through this guide.

## General Information

This chapter identifies all of the hardware and software components required to implement TCP/IP communication between the SRTP driver in Studio and a GE FANUC device using SRTP.

The information is organized into the following sections:

- Device Specifications
- Network Specifications
- Driver Characteristics
- Conformance Testing

### Device Specifications

To establish communication, your target device must meet the following specifications:

- **Manufacturer:** GE FANUC
- **Compatible Equipment:** Series 90 PLC
- **Programmer Software:** LogicMaster 90 Programmer Controller Software

For a description of the device(s) used to test driver conformance, see “Conformance Testing” on the next page.

### Network Specifications

To establish communication, your device network must meet the following specifications:

- **Device Communication Port:** SRTP port
- **Physical Protocol:** Ethernet
- **Logic Protocol:** Service Request Transfer Protocol (SRTP)
- **Device Runtime Software:** None
- **Specific PC Board:** Ethernet
- **Link Cable Scheme:** Ethernet

### Driver Characteristics

The SRTP driver package consists of the following files, which are automatically installed in the `/DRV` subdirectory of Studio:

- **SRTP.INI:** Internal driver file. *You must not modify this file.*
- **SRTP.MSG:** Internal driver file containing error messages for each error code. *You must not modify this file.*
- **SRTP.PDF:** This document, which provides detailed information about the SRTP driver.
- **SRTP.DLL:** Compiled driver.

 **Note:**

You must use Adobe Acrobat® Reader™ to view the **SRTP.PDF** document. You can install Acrobat Reader from the Studio installation CD, or you can download it from Adobe’s Web site.

You can use the SRTP driver on the following operating systems:

- Windows NT/2000/XP
- Windows CE

For a description of the operating systems used to test driver conformance, see “Conformance Testing” below.

The SRTP driver supports the following registers:

Register Type	Length	Write	Read	Bit	Integer	Float	BCD
%I (Discrete Input)	1 Bit	–	•	•	–	–	–
%Q (Discrete Output)	1 Bit	•	•	•	–	–	–
%M (Discrete Internal)	1 Bit	•	•	•	–	–	–
%T (Discrete Temporary)	1 Bit	•	•	•	–	–	–
%AI (Analog Input)	2 Bytes	–	•	•	•	•	•
%AQ (Analog Output)	2 Bytes	•	•	•	•	•	•
%R (Internal Registers)	2 Bytes	•	•	•	•	•	•
%G (Global Genius Data)	1 Bit	•	•	•	–	–	–

**➡ Attention:**

- You can read bit values from %AI, %AQ and %R registers, but you cannot *write* bit values to these registers.

### Conformance Testing

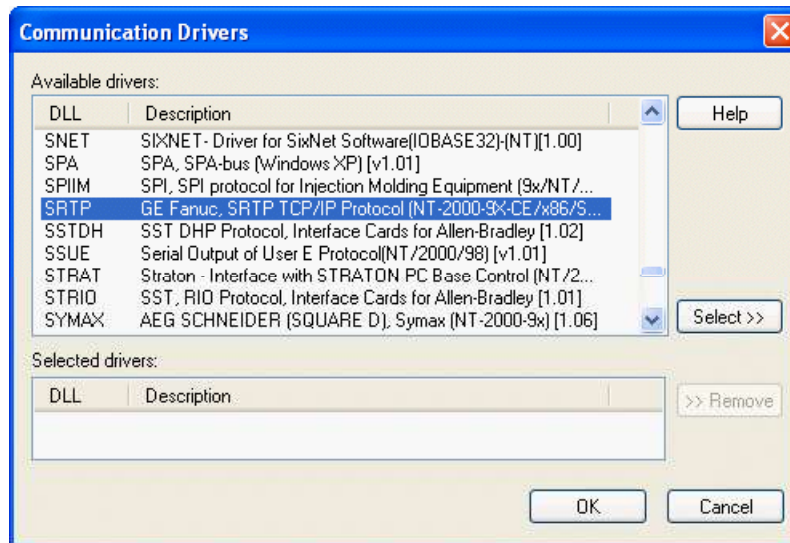
The following hardware/software was used for conformance testing:

- **Equipment:** PLC GE FANUC 90/30 CPU 350 with CMM 321 Ethernet Interface
- **Cable:** Ethernet cable
- **Operating System (development):** Windows XP with Service Pack 2
- **Operating System (target):**
  - Windows XP with Service Pack 2
  - Windows CE v4.0
- **Studio Version:** 6.1
- **Driver Version:** 1.05

## Selecting the Driver

When you install Studio, all of the communication drivers are automatically installed in the `\DRV` subdirectory but they remain dormant until manually selected for specific applications. To select the SRTP driver for your Studio application:

1. From the main menu bar, select **Insert** → **Driver** to open the *Communication Drivers* dialog.
2. Select the **SRTP driver** from the *Available Drivers* list, and then click the **Select** button.



**Communication Drivers Dialog**

3. When the **SRTP driver** is displayed in the **Selected Drivers** list, click the **OK** button to close the dialog. The driver is added to the *Drivers* folder, in the *Comm* tab of the Workspace.

**Note:**

It is not necessary to install any other software on your computer to enable communication between Studio and your target device. However, this communication can only be used by the Studio application; it cannot be used to download control logic to the device.

To download control logic to a GE FANUC device, you must also install the GE FANUC programming software (e.g., LogicMaster 90). For more information, please consult the documentation provided by the device manufacturer.

**Attention:**

For safety reasons, you must take special precautions when installing any physical hardware. Please consult the manufacturer's documentation for specific instructions.

## Configuring the Device

To configure the target device for communication, you only need to set its IP Address using the programming software (e.g., LogicMaster 90).

## Configuring the Driver

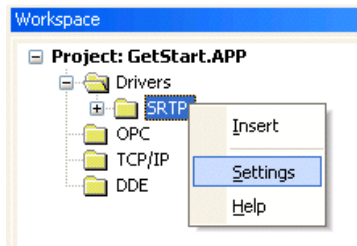
Once you have selected the SRTP driver in Studio, you must properly configure it to communicate with your target device. First, you must set the driver's communication settings to match the parameters set on the device. Then, you must build driver worksheets to associate database tags in your Studio application with the appropriate addresses (registers) on the device.

### Configuring the Communication Settings

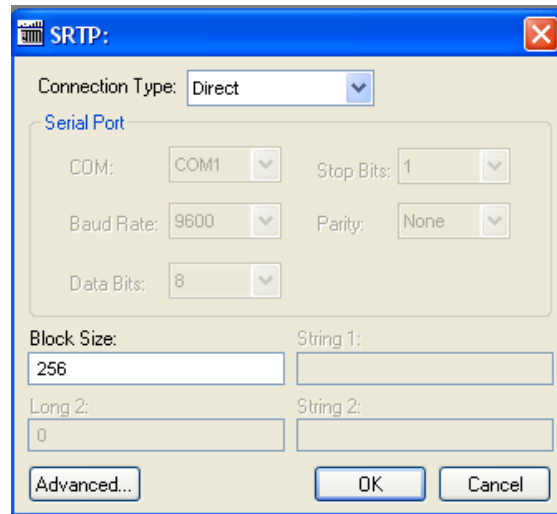
The communication settings are described in detail in the “Communication” chapter of the Studio *Technical Reference Manual*, and the same general procedures are used for all drivers. Please review those procedures before continuing.

Because the SRTP driver communicates via Ethernet, using the host PC's standard Network settings, **no additional configuration of the driver's communication settings is required**. However, you may still review the settings by accessing the *Communication Parameters* dialog:

1. In the *Workspace* pane, select the *Comm* tab and then expand the *Drivers* folder. The SRTP driver is listed here as a subfolder.
2. Right-click on the *SRTP* subfolder and then select the **Settings** option from the pop-up menu. The *SRTP: Communication Parameters* dialog is displayed:



Select Settings from the Pop-Up Menu



SRTP: Communication Parameters Dialog

3. In the *Communication Settings* dialog, configure the driver settings to enable communication with your target device. To ensure error-free communication, the driver settings must *exactly match* the corresponding settings on the device. Please consult the manufacturer's documentation for instructions how to configure the device and for complete descriptions of the settings.

Depending on your circumstances, you may need to configure the driver *before* you have configured your target device. If this is the case, then take note of the driver settings and have them ready when you later configure the device.

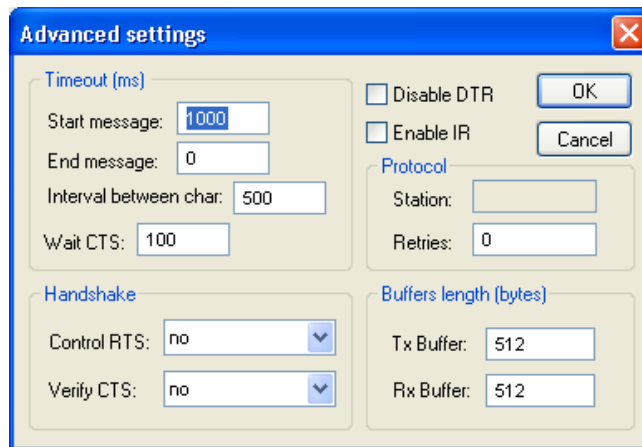
**Attention:**  
 For safety reasons, you **must** take special precautions when connecting and configuring new equipment. Please consult the manufacturer’s documentation for specific instructions.

The communication settings and their possible values are described in the following table:

Parameters	Default Value	Valid Values	Description
<b>Block Size</b>	256	50 to (Rx Buffer / 2)	Maximum number of bytes per message to be sent to the PLC.  <b>NOTE:</b> Rx Buffer value is found in the <i>Advanced Settings</i> dialog (see more information below).

**Note:**  
 If the value of **Block Size is 0 (zero)**, its value will be **half** of the value of the **Rx Buffer** setting (Default).  
 The minimum valid value of **Block Size** is 50 bytes because it is the minimum number of registers that can be addressed at one time for certain register types. For more information, see page 12.  
 The maximum valid value of **Block Size** is equal to **half** of the value of the **Rx Buffer** setting, which is found in the *Advanced Settings* dialog (see below).

- Click the **Advanced** button to open the *Advanced Settings* dialog:



**Advanced Settings Dialog**

Configure the parameters on this dialog as appropriate for your worksite. Consult the *Studio Technical Reference Manual* for instructions about configuring this dialog.

- Click **OK** to close the *Advanced Settings* dialog, and then click **OK** to close the *Communication Settings* dialog.

## Configuring the Driver Worksheets

Each selected driver includes a Main Driver Sheet and one or more Standard Driver Worksheets. The Main Driver Sheet is used to define tag/register associations and driver parameters that are in effect at all times, regardless of application behavior. In contrast, Standard Driver Worksheets can be inserted to define additional tag/register associations that are triggered by specific application behaviors.

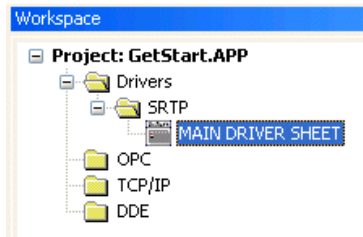
The configuration of these worksheets is described in detail in the “Communication” chapter of the Studio *Technical Reference Manual*, and the same general procedures are used for all drivers. Please review those procedures before continuing.

For the purposes of this document, only SRTP driver-specific parameters and procedures are discussed here.

### MAIN DRIVER SHEET

When you select the SRTP driver and add it to your application, Studio automatically inserts the *Main Driver Sheet* in the *SRTP driver* subfolder. To configure the Main Driver Sheet:

1. Select the *Comm* tab in the *Workspace* pane.
2. Open the *Drivers* folder, and then open the *SRTP* subfolder:



**Main Driver Sheet in the SRTP Subfolder**

3. Double-click on the **MAIN DRIVER SHEET** icon to open the following worksheet:

	Tag Name	Station	I/O Address	Action	Scan	Div
1	I[1]	192.168.0.200	%I:1	Read+Write	Always	
2	I[2]	192.168.0.200	%I:2	Read+Write	Always	
3	Q[1]	192.168.0.200	%Q:1	Read+Write	Always	
*				Read+Write	Always	

**Opening the Main Driver Sheet**



Most of the fields on this sheet are standard for all drivers; see the “Communication” chapter of the *Technical Reference Manual* for more information on configuring these fields. However, the **Station** and **I/O Address** fields use syntax that is specific to the SRTP driver.

4. For each table row (i.e., each tag/register association), configure the **Station** and **I/O Address** fields as follows:

- **Station** field: Specify the IP Address of the target device, using the following syntax:

*<IP Address>*

Example — 192.168.0.200

Where *<IP Address>* is the device’s IP Address on the Ethernet TCP/IP network.

- **I/O Address**: Specify the address of the associated device register.

For *Discrete Input*, *Discrete Output*, *Discrete Internal*, *Discrete Temporary* and *Global Genius Data* types, use the following syntax:

*<Register Type>:<Address>*

Example — %R:100

For *Analog Input*, *Analog Output* and *Internal Register* types, use the following syntax:

*<Register Type>:[Data Type]<Address>.[Bit]*

Example — %R:10.2

Where:

- *<Register Type>* : GE FANUC register type. Valid values are %I (Discrete Input), %Q (Discrete Output), %M (Discrete Internal), %T (Discrete Temporary), %AI (Analog Input), %AQ (Analog Output), %R (Internal Register), and %G (Global Genius Data).
- *[Data Type]* (optional): Type of analog data. Valid values are DW (Double Word) , F (Float) and BCD (BCD). Although this parameter is optional, if no type is specified then it is Word by default.
- *<Address>* : Address of the device register. This value must be within the valid range for the specified *<Register Type>*, according to the following table:

Register Type	Valid Range of Address	Comments
%I	1 to 512	Discrete Input
%Q	1 to 512	Discrete Output
%M	1 to 1024	Discrete Internal
%T	1 to 256	Discrete Temporary
%AI	1 to 1024	Analog Input
%AQ	1 to 256	Analog Output
%R	1 to 9999	Internal Registers
%G	1 to 1280	Global Genius Data (Boolean)

- *[Bit]* (optional): The bit number (from 0 to 15) of the address.

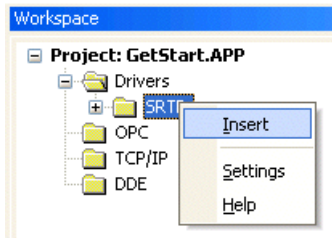
## STANDARD DRIVER WORKSHEET

When you select the SRTP driver and add it to your application, it has only a Main Driver Sheet by default (see previous section). However, you may insert additional Standard Driver Worksheets to define tag/register associations that are triggered by specific application behaviors. Doing this will optimize communication and improve system performance by ensuring that tags/registers are scanned only when necessary – that is, only when the application is performing an action that requires reading or writing to those specific tags/registers.

**Note:**  
 We recommend configuring device registers in sequential blocks in order to maximize performance.

To insert a new Standard Driver Worksheet:

1. In the *Comm* tab, open the *Drivers* folder and locate the *SRTP* subfolder.
2. Right-click on the *SRTP* subfolder, and then select **Insert** from the pop-up menu:



**Inserting a New Worksheet**

A new driver worksheet is inserted into the *SRTP* subfolder, and the worksheet is opened for configuring:

**SRTP001.DRV**

Description:   Increase priority

Read Trigger:  Enable Read when Idle:  Read Completed:  Read Status:

Write Trigger:  Enable Write on Tag Change:  Write Completed:  Write Status:

Station:  Header:   Min:   
 Max:

	Tag Name	Address	Div	Add
1	I[1]	1	0.000000	0.000000
2	I[2]	2	0.000000	0.000000

**SRTP driver Worksheet**

Most of the fields on this worksheet are standard for all drivers; see the “Communication” chapter of the *Technical Reference Manual* for more information on configuring these fields. However, the **Station**, **Header**, and **Address** fields use syntax that is specific to the SRTP driver.

3. Configure the **Station** and **Header** fields as follows:

- **Station** field: Specify the IP Address of the target device, using the following syntax:

**<IP Address>**

Example — 192.168.0.200

Where **<IP Address>** is the device's IP Address on the Ethernet TCP/IP network.

- **Header** field: Specify a single register type on the target device. The addresses declared in the *Body* of the worksheet will automatically be of this type. When Read/Write operations are executed for the entire worksheet (see **Read Trigger** and **Write Trigger** above), it scans the entire block of registers from the first address to the last.

The **Header** field uses the following syntax:

**<Register Type>**

Example — %R

Where **<Register Type>** is the GE FANUC register type. Valid values are %I (Discrete Input), %Q (Discrete Output), %M (Discrete Internal), %T (Discrete Temporary), %AI (Analog Input), %AQ (Analog Output), %R (Internal Register), and %G (Global Genius Data).

After you edit the **Header** field, Studio checks the syntax to determine if it is valid. If the syntax is invalid, then Studio automatically inserts a default value of %I.

You can also specify an indirect tag (e.g. {header}), but the tag that is referenced must follow the same syntax and contain a valid value.

4. For each table row (i.e., each tag/register association), configure the **Address** field using the following syntax...

For *Discrete Input*, *Discrete Output*, *Discrete Internal*, *Discrete Temporary* and *Global Genius Data* types, use the following syntax:

**<Address>**

Example — 100

For *Analog Input*, *Analog Output* and *Internal Register* types, use the following syntax:

**[Data Type]<Address>.[Bit]**

Example — 10.2

Where:

- **[Data Type]** (optional): Type of analog data. Valid values are **DW** (Double Word), **F** (Float) and **BCD** (BCD). Although this parameter is optional, if no type is specified then it is Word by default.
- **<Address>**: Address of the device register.
- **[Bit]** (optional): The bit number (from 0 to 15) of the address.

For examples of how device registers are specified using **Header** and **Address**, see the following table:

Address on the Device	Header Field	Address Field
%I0001	%I	1
%I0010	%I	10
%I0512	%I	512
%Q0512	%Q	512
%M1020	%M	1020
%T200	%T	200
%AI060	%AI	60
%AI060 (bit 0)	%AI	60 . 0
%AQ080	%AQ	80
%AQ080 (bit 3)	%AQ	80 . 3
%R0100	%R	100
%R0100 (bit 7)	%R	100 . 7
%R09900	%R	9900
%G0500	%G	500
%G0001	%G	1
%I0001	%I	1
%I0010	%I	10

The SRTP driver is limited in that it will always request at least 5 bytes on the PLC for register types %AI, %AQ and %R, even when you try to read only a single register. This requires special precautions when addressing registers close to the limits of these register types.

The same happens with register types %I, %Q, %M, %T and %G — the SRTP driver will always request at least 50 bytes on the PLC even when you are trying to read only a single register. Therefore, the same precaution is required when addressing registers close to the limits of these register types.

For more information about device registers and addressing, please consult the manufacturer’s documentation.

➔ **Attention:**

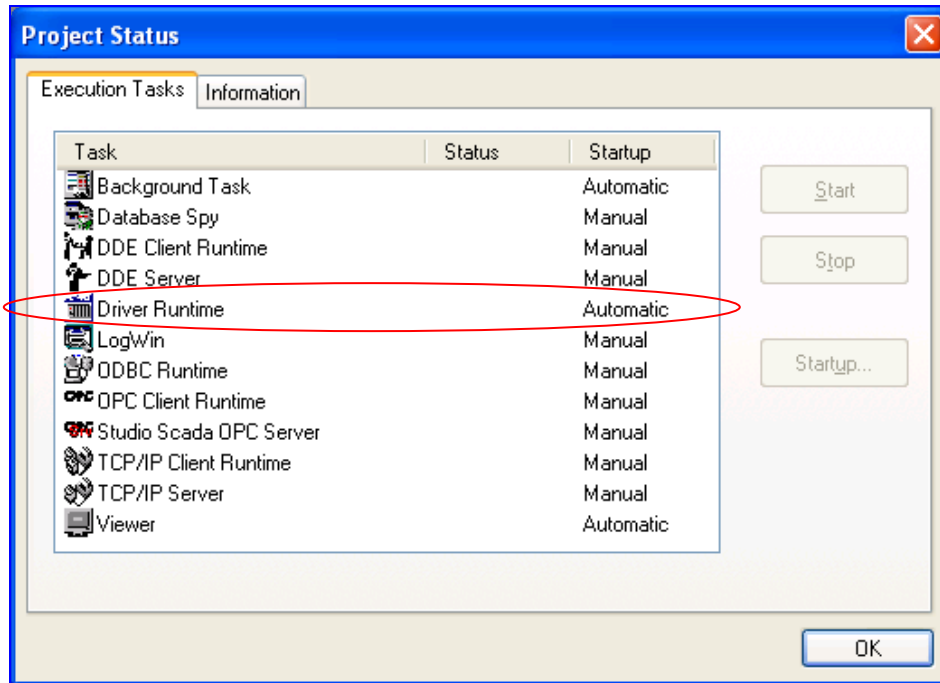
- You can read bit values from %AI, %AQ and %R registers, but you cannot *write* bit values to these registers.
- You must not configure a range of addresses greater than the maximum block size (data buffer length) supported by each device within the same worksheet. The maximum data buffer length for this driver is 64 bytes per standard driver worksheet.

## Executing the Driver

By default, Studio will automatically execute your selected communication driver(s) during application runtime. However, you may verify your application's runtime execution settings by checking the *Project Status* dialog.

To verify that the the communication driver(s) will execute correctly:

1. From the main menu bar, select **Project** → **Status**. The *Project Status* dialog displays:



*Project Status Dialog*

2. Verify that the *Driver Runtime* task is set to **Automatic**.
  - If the setting is correct, then proceed to step 3 below.
  - If the **Driver Runtime** task is set to **Manual**, then select the task and click the **Startup** button to toggle the task's *Startup* mode to **Automatic**.
3. Click **OK** to close the *Project Status* dialog.
4. Start the application to run the driver.

## Troubleshooting

If the SRTP driver fails to communicate with the target device, then the database tag(s) that you configured for the **Read Status** or **Write Status** fields of the Main Driver Sheet will receive an error code. Use this error code and the following table to identify what kind of failure occurred.

Error Code	Description	Possible Causes	Procedure to Solve
0	OK	Communication without problems	None required.
1	Failed to allocate memory	Insufficient memory for driver buffers	<ul style="list-style-type: none"> <li>Check the buffer configuration and try to reduce the buffer size. (See <i>Configuring the Communication Parameters</i>.)</li> <li>Increase the computer or HMI memory.</li> </ul>
2	Error connecting	Cannot establish a TCP/IP connection to the device	<ul style="list-style-type: none"> <li>Check the device to be sure it is connected to the network.</li> <li>Check the IP Address specified in the worksheet <b>Station</b> field to be sure it matches the device's IP Address.</li> </ul>
3	Insufficient buffer	Block Size is higher than RX Buffer or higher than TX Buffer.	<ul style="list-style-type: none"> <li>Check Block Size, RX Buffer and TX Buffer configuration, RX Buffer must be at least twice the Block Size value</li> </ul>
-34	Invalid Address	Invalid Address provided in the worksheet <b>Address</b> field	<ul style="list-style-type: none"> <li>If you used a tag in the <b>Header</b> field, verify that the tag value is valid for the configured addresses.</li> <li>If you are not using tags, and you changed the <b>Header</b> after configuring the addresses, the addresses may be invalid for the new <b>Header</b>.</li> </ul>
-37	Invalid Header	Invalid Header provided in the worksheet <b>Header</b> field	Type a valid header into the <b>Header</b> field (see page <b>Error! Bookmark not defined.</b> for configuration instructions).
-38	Invalid Station	Invalid Station provided in the worksheet <b>Station</b> field	Type a valid station into the <b>Station</b> field (see page <b>Error! Bookmark not defined.</b> for configuration instructions).
-39	Invalid Block Size	Offset specified in worksheet is too big and the message cannot be framed.	Change the offsets or create a new worksheet.
-15	Timeout waiting to start a message	<ul style="list-style-type: none"> <li>Disconnected cables</li> <li>PLC turned off, or in stop or error mode</li> <li>Wrong station number</li> <li>Wrong RTS/CTS configuration settings</li> </ul>	<ul style="list-style-type: none"> <li>Check the cable wiring.</li> <li>Check the PLC state; it must be RUN.</li> <li>Check the station number.</li> <li>Check the configuration. See the <i>Studio Technical Reference Manual</i> for valid RTS/CTS settings.</li> </ul>
-17	Timeout between rx chars	<ul style="list-style-type: none"> <li>PLC in stop or error mode</li> <li>Wrong station number</li> <li>Wrong parity</li> <li>Wrong RTS/CTS configuration settings</li> </ul>	<ul style="list-style-type: none"> <li>Check the PLC state; it must be RUN.</li> <li>Check the station number.</li> <li>Check the configuration.</li> <li>Check the configuration. See the <i>Studio Technical Reference Manual</i> for valid RTS/CTS settings.</li> </ul>

⇒ **Tip:**

You can monitor communication status by establishing an event log in Studio's *Output* window (*LogWin* module). To establish a log for **Field Read Commands**, **Field Write Commands** and **Serial Communication**, right-click in the *Output* window and select the desired options from the pop-up menu.

You can also use the *LogWin* module (**Tools** → **LogWin**) to establish an event log on a remote unit that runs Windows CE. The log is saved on the unit in the `ce1og.txt` file, which can be downloaded later.

If you are unable to establish communication between Studio and the target device, then try instead to establish communication using the device's own programming software (e.g., LogicMaster 90). Quite often, communication is interrupted by a hardware or cable problem or by a device configuration error. If you can successfully communicate using the programming software, then recheck the driver's communication settings in Studio.

To test communication between Studio and the device, we recommend using the sample application provided rather than your new application.

If you must contact us for technical support, please have the following information available:

- **Operating System** (type and version): To find this information, select **Tools** → **System Information**.
- **Project Information**: To find this information, select **Project** → **Status**.
- **Driver Version** and **Communication Log**: Displays in the Studio *Output* window when the driver is running.
- **Device Model** and **Boards**: Consult the hardware manufacturer's documentation for this information.

## Sample Application

A sample application that employs the SRTP driver is provided on the Studio installation CD. We strongly recommend that you use this sample application to test the driver *before* you develop your own applications, for the following reasons:

- To better understand the information and instructions provided in this document;
- To verify that your driver configuration is working satisfactorily with the target device; and
- To ensure that the all of hardware used in the test (i.e. the device, adapter, cable, and PC) is functioning safely and correctly.

 **Note:**

The following instructions assume that you are familiar with developing project applications in Studio. If you are not, then please review the relevant chapters of the Studio *Technical Reference Manual* before proceeding.

To use the sample application:

1. Configure the device's communication settings according to the manufacturer's documentation.
2. Run Studio.
3. From the main menu bar, select **File → Open Project**.
4. Insert the Studio installation CD and browse it to find the sample application. It should be located in the directory `\COMMUNICATION EXAMPLES\SRTP`.
5. Select and open the sample application.
6. Configure and test the driver, as described in the rest of this document.

When you have thoroughly tested the driver with your target device, you may proceed with developing your own Studio application projects.

 **Tip:**

You can use the sample application screen as the maintenance screen for your own applications.



## Revision History

Doc Version	Driver Version	Author	Date	Description of Changes
A	1.00	José L. Teodoro	16 Jan 2002	First driver version.
B	1.01	Eric Vigiani	22 Apr 2003	<ul style="list-style-type: none"> <li>▪ Modified maximum block size for the MAIN DRIVER SHEET.</li> <li>▪ Fixed bug when reading bits.</li> </ul>
	1.02	Eric Vigiani	26 Nov 2003	Included the data format to %AI, %AQ and %R.
C	1.03	Diego Barros	20 Jan 2006	Implemented Maximum Block Size.
D	1.03	Michael D. Hayden	30 Jun 2006	Edited for language and usability.
E	1.04	Graziane C. Forti	14 Sep 2006	<ul style="list-style-type: none"> <li>▪ Implemented 512 default Block Size</li> <li>▪ Fixed problem (Invalid Block Size) when configured Block Size field in the MAIN DRIVER SHEET</li> </ul>
F	1.04	Michael D. Hayden	08 Dec 2006	Additional editing to merge previously forked documents.
G	1.04	Plínio M. Santana	22 Dec 2006	Added comment about the PLC's requests for each register type.
H	1.04	Plínio M. Santana	12 Jan 2007	Inserted Sample Application section.
I	1.04	Michael D. Hayden	29 Jan 2007	<ul style="list-style-type: none"> <li>▪ Minor editing of Plínio's revisions regarding register addresses.</li> <li>▪ Fixed some pagination issues.</li> </ul>
J	1.05	Rafael R. Fernandes	05 Jun 2007	<ul style="list-style-type: none"> <li>▪ Changed Block Size default value to 256 or half RX Buffer value.</li> <li>▪ Added error 27 to Troubleshooting</li> </ul>
K	1.06	Rafael R. Fernandes	25 Apr 2008	<ul style="list-style-type: none"> <li>▪ Implemented BCD datatype</li> <li>▪ Fixed problem with ending addresses</li> </ul>
L	10.1	Marcelo Carvalho	07 Jan 2009	<ul style="list-style-type: none"> <li>▪ Updated driver version, no changes in the contents.</li> </ul>
M	10.2	Lourenço Teodoro	02 Jul 2009	<ul style="list-style-type: none"> <li>▪ Improved driver error codes</li> </ul>