

Yokogawa WT 210/230 Driver

File Name	WT210230.dll
Manufacturer	Yokogawa América do Sul
Devices	WT210 and WT230 digital power meters
Protocol	IEEE 488.2-1992
Version	2.0.2
Last Update	08/13/2026
Platform	Win32
Dependencies	IOKit version 2.0 or later
Superblock Readings	No
Level	0

Introduction

This Driver implements the IEEE 488.2-1992 protocol, allowing applications developed by **Elipse Software** to communicate with digital power meter devices of models WT210 and WT230 by Yokogawa América do Sul.

Yokogawa WT 210/230 Driver combines into a single device voltage, current, harmonics, frequency, and power measurements, as well as other functions, such as mathematics and trigonometry functions, integration and embedded communication commands.

Preparing a Device

Connecting a device to an **Elipse Software** application must be performed by using a serial cable from a WT210 or WT230 meter to the computer where that application is executing. In the front panel of a device, set up the communication parameters described on the next table.

Configuration parameters

PARAMETER	VALUE
Mode	488.2
Handshaking	Hand0 (no handshaking)
Data Format	For '0' (Data Length = 8, Parity = No, Stop bit = 1)
Baud Rate	b 9600
Interface	232C
Terminator	LF

Driver Configuration

[P] parameters are not used. All configurations are performed on the configuration window of this Driver. For more information about **Setup** and **Serial** tabs, please check topic **Documentation of I/O Interfaces**.

Configuring Properties

Configuration parameters to communicate with devices by Yokogawa América do Sul are available on the properties window of this Driver.

In addition to this properties window, these settings can also be defined at run time in **Elipse E3**, **Elipse Power**, or **Elipse Water** applications. To do so, initialize this Driver in **Offline** mode, that is, execute an application with the **Start driver OFFLINE** option enabled, which is configured on the **Setup** tab of the properties window. The configuration options of this Driver are described on the next table.

Configuration options for Yokogawa WT 210/230 Driver

TAB	PARAMETER	OFFLINE STRING	DATA TYPE	DESCRIPTION
Setup	Physical Layer	IO.Type	Text	By default, use the Serial option
	Timeout	IO.TimeoutMs	Number	A time limit, in milliseconds, to receive data from a device's response. For example, the value 1000 defines a 1 (one) second limit
Serial	Port	IO.Serial.Port	Number	By default, use the same value set on a device. Possible values are 1 : COM1, 2 : COM2, 3 : COM3, or n : COMn
	Baud rate	IO.Serial.Baudrate	Number	By default, use the same value set on a device. For example, the value 9600 defines a baud rate of 9600 bps for serial communication
	Data bits	IO.Serial.DataBits	Number	By default, use the same value set on a device. Possible values are 7 : 7 (seven) bits or 8 : 8 (eight) bits
	Parity	IO.Serial.Parity	Number	By default, use the same value set on a device. Possible values are 0 : No Parity, 1 : Odd Parity, 2 : Even Parity, 3 : Mark Parity, or 4 : Space Parity
	Stop bits	IO.Serial.StopBits	Number	By default, use the same value set on a device. Possible values are 0 : Stop Bit 1, 1 : Stop Bit 1.5, or 2 : Stop Bit 2

All offline properties must be configured via PLC Tags in **String** format, by using the *N1* parameter equal to -1 (minus one), the *N2* parameter equal to 0 (zero), the *N3* parameter equal to 0 (zero), and the *N4* parameter equal to 3 (three). For more details and examples, please check topic **Documentation of I/O Interfaces**.

Tag Reference

During initialization, this Driver automatically tries to configure communication to disable **HEADERS** and **VERBOSE** of commands.

This initialization is important to ensure a correct interpretation or decoding of frames. Through these settings, this Driver can avoid delays when processing frames from the protocol. Therefore, if the initialization of this Driver is not successful, it returns an error and the initialization fails.

Users can retry this activation but, if the error persists, it is advisable to check whether a device has communication problems or if communication parameters are correctly configured.

All Tags of this Driver must be referenced by using *N* parameters, according to the next topics.

Common Commands

Use a PLC or Block Tag to execute common commands and configure their parameters according to the next table.

Parameters for common commands

N1 or B1	Code of a command. Please check the next table for more information
N2 or B2	Not used, leave it in 0(zero)
N3 or B3	Not used, leave it in 0(zero)
N4 or B4	Not used, leave it in 0(zero)

The next table contains a list of all common commands supported by this Driver.

Common commands

N1 OR B1	COMMAND	TYPE OF TAG	DESCRIPTION	OPERATION
10	Identification of a model	Block	Returns information about a device. The available Elements are 1 : Model of a device, 2 : Type of a device, 3 : Serial number of a device, and 4 : Firmware version of a device	Read-only
11	Device reset	PLC	Performs a software reset in a device	Write-only
12	Trigger	PLC	Same function as the TRIGGER key in the front panel of a device	Write-only

N1 OR B1	COMMAND	TYPE OF TAG	DESCRIPTION	OPERATION
13	Software and hardware test	PLC	Executes a hardware and software test, including I/O, and returns the status of a device. Possible values are 0 : WT OK or 1 : WT NOK	Read-only

Harmonics Commands

Use a PLC Tag to execute harmonics commands and configure their parameters according to the next table.

Parameters for harmonics commands

N1	50
N2	Not used, leave it in 0(zero)
N3	Not used, leave it in 0(zero)
N4	Options. Please check the next table for more information

This command requests or sets the current modes for measuring harmonics, according to the options described on the next table.

Harmonics commands

N4	OPTION	DESCRIPTION	OPERATION
0	Request	Requests a reading configuration of harmonics. Possible values are 0 : OK or 1 : NOK	Read-only
1	ON	Enables the harmonics measurement mode	Write-only
2	OFF	Disables the harmonics measurement mode	Write-only

Measurement Commands

Use a PLC Tag to execute measurement commands and configure their parameters according to the next table.

Parameters for measurement commands

N1	Code of a command. Please check the next table for more information
N2	Parameter of a command, if required
N3	Parameter of a command, if required
N4	Parameter of a command, if required

The next table contains a list of measurement commands supported by this Driver.

Measurement commands

N1	COMMAND	N2	N3	N4	DESCRIPTION	OPERATION
100	Extended status register (ESER)	Not used, leave it in (zero)	Not used, leave it in (zero)	Not used, leave it in (zero)	Several statuses information are stored in the extended status register and returned when executing this command. After execution, statuses information are updated. Returns a 16-bit status value with a structure described on table Structure of bits for status information	Read-only
101	Communication configuration	Mode. Possible values are 0 : :REM, 1 : :HEAD, or 2 : :VERB	Not used, leave it in (zero)	Options. Possible values are 0 : Request (read-only), 1 : ON (write-only), or 2 : OFF (write-only)	This command configures the main communication options. Returns for the Request option (the <i>N4</i> parameter equal to zero) the values 0 : OFF or 1 : ON. Please check the next note for more information	Reading or writing
102	Integration	Mode. Possible values are 0 : :STAR, 1 : :STOP, 2 : :RES, or 3 : :MODE	Not used, leave it in (zero)	Integration. Possible values are 0 : NORM or 1 : CONT. This parameter is only valid if the <i>N2</i> parameter is equal to 3 (three, :MODE)	Energy integration. Returns for :MODE (the <i>N2</i> parameter equal to three) the values 0 : Normal or 1 : Continuous. Please check the next note for more information	Read-only
103	Measurement	Measurement. Possible values are 0 : V, 1 : A, 2 : W, 3 : VA, 4 :	Element. Possible values are 0 : :ALL (write-only),	Options. Possible values are 0 : Request (read-only), 1 :	Enables or disables reading normal measurements.	Reading or writing

N1	COMMAND	N2	N3	N4	DESCRIPTION	OPERATION
		VAR, 5 : PF, 6 : DEGR, 7 : VHZ, 8 : AHZ, 9 : WH, 10 : WHP, 11 : WHM, 12 : AH, 13 : AHP, 14 : AHM, 15 : VPK, or 16 : APK	1 : :SIGM (reading or writing), 2 : :ELEM1 (reading or writing), 3 : :ELEM2 (reading or writing), or 4 : :ELEM3 (reading or writing)	ON (write-only), or 2 : OFF (write-only)	Returns for the Request option (the <i>N4</i> parameter equal to zero) the values 0 : OFF or 1 : ON. Please check table Options for the Measurement command for more information	
104	Harmonics measurement	Harmonic. Possible values are 0 : SYNC, 1 : VTHD, 2 : V, 3 : VCON, 4 : ATHD, 5 : A, 6 : ACON, 7 : PF, 8 : W, 9 : WCON, 10 : VDEG, or 11 : ADEG	Not used, leave it in (zero)	Options. Possible values are 0 : Request (read-only), 1 : ON (write-only), or 2 : OFF (write-only)	Enables or disable reading harmonic measurements. Returns for the Request option (the <i>N4</i> parameter equal to zero) the values 0 : OFF or 1 : ON	Reading or writing
105	Time Math functions	Item. Possible values are 0 : TIME or 1 : MATH	Not used, leave it in (zero)	Options. Possible values are 0 : Request (read-only), 1 : ON (write-only), or 2 : OFF (write-only)	Enables or disables reading TIME or MATH parameters. Returns for the Request option (the <i>N4</i> parameter equal to zero) the values 0 : OFF or 1 : ON	Reading or writing
106	Harmonics presets	Presets. Possible values are 0 : VPAT, 1 : APAT, 2 : WPA, 3 : DPAT, 4 : ALL, or 5 : CLE	Not used, leave it in (zero)	Not used, leave it in (zero)	Enables or disables reading harmonics presets. Please check table Options for harmonics presets for more information	Write-only

NOTES

- It is not advisable to change the communication parameters of the **Communication configuration** command during the execution of an application, because this Driver depends on this configuration to decode data. Also, the behavior of this Driver may become unpredictable if those parameters are changed while it is active.
- For all other modes of the **Integration** command, please check the result of its execution using the ITG and ITM bits of the **Extended Status Register** (ESER). To enable a **Request** command, change the type of a Tag to **Reading** and the **Mode** parameter to 3 (three).

Structure of bits for status information

BIT	DESCRIPTION
0	UPD (Updating)
1	ITG (Integrating)
2	ITM (Integrate timer busy)
3	OVRS (Sigma results overflow)
4	FOV (Frequency over)
5	SRB (Store/Recall busy)
6	OVR1 (Element 1: Measured data over)
7	POV1 (Element 1: Voltage peak over)
8	POA1 (Element 1: Current peak over)
9	OVR2 (Element 2: Measured data over)
10	POV2 (Element 2: Voltage peak over)
11	POA2 (Element 2: Current peak over)
12	OVR3 (Element 3: Measured data over)
13	POV3 (Element 3: Voltage peak over)
14	POA3 (Element 3: Current peak over)
15	None

Options for the Measurement command

OPTION	N3	DESCRIPTION
:SIGM	1 (one)	This option is not available in Reading mode for WT210 models
:ELEM1	2 (two)	For WT210 models (one phase), this option corresponds to Element 1 (one)
:ELEM2	3 (three)	For WT230 models (three phases and three wires), this option corresponds to Elements 1 (one) and 3 (three)
:ELEM3	4 (four)	For WT230 models (three phases and four wires), this option corresponds to Elements 1 (one), 2 (two), and 3 (three)

Options for harmonics presets

PRESET	N2	DESCRIPTION
VPAT	0 (zero)	Sets SYNC , VTHD , V , and VCON harmonics to ON and all others to OFF
APAT	1 (one)	Sets SYNC , ATHD , A , and ACON harmonics to ON and all others to OFF
WPA	2 (two)	Sets SYNC , PF , W , and WCON harmonics to ON and all others to OFF
DPAT	3 (three)	Sets SYNC , VDEG , and ADEG harmonics to ON and all others to OFF
ALL	4 (four)	Sets all harmonics to ON
CLE	5 (five)	Sets all harmonics to OFF

Configuration Commands

Use a PLC Tag to execute configuration commands and configure their parameters according to the next table.

Parameters for configuration commands

N1	Code of a command. Please check the next table for more information
N2	Parameter of a command, if required
N3	Parameter of a command, if required
N4	Parameter of a command, if required

The next table contains a list of configuration commands supported by this Driver.

Configuration commands

N1	COMMAND	N2	N3	N4	DESCRIPTION	OPERATION
200	Measurement mode	Mode. Possible values are 0 : RMS, 1 : VME, or 2 : DC	Not used, leave it in 0 (zero)	Not used, leave it in 0 (zero)	Configures a measurement mode. When reading returns the values RMS , VME , or DC , according to the mode specified in the N2 parameter. When writing does not return any value	Reading or writing
201	Wiring Schema	Schema. Possible values are 0 : P1W2, 1 : P1W3, 2 : P3W3,	Not used, leave it in 0 (zero)	Not used, leave it in 0 (zero)	Configures or requests the wiring schema of a device.	Reading or writing

N1	COMMAND	N2	N3	N4	DESCRIPTION	OPERATION
		3: P3W4, or 4: V3A3			When reading returns the value of the selected Schema parameter. When writing does not return any value. NOTE: This command only applies to the WT230 model, because the WT210 model only have a single wiring schema	
202	Voltage	Range. Possible values are 0 : :AUTO or 1 : :RANG	Scale. Possible values are 0 : 15V, 1 : 30V, 2 : 60V, 3 : 150V, 4 : 300V, or 5 : 600V	Options. Possible values are 0 : Request (read-only), 1 : ON (write-only), or 2 : OFF (write-only)	Voltage configuration. For the N2 and N4 parameters equal to 0 (zero) returns the values 0 : OFF or 1 : ON. For the N2 parameter equal to 1 (one) and the N4 parameter equal to 0 (zero) returns 15, 30, 60, 150, 300, or 600 (V)	Reading or writing
203	Current	Range. Possible values are 0 : :AUTO, 1 : :RANG, or 2 : :EXT	Scale. Please check table Available scale options for a Current command for more information	Options. Possible values are 0 : Request (read-only), 1 : ON (write-only), or 2 : OFF (write-only). For the N2 parameter equal to 1 (one), possible values are 0 : Request (read-only), 1 : WT210 model, 2 : WT230 model (three phases and three wires), or 3 : WT230 model	Current configuration. For the N2 and N4 parameters equal to 0 (zero) returns 0 : OFF or 1 : ON. For the N2 parameter equal to 1 (one) and the N4 parameter equal to 0 (zero) returns 0.5, 1, 2, 5, 10, or 20. For the N2 parameter equal to 1 (one), the N4 parameter	Reading or writing

N1	COMMAND	N2	N3	N4	DESCRIPTION	OPERATION
				(three phases and four wires)	equal to 0 (zero), and WT210 models, returns the values 5 (five), 10, 20, 50, 100, or 200 (mA)	
204	Enable TP/TC	Not used, leave it in 0 (zero)	Not used, leave it in 0 (zero)	Options. Possible values are 0 : Request (read-only), 1 : ON (write-only), or 2 : OFF (write-only)	Enables or disables TP and TC configuration for a command with the <i>N1</i> parameter equal to 205. Returns for the Request option (the <i>N4</i> parameter equal to zero) the values 0 : OFF or 1 : ON	Reading or writing
205	Configure TP/TC	Type. Possible values are 0 : :PT:ALL or 1 : :CT:ALL	Scale. Possible values are in the range between 0 (zero) and 9999	Point. Possible values are in the range between 0 (zero) and 3 (three, position of decimal point)	The <i>Scale</i> and <i>Point</i> parameters can be used as setpoints for TP and TC, loading the <i>Scale</i> parameter with a number without a decimal point and the <i>Point</i> parameter with a decimal position. For example, for the <i>N3</i> parameter equal to 1 (one) and the <i>N4</i> parameter equal to 3 (three), the result is .001	Write-only

Available scale options for a Current command

OPTION	DESCRIPTION
0	0.5 A or 50 mV for external voltage scale /EX1 (the <i>N2</i> parameter equal to two)

OPTION	DESCRIPTION
1	1 A or 100 mV for external voltage scale /EX1 (the N2 parameter equal to two)
2	2 A or 200 mV for external voltage scale /EX1 (the N2 parameter equal to two)
3	5 A or 2.5 V for external voltage scale /EX2 (the N2 parameter equal to two)
4	10 A or 5 V for external voltage scale /EX2 (the N2 parameter equal to two)
5	20 A or 10 V for external voltage scale /EX2 (the N2 parameter equal to two)
6	5 mA (only for WT210 models)
7	10 mA (only for WT210 models)
8	20 mA (only for WT210 models)
9	50 mA (only for WT210 models)
10	100 mA (only for WT210 models)
11	200 mA (only for WT210 models)

Data Output Commands

Use a PLC or Block Tag to execute data output commands and configure their parameters according to the next table.

Parameter for data output commands

N1 or B1	Code of a command. Please check the next table for more information
N2 or B2	Not used, leave it in 0(zero)
N3 or B3	Not used, leave it in 0(zero)
N4 or B4	Not used, leave it in 0(zero)

The next table contains a list of data output commands supported by this Driver.

Data output commands

N1 OR B1	COMMAND	TYPE OF TAG	DESCRIPTION	OPERATION
300	Configuration of harmonics	PLC	Reads the configuration of harmonics. Returns a 16-bit value with the structure described on table Structure of bits of harmonics configurations	Read-only
301	Harmonics	Block	Reads measured or calculated harmonics values. Data type for all Elements is Float ,	Read-only

N1 OR B1	COMMAND	TYPE OF TAG	DESCRIPTION	OPERATION
			returning the Elements described on table Structure of Elements of harmonics values . Please check the next note for more information	
302	Configuration of normal measurements	Block	Reads the configuration of normal measurements. Returned data have an ON or OFF type, indicating whether parameters are enabled or not	Read-only
303	Normal measurements	Block	Reads normal measurement values, measured or calculated. The position of the parameters is marked by an x on Appendix 1. NOTE: Time and Math variables, when inactive, always receive the value -1 (minus one)	Read-only

Structure of bits of harmonics configurations

BIT	DESCRIPTION
0	SYNC (On or Off)
1	VTHD (On or Off)
2	V (On or Off)
3	VCON (On or Off)
4	ATHD (On or Off)
5	A (On or Off)
6	ACON (On or Off)
7	PF (On or Off)
8	W (On or Off)
9	WCON (On or Off)
10	VDEG (On or Off)
11	ADEG (On or Off)
12	None
13	None

BIT	DESCRIPTION
14	None
15	None

Structure of Elements of harmonics values

ELEMENT	DESCRIPTION
1	PLL source frequency (Hz)
2	Harmonic distortion factor of voltage (%)
3	RMS value of 1st order out of 50th (V)
4	Fundamental measured value of 1st order (V)
5 a 53	Harmonic measured value from 2nd order to 50th order (V)
54 a 102	Relative harmonic content from 2nd order to 50th order (%)

NOTE

If all presets are enabled for reading in a **Harmonics** command, the size of a Block Tag is 404 Elements. While supported by the specification of this command in Yokogawa protocol, that is not advisable. Prefer a partial reading of 102 Elements. To execute a reading command of harmonics values, enable the harmonics measurement mode by executing a **Harmonics Command** (the *N1* parameter equal to 50).

Appendix 1

This appendix describes how device values are written or read based on the identified model. The data type for all Elements is **Float**.

Block Elements for reading or writing

MODEL		WT210 (ONE PHASE)	WT230 (THREE PHASES AND THREE WIRES)	WT230 (THREE PHASES AND FOUR WIRES)
ELEMENT	DESCRIPTION	760401	760502	760503
1	V1	x	x	x
2	V2			x
3	V3		x	x
4	Vsigma		x	x
5	A1	x	x	x
6	A2			x
7	A3		x	x
8	Asigma		x	x
9	W1	x	x	x
10	W2			x

MODEL		WT210 (ONE PHASE)	WT230 (THREE PHASES AND THREE WIRES)	WT230 (THREE PHASES AND FOUR WIRES)
ELEMENT	DESCRIPTION	760401	760502	760503
11	W3		x	x
12	Wsigma		x	x
13	VA1	x	x	x
14	VA2			x
15	VA3		x	x
16	VAsigma		x	x
17	VAR1	x	x	x
18	VAR2			x
19	VAR3		x	x
20	VARsigma		x	x
21	PF1	x	x	x
22	PF2			x
23	PF3		x	x
24	PFsigma		x	x
25	DEGR1	x	x	x
26	DEGR2			x
27	DEGR3		x	x
28	DEGRsigma		x	x
29	VHZ1	x	x	x
30	VHZ2			x
31	VHZ3		x	x
32	VHZsigma		x	x
33	AHZ1	x	x	x
34	AHZ2			x
35	AHZ3		x	x
36	AHZsigma		x	x
37	WH1	x	x	x
38	WH2			x
39	WH3		x	x
40	WHsigma		x	x
41	WHP1	x	x	x
42	WHP2			x
43	WHP3		x	x
44	WHPsigma		x	x
45	WHM1	x	x	x

MODEL		WT210 (ONE PHASE)	WT230 (THREE PHASES AND THREE WIRES)	WT230 (THREE PHASES AND FOUR WIRES)
ELEMENT	DESCRIPTION	760401	760502	760503
46	WHM2			x
47	WHM3		x	x
48	WHMsigma		x	x
49	AH1	x	x	x
50	AH2			x
51	AH3		x	x
52	AHsigma		x	x
53	AHP1	x	x	x
54	AHP2			x
55	AHP3		x	x
56	AHPsigma		x	x
57	AHM1	x	x	x
58	AHM2			x
59	AHM3		x	x
60	AHMsigma		x	x
61	VPK1	x	x	x
62	VPK2			x
63	VPK3		x	x
64	VPKsigma		x	x
65	APK1	x	x	x
66	APK2			x
67	APK3		x	x
68	APKsigma		x	x
69	TIME	x	x	x
70	MATH	x	x	x

Documentation of I/O Interfaces

This section contains the documentation of I/O Interfaces referring to **WT210230** Driver.

Configuration of a Driver

I/O Interface configuration is performed on a Driver's configuration dialog box. To access the configuration of this dialog box in **Elipse E3** in version 1.0, follow these steps:

1. Right-click a Driver object (IODriver).
2. Select the **Properties** item on the contextual menu.
3. Select the **Driver** tab.

4. Click **Other parameters**.

In **Eclipse E3** version 2.0 or later, click **Configure driver**  on a Driver's toolbar. In **Eclipse SCADA**, follow these steps:

1. Open the Organizer.
2. Select a Driver on Organizer's tree.
3. Click **Extras** on the **Driver** tab.

Currently, an I/O Interface allows opening only one connection for each Driver. This means that, if users want to access two serial ports, they must add two Drivers to an application and then configure each one of these Drivers for each serial port.

Configuration Dialog Box

The dialog box of I/O Interfaces allows configuring the I/O connection used by a Driver. This dialog box contains the **Setup**, **Serial**, **Ethernet**, **Modem**, and **RAS** tabs, described on the next topics. If a Driver does not implement a specific I/O connection, its corresponding tab is not available for configuration. Some Drivers may contain additional tabs, specific for that Driver, on the configuration dialog box.

Setup Tab

The **Setup** tab contains general configurations of a Driver. This tab is divided into the following groups:

- **General configurations:** Configurations of a Driver's physical layer, time-out, and initialization mode
- **Connection management:** Configurations on how the I/O Interface keeps a connection and which recovery policy is used on failure
- **Logging options:** Controls the generation of log files

Setup

Physical Layer: Ethernet ☐ Start driver OFFLINE

Timeout: 1000 ms Communication check time: 5000 ms

Connection management

Mode: Automatic (managed by the driver)

☒ Retry failed connection every 20 seconds

☐ Give up after 1 failed retries

☐ Disconnect if non-responsive for 0 seconds

Logging Options

☐ Log to File: C:\eeLogs\MicrolokII_%DATE%.log

File size limit (MB): 0 ('0' is unlimited)

Setup tab

General options on the Setup tab

OPTION	DESCRIPTION
Physical Layer	Select the physical layer on a list. Available options are Serial , Ethernet , Modem , and RAS . The selected interface must be configured on its specific tab
Timeout	Configure a time-out, in milliseconds, for the physical layer. This is the amount of time an I/O interface waits to receive any byte from the reception's buffer
Communication check time	Set the time, in milliseconds, to define the interval at which communication is considered to be in an inactive state. As long as an I/O Driver receives valid data, its communication state is considered active. However, if during operation an I/O Driver does not receive valid data inside this period of time, the state is considered inactive. The communication state is shown in the IO.CommunicationStatus Tag
Start driver OFFLINE	Select this option so that a Driver starts in Offline mode or stopped. This means that the I/O interface is not created until this Driver is configured to Online mode by using a Tag in an application. This mode enables a dynamic configuration of an I/O interface at run time

Options on the Connection management group

OPTION	DESCRIPTION
Mode	Selects a management mode of a connection. Selecting the Automatic option allows a Driver to manage the connection automatically, as specified in the next options. Selecting the Manual option allows an application to fully manage a connection
Retry failed connection every ... seconds	Select this option to enable a Driver's connection retry in a certain interval, in seconds. If the Give up after failed retries option is not selected, this Driver keeps retrying until a connection is performed, or until the application is stopped
Give up after ... failed retries	Enable this option to define a maximum number of connection retries. When the specified number of consecutive connection retries is reached, a Driver goes to the Offline mode, assuming that a hardware problem was detected. If a Driver establishes a successful connection, the number of unsuccessful retries is cleared. If this new connection is lost, then the retry counter starts at zero
Disconnect if non-responsive for ... seconds	Enable this option to force a Driver to disconnect if no byte was received by the I/O interface during the specified time-out, in seconds. This time-out must be greater than the time-out configured in the Timeout option

Options on the Logging Options group

OPTION	DESCRIPTION
Log to File	Enable this option and configure the name of a file to write a log. Log files can be large, so use this option for short periods of time, only for testing and debugging purposes. If the %PROCESS% macro is used in the log file name, it is replaced by the identifier of the current process. This option is particularly useful when using several instances of the same Driver in Eclipse E3, thus allowing each instance to generate a separate log file. For example, when configuring this option with value "c:\e3logs\drivers\sim_%PROCESS%.log", it generates a file named c:\e3logs\drivers\sim_00000FDA.log for process 0FDAh. Users can also use the %DATE% macro in the file name. In this case a log file is generated every day, in the format aaaa_mm_dd. For example, when configuring this option with value "c:\e3logs\drivers\sim_%DATE%.log", it generates a file named c:\e3logs\drivers\sim_2005_12_31.log in 12/31/2005 and a file named c:\e3logs\drivers\sim_2006_01_01.log in 01/01/2006. Similarly, the %DATE_HOUR% macro generates one log file per hour, in the format aaaa_mm_dd_hh
File size limit (MB)	Configure the log file size limit, in megabytes. A value equal to 0 (zero) means that there is no size limit for the log file

Serial Tab

Use this tab to configure parameters for a **Serial** Interface.

Serial

Port: COM1

Baud rate: 9600

Data bits: 8 data bits

Parity: None

Stop bits: 1 stop bit

☐ Enable 'ECHO' suppression

Handshaking

DTR control: OFF

RTS control: OFF

☐ Wait for CTS before send

CTS timeout: 0 ms

Delay before send: 0 ms

Delay after send: 0 ms

Inter-byte delay (microseconds): 0 μ s

Inter-frame delay (milliseconds): 0 ms

Serial tab

General options on the Serial tab

OPTION	DESCRIPTION
Port	Select a serial port on the list, from COM1 to COM4 , or type the name of a serial port in the format COMn , such as "COM15". When typing the name of a serial port manually, the dialog box only accepts names of serial ports starting with the expression "COM"
Baud rate	Select a baud rate on the list (1200 , 2400 , 4800 , 9600 , 19200 , 38400 , 57600 , or 115200) or type a baud rate, such as 600
Data bits	Select 7 (seven) or 8 (eight) data bits on the list
Parity	Select a parity on the list. The available options are None , Even , Odd , Mark , or List
Stop bits	Select the number of stop bits on the list. The available options are 1 , 1.5 , or 2 stop bits
Enable 'ECHO' suppression	Enable this option to remove the echo received after the I/O Interface sends data via serial port. If this echo is not equal to the bytes just sent, then the I/O Interface aborts communication
Inter-byte delay (microseconds)	Defines a delay between each byte transmitted by the I/O Interface, in millionths of a second, that is, 1000000 is equal to a second. This option must be used with small delays of less than a millisecond
Inter-frame delay (milliseconds)	Defines a delay between packets sent or received by the I/O Interface, in thousandths of a second, that is, 1000 is equal to a second. This delay is applied if the I/O Interface

OPTION	DESCRIPTION
	sends two consecutive packets, or between a received packet and the next sending

The **Handshaking** group configures the usage of **RTS**, **CTS**, and **DTR** signals in the handshaking process, that is, it controls when data can be sent or received via serial line. Most of the time, configuring the **DTR control** option to **ON** and the **RTS control** option to **Toggle** works with **RS232**-type serial lines as well as with **RS485**-type serial lines.

Available options on the Handshaking group

OPTION	DESCRIPTION
DTR control	Select the value ON to keep the DTR signal always on while the serial port is open. Select the value OFF to turn the DTR signal off while the serial port is open. Some devices require the DTR signal always on to allow communication
RTS control	Select the value ON to keep the RTS signal always on while the serial port is open. Select the value OFF to turn the RTS signal off while the serial port is open. Select the value Toggle to turn the RTS signal on while sending bytes via serial port and turn it off when not sending bytes, therefore enabling the reception
Wait for CTS before send	Available only when the RTS control option is configured with the value Toggle . Use this option to force a Driver to check the CTS signal before sending bytes via serial port, after turning the RTS signal on. In this mode, the CTS signal is handled as a permission flag for sending
CTS timeout	Determines a maximum time, in milliseconds, that a Driver waits for the CTS signal after turning the RTS signal on. If the CTS signal is not turned on within this time-out, that Driver then fails the current communication and returns an error
Delay before send	Some serial port devices have a delay when enabling a data sending circuit after the RTS signal is turned on. Configure this option to wait a certain number of milliseconds after turning the RTS signal on and before sending the first byte. IMPORTANT: This delay must be used carefully, because it uses 100% of CPU resources while waiting. System's general performance degrades as this value increases
Delay after send	This is the same effect of the Delay before send option, but in this case the delay is performed after sending the last byte, before turning the RTS signal off

Ethernet Tab

Use this tab to configure parameters of an **Ethernet** Interface. These parameters, except port configurations, must also be configured for use in the **RAS** Interface.

Ethernet

Transport: TCP/IP ☐ Listen for connections on port: 0

☐ PING before connecting ☐ Share listen port with other processes

Timeout: 4000 ms ☐ Interface: (All Interfaces)

Retries: 1 ☐ Use IPv6 ☐ Use SSL SSL Settings

☐ Enable 'ECHO' suppression

IP Filter:

Connect to

Main IP: Port: 502 ☐ Local port: 0

☐ Backup IP 1: Port: 0 ☐ Local port: 0

☐ Backup IP 2: Port: 0 ☐ Local port: 0

☐ Backup IP 3: Port: 0 ☐ Local port: 0

Ethernet tab

Available options on the Ethernet tab

OPTION	DESCRIPTION
Transport	Select the value TCP/IP for a TCP socket (<i>stream</i>) or select the value UDP/IP to use a UDP socket (<i>connectionless datagram</i>)
Listen for connections on port	Use this option to wait for new connections in a specific IP port, common in Slave Drivers. If this option remains unselected, a Driver connects to the address and port specified in the Connect to option
Share listen port with other processes	Select this option to share the listening port with other Drivers and processes
Interface	Select the local network interface, identified by its IP address, that a Driver uses to establish and receive connections, or select the value (All Interfaces) to allow connection in any network interface
Use IPv6	Select this option to force a Driver to use addresses in IPv6 format on all Ethernet connections. Leave this option deselected to use the IPv4 format
Enable 'ECHO' suppression	Enable this option to remove the echo from received data. An echo is a copy of sent data, which can be returned before a reply message
IP Filter	List of restricted or allowed IP addresses from where a Driver accepts connections (<i>Firewall</i>). Please check the IO.Ethernet.IPFILTER property for more information
PING before connecting	Enable this option to execute a ping command, that is, to check whether a device can be reached on a network, for a device before trying a socket connection. This is a quick way

OPTION	DESCRIPTION
	of determining a successful connection before trying to open a socket with a device. The time-out of a connection with a socket can be very high. The available options are: • Timeout: Specify the number of milliseconds to wait for a reply from a ping command. Users must use a ping command to check the normal reply time, configuring this option for a value above that average. Usually this value can be configured between 1000 and 4000 milliseconds, that is, between 1 (one) and 4 (four) seconds • Retries: Number of retries of a ping command, not counting the first attempt. If all attempts fail, then the socket connection is aborted

Available options on the Connect to group

OPTION	DESCRIPTION
Main IP	Type the IP address of a remote device. Users can use an IP address separated by dots, as well as a URL. In case of a URL, a Driver uses the available DNS service to map that URL to an IP address, such as "192.168.0.13" or "Server1"
Port	Type the IP port of a remote device, between 0 (zero) and 65535
Local port	Select this option to use a fixed local IP port when connecting to a remote device
Backup IP 1, 2, and 3	Indicate the IP address, the IP port, and the fixed local IP port of up to 3 (three) backup addresses of a remote device

Modem Tab

Use this tab to configure parameters of a **Modem** Interface. Some options on the **Serial** tab affect the configuration of a modem, therefore users must also configure the **Serial** Interface.

Modem tab

The **Modem** Interface uses the TAPI modems installed on the computer.

Available options on the Modem tab

OPTION	DESCRIPTION
Select the modem to use	Select a modem on the list of available modems on the computer. If the value Default modem is selected, then the first available modem is used. Selecting this option is recommended specially when an application is used on another computer
Modem settings	Click to open the configuration window of the selected modem
Dial Number	Type a default number for dialing. This value can be changed at run time. Users can use the w character to represent a pause or a waiting time for a dial tone. For example, "0w33313456" dials the number 0 (zero), waits, and then dials the number "33313456"
Accept incoming calls	Enable this option so that a Driver answers the phone when receiving an external call. To use this option, users must configure the Connection management option on the Setup tab to the value Manual

RAS Tab

Use this tab configure parameters of a **RAS** Interface. Users must also configure the **Ethernet** tab.

A **RAS** Interface opens a socket connection with a RAS device. A RAS device is a server of modems available through TCP/IP, waiting for socket connections on an IP port. For each connection accepted on this port, users have access to one modem.

When connecting to a RAS device, first the I/O Interface**IOKit** connects to the socket on the IP address and port configured on the **Ethernet** tab. After opening the socket, the following initialization or connection steps are performed:

1. Clears the socket, that is, removes any **TELNET** greeting message received from a RAS device.
2. Sends an **AT** dial message, in **ASCII** format, in the socket.
3. Waits for a **CONNECT** reply.
4. If the time-out expires, the connection is aborted.
5. If the **CONNECT** reply is received within the time-out, the socket is available for communication with a device, that is, the connection was established.

If step 5 (five) is successful, then the socket behaves as a normal socket, with the RAS device working as a router between a Driver and the device. Bytes sent by a Driver are received by the RAS device and sent to the destination device using a modem. Bytes received by the modem's RAS device are sent back to a Driver using the same socket.

After establishing a connection, the **RAS** interface monitors data received by a Driver. If a "NO CARRIER" **String** is found, the socket is closed. If the RAS device does not send a **NO CARRIER** signal, the **RAS** Interface cannot detect when the modem connection between the RAS device and the final I/O device fails. To recover from this failure, users are strongly advised to enable the **Disconnect if non-responsive** option on the **Setup** tab.

RAS

AT command:

Connection timeout:

0

seconds

Other socket settings should be configured in the "Ethernet" tab!

RAS tab

Available options on RAS tab

OPTION	DESCRIPTION
AT command	A String with the full AT command used to dial to a destination device. For example, "ATDT33313456" dials by tone to number "33313456"
Connection timeout	Number of seconds to wait for a modem's CONNECT reply, after sending an AT command

General Configurations

This section contains information about the configuration of general **I/O Tags** and **Properties** of I/O Interfaces.

I/O Tags

General I/O Interfaces Tags (N2/B2 = 0)

The Tags described next are provided for all supported I/O Interfaces.

IO.CommunicationStatus

Type of Tag	I/O Tag
Type of Access	Reading
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	6 (six)
String Configuration	IO.CommunicationStatus

This Tag informs the communication status of a Driver. It indicates how communication works relative to receiving valid data within a time period arbitrated in the configuration. For more information, please check topic **Setup Tab**. Possible values are **0 - Inactive communication**: The Driver did not receive valid data or stopped receiving data after *n* milliseconds, as configured in the properties window, or **1 - Active communication**: The Driver is receiving valid data.

IO.IOKitEvent

Type of Tag	Block Tag
Type of Access	Read-Only
B1 Parameter	-1 (minus one)
B2 Parameter	0 (zero)
B3 Parameter	0 (zero)
B4 Parameter	1 (one)
Size Property	4 (four)
ParamItem Property	IO.IOKitEvent

This Block returns Driver events generated by several sources in I/O Interfaces. The **TimeStamp** property of this Block represents the moment this event occurred. The Block Elements are the following:

- **Element 0**: Type of event. Possible values are **0**: Information, **1**: Warning, or **2**: Error
- **Element 1**: Source of an event. Possible values are **0**: Driver (specific of a Driver), **-1**: IOKit (generic events of I/O Interfaces), **-2**: **Serial** Interface, **-3**: **Modem** Interface, **-4**: **Ethernet** Interface, or **-5**: **RAS** Interface
- **Element 2**: Error number, specific for each source of event

- **Element 3:** Message of an event, a **String** specific for each event

NOTE

A Driver keeps a maximum number of 100 events internally. If additional events are reported, older events are discarded.

IO.PhysicalLayerStatus

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	2 (two)
String Configuration	IO.PhysicalLayerStatus

This Tag indicates the status of a physical layer. Possible values are the following:

- **0:** Physical layer stopped, that is, a Driver is in **Offline** mode, the physical layer failed when initializing, or exceeded the maximum number of reconnection attempts
- **1:** Physical layer started but not connected, that is, a Driver is in **Online** mode but the physical layer is not connected. If the **Connection management** option is configured with the value **Automatic**, the physical layer can be connecting, disconnecting, or waiting for a reconnection attempt. If the **Connection management** option is configured with the value **Manual**, then the physical layer remains in this status until forced to connect
- **2:** Physical layer connected, that is, the physical layer is ready for use. This **DOES NOT** mean a device is connected, only that the access layer is working

IO.SetConfigurationParameters

Type of Tag	Block Tag
Type of Access	Read-Only
B1 Parameter	-1 (minus one)
B2 Parameter	0 (zero)
B3 Parameter	0 (zero)
B4 Parameter	3 (three)
Size Property	2 (two)
ParamItem Property	IO.SetConfigurationParameters

Use this Tag to change any property of a Driver's configuration dialog box at run time.

This Tag works only while a Driver is in **Offline** mode. To start a Driver in **Offline** mode, select the **Start driver OFFLINE** option on that Driver's configuration dialog box. Users can write to a PLC Tag or to a Block Tag containing the parameters to change. Writing individual Block Elements is not supported, the whole Block must be written at once.

In **Elipse SCADA**, users must use a Block Tag. Every parameter to configure uses two Block Elements. For example, if users want to configure 3 (three) parameters, then the size of the Block must be 6 (six, 3×2). The first Element is the property's name, as a **String**, and the second Element is the property's value, according to the next example.

```
// 'Block' must be a Block Tag with automatic reading,
// scan reading, and automatic writings disabled.
// Configure all parameters
Block.element001 = "IO.Type" // Parameter 1
Block.element002 = "Serial"
Block.element003 = "IO.Serial.Port" // Parameter 2
Block.element004 = 1
Block.element005 = "IO.Serial.BaudRate" // Parameter 3
Block.element006 = 19200
// Writes the whole Block
Block.Write()
```

When using **Elipse E3**, the ability to create arrays at run time allows using an I/O Tag as well as a Block Tag. Users can use the **Write** method of a Driver to send the parameters directly to that Driver, without creating a Tag, according to the next example.

```
Dim arr(6)
' Configure all array elements
arr(1) = "IO.Type"
arr(2) = "Serial"
arr(3) = "IO.Serial.Port"
arr(4) = 1
arr(5) = "IO.Serial.BaudRate"
arr(6) = 19200
' There are two methods to send parameters
' Method 1: Using an I/O Tag
tag.WriteEx arr
' Method 2: Without using a Tag
Driver.Write -1, 0, 0, 3, arr
```

A variation of the previous example uses a bidimensional array.

```
Dim arr(10)
' Configure all array elements. Notice the array was resized
' to 10 elements. Empty array elements are ignored by a Driver
arr(1) = Array("IO.Type", "Serial")
arr(2) = Array("IO.Serial.Port", 1)
arr(3) = Array("IO.Serial.BaudRate", 19200)
Driver.Write -1, 0, 0, 3, arr
```

A Driver does not validate parameter names or passed values, therefore be careful when writing parameters and values. The **Write** method fails if the configuration array is incorrectly created. Users can check the log of a Driver or use the *writeStatus* parameter of the **WriteEx** method to find out the exact cause of an error.

```
Dim arr(10), strError
arr(1) = Array("IO.Type", "Serial")
arr(2) = Array("IO.Serial.Port", 1)
arr(3) = Array("IO.Serial.BaudRate", 19200)
If Not Driver.WriteEx -1, 0, 0, 3, arr, , strError Then
    MsgBox "Failed configuring Driver parameters: " + strError
End If
```

IO.WorkOnline

Type of Tag	I/O Tag
Type of Access	Reading or Writing
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	4 (four)
String Configuration	IO.WorkOnline

This Tag informs the current status of a Driver and allows starting or stopping the physical layer. Possible values are the following:

- **0 - Driver Offline:** Physical layer is closed or stopped. This mode allows a dynamic configuration of a Driver's parameters using the **IO.SetConfigurationParameters** Tag
- **1 - Driver Online:** Physical layer is open or executing. While in **Online** mode, the physical layer can be connected or disconnected and its current status can be checked using the **IO.PhysicalLayerStatus** Tag

In the next example, using **Eclipse E3**, a Driver is configured to **Offline** mode, its COM port is changed, and then configured to **Online** mode again.

```
'Configure to Offline mode
Driver.Write -1, 0, 0, 4, 0
'Change port to COM2
Driver.Write -1, 0, 0, 3, Array("IO.Serial.Port", 2)
'Configure to Online mode
Driver.Write -1, 0, 0, 4, 1
```

The **Write** method may fail when configuring a Driver to **Online** mode, that is, writing the value 1 (one). In this case, this Driver remains in **Offline** mode. The cause of failure can be:

- Type of physical layer incorrectly configured, probably an invalid value was configured in the **IO.Type** property
- This Driver may have run out of memory
- Physical layer probably did not create its working thread. Search the log file for a message "Failed to create physical layer thread!"
- Physical layer could not start. The cause of this failure depends on the type of physical layer. It can be an invalid serial port number, a failure when starting Windows Sockets, or a failure when starting TAPI (modem), among others. This cause is recorded on the log file

IMPORTANT

Even if the configuration of a Driver to **Online** mode is successful, this does not necessarily mean the physical layer is ready to use, that is, ready to execute input and output operations with an external device. The **IO.PhysicalLayerStatus** Tag must be checked to ensure the physical layer is connected and ready for communication.

Properties

These are general properties of all supported I/O Interfaces.

IO.ConnectionMode

9 Controls the management mode of a Connection. Possible values are **0**: Automatic mode, in which a Driver manages the connection or **1**: Manual mode, in which an application manages the connection.

IO.GiveUpEnable

☑ When configured to True, defines a maximum number of reconnection attempts. If all reconnection attempts fail, a Driver enters the **Offline** mode. When configured to False, a Driver tries until a reconnection is successful.

IO.GiveUpTries

9 Number of reconnection attempts before this one is aborted. For example, if the value of this property is equal to 1 (one), a Driver tries only one reconnection when the connection is lost. If this one fails, this Driver enters the **Offline** mode.

IO.InactivityEnable

☑ Configure to True to enable and to False to disable inactivity detection. The physical layer is disconnected if inactive for a certain period of time. The physical layer is considered inactive only if it is capable of sending data but not capable of receiving it back.

IO.InactivityPeriodSec

9 Number of seconds to check for inactivity. If the physical layer is inactive for this period of time, it is then disconnected.

IO.RecoverEnable

☑ Configure to True to enable a Driver to recover lost connections and to False to leave a Driver in **Offline** mode when a connection is lost.

IO.RecoverPeriodSec

9 Delay time between two connection attempts, in seconds.

NOTE

The first reconnection is executed immediately after a connection is lost.

IO.StartOffline

☑ Configure to True to start a Driver in **Offline** mode and to False to start a Driver in **Online** mode.

NOTE

It is pointless to change this property at run time, as it can only be changed when a Driver is already in **Offline** mode. To configure a Driver in **Online** mode at run time, write the value 1 (one) to the **IO.WorkOnline** Tag.

IO.TimeoutMs

9 Defines a time-out for the physical layer, in milliseconds. One second is equal to 1000 milliseconds.

IO.Type

 Defines the type of physical interface used by a Driver. Possible values are the following:

- **N or None:** Does not use a physical interface, that is, a Driver must provide a customized interface
- **S or Serial:** Uses a local serial port (COM n)
- **M or Modem:** Uses a local modem, internal or external, accessed via TAPI (*Telephony Application Programming Interface*)
- **E or Ethernet:** Uses a TCP/IP or UDP/IP socket
- **R or RAS:** Uses a **RAS** (*Remote Access Server*) Interface. A Driver connects to a RAS device using the **Ethernet** Interface and then sends an **AT** (*dial*) command

Statistical Configuration

This section contains information about the configuration of **I/O Tags** and **Properties** of I/O Interfaces statistics.

I/O Tags

Tags of I/O Interface Statistics (N2/B2 = 0)

The Tags described next display statistics for all I/O Interfaces.

IO.Stats.Partial.BytesRecv

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1101
Configuration by String	IO.Stats.Partial.BytesRecv

This Tag returns the number of bytes received in the current connection.

IO.Stats.Partial.BytesSent

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1100
Configuration by String	IO.Stats.Partial.BytesSent

This Tag returns the number of bytes sent through the current connection.

IO.Stats.Partial.TimeConnectedSeconds

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1102
Configuration by String	IO.Stats.Partial.TimeConnectedSeconds

This Tag returns the number of seconds a Driver is connected in the current connection or 0 (zero) if a Driver is disconnected.

IO.Stats.Partial.TimeDisconnectedSeconds

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1103
Configuration by String	IO.Stats.Partial.TimeDisconnectedSeconds

This Tag returns the number of seconds a Driver is disconnected since the last connection ended or 0 (zero) if a Driver is connected.

IO.Stats.Total.BytesRecv

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1001
Configuration by String	IO.Stats.Total.BytesRecv

This Tag returns the number of bytes received since a Driver was loaded.

IO.Stats.Total.BytesSent

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1000
Configuration by String	IO.Stats.Total.BytesSent

This Tag returns the number of bytes sent since a Driver was loaded.

IO.Stats.Total.ConnectionCount

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1004
Configuration by String	IO.Stats.Total.ConnectionCount

This Tag returns the number of connections a Driver already established, successfully, since it was loaded.

IO.Stats.Total.TimeConnectedSeconds

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1002
Configuration by String	IO.Stats.Total.TimeConnectedSeconds

This Tag returns the number of seconds a Driver remained connected since it was loaded.

IO.Stats.Total.TimeDisconnectedSeconds

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1003
Configuration by String	IO.Stats.Total.TimeDisconnectedSeconds

This Tag returns the number of seconds a Driver remained disconnected since it was loaded.

Properties

Currently, there are no properties defined specifically to display I/O Interface statistics at run time.

Ethernet Interface Configuration

This section contains information about the configuration of **I/O Tags** and **Properties** of an **Ethernet** Interface.

I/O Tags

Tags of an Ethernet Interface (N2/B2 = 4)

The Tags described next allow controlling and identifying an **Ethernet** Interface at run time and they are also valid when the **RAS** Interface is selected.

IMPORTANT

These Tags are available **ONLY** while a Driver is in **Online** mode.

IO.Ethernet.IPSelect

Type of Tag	I/O Tag
Type of Access	Reading or Writing
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	4 (four)
N4 Parameter	0 (zero)
String Configuration	IO.Ethernet.IPSelect

Indicates the active IP address. Possible values are **0**: The main IP address is selected, **1**: The first alternative or backup IP address is selected, **2**: The second alternative or backup IP address is selected, or **3**: The third alternative or backup IP address is selected.

If the **Ethernet** or **RAS** Interface is connected, this Tag indicates which one of the four configured IP addresses is in use. If the Interface is disconnected, this Tag indicates which IP address is used first on the next attempt to connect.

During the connection process, if the active IP address is not available, the I/O Interface tries to connect using the other IP address. If the connection with the alternative IP address works, it is configured as the active IP address (automatic switchover).

To force a manual switchover, write values from 0 (zero) to 3 (three) to this Tag. This forces a reconnection with the specified IP address (**0**: Main address or **1, 2, 3**: Alternative address) if a Driver is currently connected. If a Driver is disconnected, this Tag configures the active IP address for the next attempt to connect.

IO.Ethernet.IPSwitch

Type of Tag	I/O Tag
Type of Access	Write-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	4 (four)
N4 Parameter	1 (one)
String Configuration	IO.Ethernet.IPSwitch

Any value written to this Tag forces a manual switchover. If the main IP address is active, then the first alternative or backup IP address is activated, and so on for all alternative IP addresses and returning to the main address until a connection is established.

If a Driver is disconnected, this Tag configures the active IP address for the next attempt to connect.

IO.Ethernet.SocketState

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	4 (four)
N4 Parameter	2 (two)
String Configuration	IO.Ethernet.SocketState

The Value property of this Tag corresponds to socket states as a map of bits:

- **Bit 0**: 0 (zero, not listening) or 1 (one, listening)
- **Bit 1**: 0 (zero, disconnected) or 1 (one, connected)

Properties

These properties control the configuration of an **Ethernet** Interface.

NOTE

The **Ethernet** Interface is also used by the **RAS** Interface.

IO.Ethernet.AcceptConnection

■ Configure to False if a Driver must not accept external connections, that is, if a Driver behaves as a master, or configure to True to enable the reception of connections, that is, if a Driver behaves as a slave.

IO.Ethernet.BackupEnable[2,3]

■ Configure to True to enable an alternative or backup IP address. If the reconnection attempt with the main IP address fails, a Driver tries to use an alternative IP address. Configure to False to disable its usage.

IO.Ethernet.BackupIP[2,3]

A Alternative or backup IP address of a remote device. Users can use a numerical address, as well as a device's host name, such as "192.168.0.7" or "SERVER2".

IO.Ethernet.BackupLocalPort[2,3]

9 Local port number to be used when connecting to an alternative IP address of a remote device. Used only if **IO.Ethernet.BackupLocalPortEnable** is equal to True.

IO.Ethernet.BackupLocalPortEnable[2,3]

■ Configure to True to force the use of a specific local port when connecting to an alternative or backup IP address or configure to False to use any available local port.

IO.Ethernet.BackupPort[2,3]

9 Port number of an alternative or backup IP address of a remote device, used with the **IO.Ethernet.BackupIP** property.

IO.Ethernet.IPFilter

A List with a comma-separated IPv4 or IPv6 addresses, which defines from which addresses a Driver accepts or blocks connections. Users can use asterisks, such as "192.168.*.*", or intervals, such as "192.168.0.41-50", in any part of IP addresses. To block an IP address or a range of IP addresses, use the tilde ("~") character at the beginning of the address, according to the next examples:

- **192.168.0.24**: Accepts only connections from IPv4 address 192.168.0.24
- **192.168.0.41-50**: Accepts connections from IPv4 addresses in the interval between 192.168.0.41 and 192.168.0.50
- **192.168.0.***: Accepts connections from IPv4 addresses in the interval between 192.168.0.0 and 192.168.0.255
- **fe80:3bf:877::** (expands to fe80:03bf:0877:0000:0000:0000:0000:0000:****)**: Accepts connections from IPv6 addresses in the interval between fe80:03bf:0877:0000:0000:0000:0000:0000 and fe80:03bf:0877:0000:0000:0000:0000:ffff:ffff
- **192.168.0.10, 192.168.0.15, 192.168.0.20**: Accepts connections from IPv4 addresses 192.168.0.10, 192.168.0.15, and 192.168.0.20
- **~192.168.0.95, 192.168.0.***: Accepts connections from IPv4 addresses in the interval between 192.168.0.0 and 192.168.0.255, except the IPv4 address 192.168.0.95

When a Driver receives a connection attempt, the list of filters is scanned sequentially from left to right, searching for a specific authorization or block for the IP address where the connection comes from. If no element on the list corresponds to the IP address, the authorization or block are dictated by the last element of that list:

- If the last element on the list is an authorization, such as "192.168.0.24", then all IP addresses not found on the list are blocked
- If the last element on the list is a block, such as "~192.168.0.24", then all IP addresses not found on the list are authorized

If an IP address appears on more than one filter on the list, the leftmost filter has precedence. For example, in case of "~192.168.0.95, 192.168.0.*", the IP address 192.168.0.95 fits both rules, but the rule that wins is the leftmost one, "~192.168.0.95", and therefore this IP address is blocked.

When **IOKit** blocks a connection, it logs a message "Blocked incoming socket connection from {IP}!".

In case of UDP connections in broadcast listening mode, in which a Driver can receive packets from different IP addresses, blocks or permissions are performed at each packet received. If a packet is received from a blocked IP address, it logs a message "Blocked incoming packet from {IP} (discarding {N} bytes)!".

IO.Ethernet.ListenIP

 IP address of the local network interface that a Driver uses to establish and accept connections. Leave this property empty to establish and accepts connections using any local network interface.

IO.Ethernet.ListenPort

 Number of the IP port used by a Driver to listen to connections.

IO.Ethernet.MainIP

 IP address of a remote device. Users can use a numerical address, as well as a device's host name, such as "192.168.0.7" or "SERVER2".

IO.Ethernet.MainLocalPort

 Local port number to use when connecting to the main IP address of a remote device. This value is only used if the **IO.Ethernet.MainLocalPortEnable** property is equal to True.

IO.Ethernet.MainLocalPortEnable

 Configure to True to force the use of a specific local port when connecting to the main IP address of a remote device or configure to False to use any available local port.

IO.Ethernet.MainPort

 Number of the IP port of a remote device, used with the **IO.Ethernet.MainIP** property.

IO.Ethernet.PingEnable

 Configure to True to enable sending a **ping** command to the IP address of a remote device, before trying to connect to the socket. This socket's connection time-out cannot be controlled, therefore sending a **ping** command before connecting is a fast way to detect if the connection is going to fail. Configure to False to disable a **ping** command.

IO.Ethernet.PingTimeoutMs

 Delay time to wait for a response from a **ping** command, in milliseconds.

IO.Ethernet.PingTries

 Maximum number of attempts of a **ping** command. Minimum value is 1 (one), including the first **ping** command.

IO.Ethernet.ShareListenPort

 Configure to True to share a listening port with other Drivers and processes or False to open a listening port in exclusive mode. To successfully share a listening port, all Drivers and processes that use that port must open it in shared mode. When a listening port is shared, each incoming connection is distributed to one of the processes listening. This way, if a Slave Driver only supports one connection at a time, users can use several instances of this Driver listening on the same port, therefore simulating a Driver with support for multiple connections.

IO.Ethernet.SuppressEcho

 Configure to True to eliminate echoes in communication. An echo is the unwanted reception of an exact copy of all data packets a Driver sent to a device.

IO.Ethernet.Transport

 Defines a transport protocol. Possible values are **T** or **TCP**: Uses the TCP/IP protocol or **U** or **UDP**: Uses the UDP/IP protocol.

IO.Ethernet.UseIPv6

 Configure to True to use IPv6 addresses on all Ethernet connections or configure to False to use IPv4 addresses (default).

Modem Interface Configuration

This section contains information about the configuration of **I/O Tags** and **Properties** of a **Modem** (TAPI) Interface.

I/O Tags

Tags of a Modem Interface (N2/B2 = 3)

The Tags described next allow controlling and diagnosing a **Modem** (TAPI) Interface at run time.

IMPORTANT

These Tags are available **ONLY** while a Driver is in **Online** mode.

IO.TAPI.ConnectionBaudRate

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	3 (three)
N4 Parameter	5 (five)
String Configuration	IO.TAPI.ConnectionBaudRate

Indicates a baud rate value for the current connection. If a modem is not connected, returns the value 0 (zero).

IO.TAPI.Dial

Type of Tag	I/O Tag
Type of Access	Write-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	3 (three)
N4 Parameter	1 (one)
String Configuration	IO.TAPI.Dial

Write any value to this Tag to force a **Modem** Interface to start a call. This is an asynchronous command, only starting the call process. Users can monitor the **IO.TAPI.IsModemConnected** Tag to detect when a call is established.

IO.TAPI.HangUp

Type of Tag	I/O Tag
Type of Access	Write-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	3 (three)
N4 Parameter	4 (four)
String Configuration	IO.TAPI.HangUp

Any value written to this Tag hangs the current call up.

NOTE

Use this command only when managing the physical layer manually or when explicitly trying to force a Driver to restart the communication. If the physical layer is configured for automatic reconnection, a Driver immediately tries to reestablish the connection.

IO.TAPI.IsModemConnected

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	3 (three)
N4 Parameter	3 (three)
String Configuration	IO.TAPI.IsModemConnected

This Tag indicates the status of a modem connection. Possible values are **0**: The modem is not connected, but it may be performing or receiving an external call or **1**: The modem is connected and a Driver completed or received an external call successfully. While it is in this status, the physical layer can send or receive data.

IO.TAPI.IsModemConnecting

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	3 (three)
N4 Parameter	6 (six)
String Configuration	IO.TAPI.IsModemConnecting

This Tag indicates the status of a modem connection, with more details than the **IO.TAPI.IsModemConnected** Tag. Possible values are **0**: Modem is not connected, **1**: Modem is connecting, that is, performing or receiving an external call, **2**: Modem is connected. While in this status, the physical layer can send or receive data, or **3**: Modem is disconnecting the current call.

IO.TAPI.ModemStatus

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	3 (three)
N4 Parameter	2 (two)
String Configuration	IO.TAPI.ModemStatus

Returns a **String** with the current status of a modem. Possible values are the following:

- **"No status!"**: The **Modem** Interface was not open yet or was already closed
- **"Modem initialized OK!"**: The **Modem** Interface was initialized successfully
- **"Modem error at initialization!"**: A Driver could not initialize modem's line. Check that Driver's log file for more details
- **"Modem error at dial!"**: A Driver could not start or accept a call
- **"Connecting..."**: A Driver started a call successfully, and is currently processing that call
- **"Ringing..."**: Indicates that the modem is receiving an external call, but it did not accepted it yet
- **"Connected!"**: A Driver connected successfully, that is, completed or accepted an external call
- **"Disconnecting..."**: A Driver is turning the current call off
- **"Disconnected OK!"**: A Driver turned the current call off
- **"Error: no dial tone!"**: A Driver aborted a call because the available line signal was not detected
- **"Error: busy!"**: A Driver aborted a call because the line was busy
- **"Error: no answer!"**: A Driver aborted a call because no answer was received from the other modem
- **"Error: unknown!"**: Current call was aborted because of an unknown error

IO.TAPI.PhoneNumber

Type of Tag	I/O Tag
Type of Access	Reading or Writing
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	3 (three)
N4 Parameter	0 (zero)
String Configuration	IO.TAPI.PhoneNumber

This Tag is a **String** that reads or changes the telephone number used by the **IO.TAPI.Dial** Tag. When changing this Tag, the new value is used only on the next **Dial** command.

Properties

These properties control the configuration of a **Modem** (TAPI) Interface.

IO.TAPI.AcceptIncoming

9 Configure to False if a modem cannot accept external calls, that is, if a Driver behaves as a master, and configure to True to enable receiving calls, that is, if a Driver behaves as a slave.

IO.TAPI.ModemID

9 This is the identification number of a modem. This ID is created by Windows and used internally to identify a modem on a list of devices installed on a computer. This ID may not remain valid if a modem is reinstalled or an application is executed on another computer.

NOTE

It is advisable to configure this property as 0 (zero), indicating that a Driver must use the first available modem.

IO.TAPI.PhoneNumber

A A telephone number used by **Dial** commands, such as "0w01234566", in which the "w" character forces a modem to wait for a call sign.

RAS Interface Configuration

This section contains information about the configuration of **I/O Tags** and **Properties** of a **RAS** Interface.

I/O Tags

Tags of a RAS Interface (N2/B2 = 5)

Currently, there are no Tags defined specifically to manage a **RAS** Interface at run time.

Properties

These properties control the configuration of a **RAS** Interface.

NOTE

A **RAS** Interface uses the **Ethernet** Interface, which therefore must be also configured.

IO.RAS.ATCommand

A An **AT** command to send through a socket to force a RAS device to perform a call using the current RAS channel, such as "ATDT6265545".

IO.RAS.CommandTimeoutSec

9 Time to wait for a **CONNECT** message in response to an **AT** command, in seconds.

Serial Interface Configuration

This section contains information about the configuration of **I/O Tags** and **Properties** of a **Serial** Interface.

I/O Tags

Tags of a Serial Interface (N2/B2 = 2)

Currently, there are no Tags defined specifically to manage a **Serial** Interface at run time.

Properties

These properties control the configuration of a **Serial** Interface.

IO.Serial.Baudrate

9 Specifies a baud rate of a serial port, such as 9600.

IO.Serial.CTSTimeoutMs

9 Time to wait for a **CTS** signal, in milliseconds. After turning the **RTS** signal on, a timer is started to wait for a **CTS** signal. If this timer expires, a Driver aborts sending bytes through the serial port. Available only when the **IO.Serial.RTS** property is configured with the value **Toggle** and the **IO.Serial.WaitCTS** property is configured to True.

IO.Serial.DataBits

9 Specifies the number of data bits to configure a serial port. Possible values are **5**: Five data bits, **6**: Six data bits, **7**: Seven data bits, or **8**: Eight data bits.

IO.Serial.DelayAfterMs

9 Number of milliseconds to delay after the last byte is sent through a serial port, but before turning the **RTS** signal off. Available only when the **IO.Serial.RTS** property is configured with the value **Toggle** and the **IO.Serial.WaitCTS** property is configured to False.

IO.Serial.DelayBeforeMs

9 Number of milliseconds to delay after turning the **RTS** signal on, but before data is sent. Available only when the **IO.Serial.RTS** property is configured with the value **Toggle** and the **IO.Serial.WaitCTS** property is configured to False.

IO.Serial.DTR

A Indicates how a Driver deals with the **DTR** signal. Possible values are **OFF**: **DTR** signal is always turned off or **ON**: **DTR** signal is always turned on.

IO.Serial.InterbyteDelayUs

9 Delay time, in milliseconds (1/1000000 of a second), for each two bytes sent through a **Serial** Interface.

IO.Serial.InterframeDelayMs

9 Delay time, in milliseconds, before sending a packet after the last packet sent or received.

IO.Serial.Parity

A Specifies a parity for the configuration of a serial port. Possible values are **E or Even**: Even parity, **N or None**: No parity, **O or Odd**: Odd parity, **M or Mark**: Mark parity, or **S or Space**: Space parity.

IO.Serial.Port

9 Number of the local serial port. Possible values are **1**: Uses the COM1 port, **2**: Uses the COM2 port, **3**: Uses the COM3 port, or **n**: Uses the COMn port.

IO.Serial.RTS

A Indicates how a Driver deals with the **RTS** signal. Possible values are **OFF**: **RTS** signal always off, **ON**: **RTS** signal always on, or **Toggle**: Turns the **RTS** signal on when transmitting data and turns the **RTS** signal off when not transmitting data.

IO.Serial.StopBits

9 Specifies the number of stop bits for the configuration of a serial port. Possible values are **1**: One stop bit, **2**: One and a half stop bit, or **3**: Two stop bits.

IO.Serial.SuppressEcho

9 Use a value different from 0 (zero) to enable suppressing the echo or 0 (zero) to disable it.

IO.Serial.WaitCTS

■ Configure to True to force a Driver to wait for the **CTS** signal before sending bytes when the **RTS** signal is turned on. Available only when the **IO.Serial.RTS** property is configured with the value **Toggle**.

Driver's Revision History

VERSION	DATE	AUTHOR	COMMENTS
2.0.2	08/13/2026	M. Ludwig	Driver updated to IOKit library version 3.0 and Visual Studio 2022 (Case 38026).
2.0.1	08/21/2019	C. Mello	- Adjustments when collecting measurement values (Case 26911). - Driver updated and standardized to IOKit library version 2.0 (Case 26927).
1.1.1	04/04/2007	T. Rossi	Fixed a routine call to initialize parameters and the communication mode whenever connecting to a device (Case 8078).

VERSION	DATE	AUTHOR	COMMENTS
			Driver updated to IOKit library version 1.14 (Case 8076).
1.0.1	11/04/2005	T. Rossi	Initial version of this Driver (Case 5866).

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