User's Manual

DP410
DAQOPC for DARWIN Series

YOKOGAWA
Yokogawa Electric Corporation

IM DP41013-61E
3rd Edition

Foreword

This manual explains the functions and operations of DAQOPC. To ensure correct use, please read this manual thoroughly before beginning operation. After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation.
DAQOPC is an OPC server that provides OPC interface (Data Access interface). The OPC interface was designed by the OPC (OLE for Process Control) Foundation.
This manual describes the specifications of the Data Access interface and vender-dependent section. This manual is for those who understand the specifications of the OPC Foundation.

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1.1 Functional Overview of DAQOPC

What Is an OPC Interface

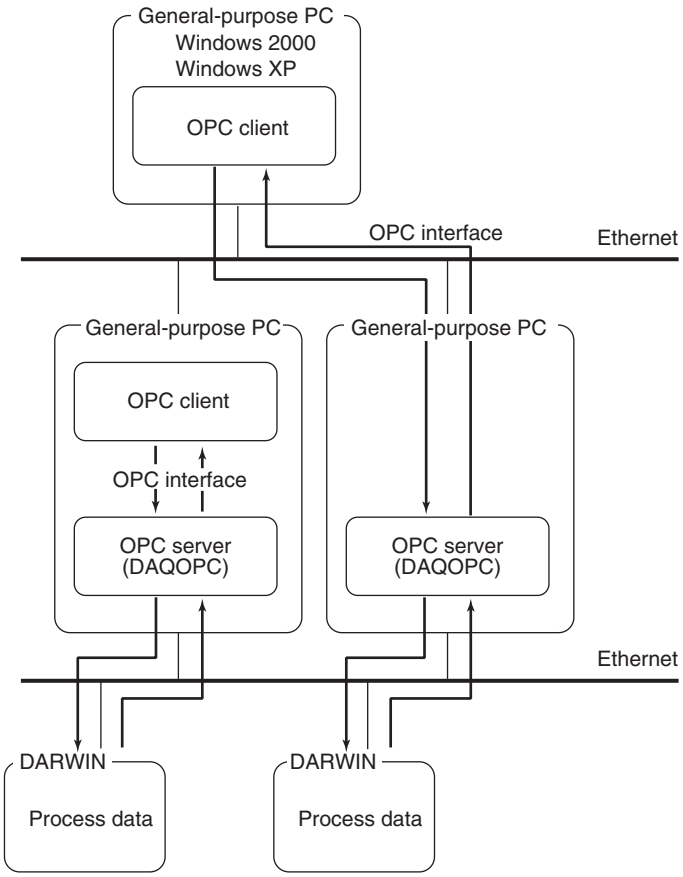
By using the OPC interface provided by YOKOGAWA, the user is able to access various data on the DARWIN via the DAQOPC server using an OPC-compliant application that runs on a Windows machine. The user does not have to create a special application program.
The OPC interface is a standard interface that uses OLE (Object Linking and Embedding) for process control. It consists of a server that provides various data on the DARWIN and a general-purpose interface used to access the server.
OPC applies OLE, which is a standard method of communication between applications in the Windows environment, to process control. It allows the exchange of process data between multiple general-purpose Windows applications.

DAQOPC Functions

- Provides Data Access function (DA), the OPC interface.
  DA function: Reading of the current value of the process data that uses ItemID as the data identifier and writing using communication input data.
- Starts and stops the OPC server in sync with the start and shutdown of Windows.
- Supports the Ethernet, RS-232-C (EIA-232 standard), and RS-422-A (EIA-422 standard) interfaces of DARWIN.
- Allows a data update rate of up to 1 s. However, data update may not be possible at the specified rate depending on the communication conditions.
- Capable of reading measured value, computed value, and alarm status as an ItemID.
- Capable of reading and writing communication input data and command DO as ItemIDs (excluding communications using the Ethernet module via port No. 34151).
- By setting the communication status with the connected device as an ItemID, a client is able to instruct a recovery after a power failure.
- Retrieves span value, unit, tag, alarm type, and alarm setting as Property IDs of the ItemID.
- The DAQOPC OPC server supports the OPC Data Access Version 2.05A.
- The DAQOPC OPC server supports the OPC DA Custom Interface.
- The DAQOPC OPC server supports the OPC DA Automation Interface.
- The DAQOPC OPC server supports optional the OPC DA browser function. (Browser function is used by the OPC client to browse the contents of the OPC server.)
- The DAQOPC OPC server can connect up to 16 DARWINs.

Where OPC Interface Fits

OPC client refers to the application that requests data using the OPC interface. OPC server refers to the application that provides the data.

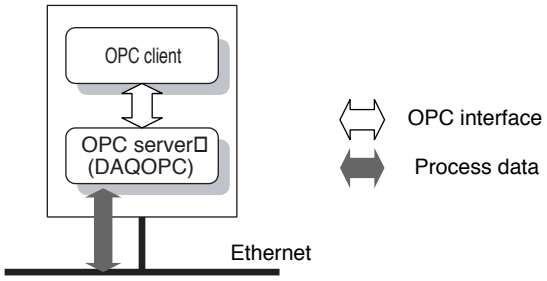


The OPC server and OPC client run on a general-purpose PC.
You can use a commercially sold OPC-compliant application or an OPC-compliant application that you've created using VC++ (Visual C++), VB (Visual Basic), or VBA (Visual Basic for Application) as an OPC client.

Server/Client Configuration

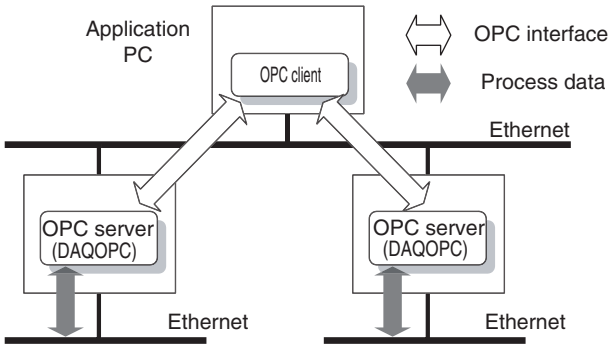
The DAQOPC user (OPC client) may exist on the same PC as the DAQOPC server or on a host computer (Windows machine).

When the OPC client exists on the same PC as the DAQOPC server



- Application size : Mid-size
- Performance : Faster than when the OPC client exists on a host computer, because a local OPC server is used.

When the OPC client exists on a host computer



- Application size: Mid- to large-size
- Performance: The performance degrades slightly (20% to 30%) per server when compared to the case in which the OPC client exists on the same PC as the DAQOPC server. This is because the DCOM (Distributed Component Object Model) is used to connect between the client and server.

Hardware Requirements

The following hardware is required for DAQOPC to operate properly.

- PC model: IBM PC/AT compatible (Single CPU)
- CPU: Pentium II 300MHz or faster recommended (Windows 2000)
  Pentium II 800MHz or faster recommended (Windows XP)
- Main memory: 256 MB or more.
- Free disk space: 1 GB or more.
- Communication device: RS-232-C port supported by the OS.
  Ethernet NIC (not required if the OPC client and the DAQOPC server exist on the same PC, and the RS-232-C/RS-422-A interface is used to retrieve data from the DARWIN.)
- Peripheral devices: Mouse supported by the OS .

Software Requirements

The following software is required for DAQOPC to operate properly.

- Operating System: Windows 2000 or Windows XP
  The package (DAQOPC) and the OS (Windows 2000 or Windows XP) is of a same language.
- Service pack: Windows 2000 Service Pack 3 or 4
  Windows XP Service Pack 1 or 2

Others

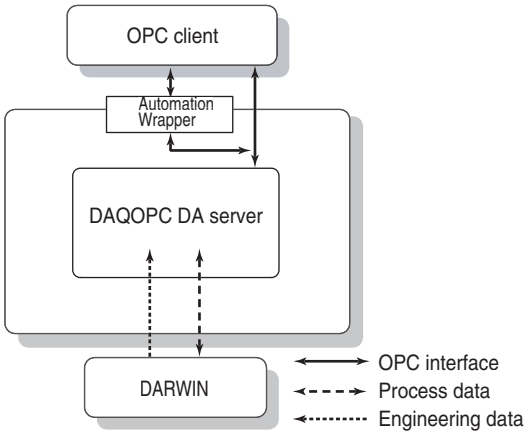
If the communication interface with the DARWIN is RS-422-A, an RS-232-C/RS-422-A converter is required.

1.2 Overall Configuration and DAQOPC Interface

This section will describe the overall construction of DAQOPC and an overview of DAQOPC functions.

Overall Construction of DAQOPC

The overall construction of DAQOPC is shown below. DAQOPC OPC server consists of a server that provides the interface specifications of the OPC DA.



Role of each function

An overview of the interface that DAQOPC supports is indicated.

Process Data		OPC Specification
Current value data	Read/write*	Complies with DA 2.05a

* Write is only for communication input data only.

Engineering Data		OPC Specification
Tag information	Read	Complies with DA 2.05a
Tag list	Read	Complies with DA 2.05a

1.3 Server Function

A list of DAQOPC server functions is shown below.

Function Name	Description
OPC DA custom interface	Functions that complies with the custom interface of the OPC specification.
OPC DA automation interface	Functions that complies with the automation interface of the OPC specification.

DA Server

Application capacity

The application capacity of the DAQOPC DA server is shown below.

Item	Application Capacity
Maximum number of clients	100 clients
Maximum number of group objects	1,000 groups
Maximum number of registered ItemIDs	10,000/group
Maximum number of cache update ItemIDs	100,000
Cache update rate (UpdateRate)	1 to 3,600 sec

Server name (ProgID)

The server name of the DAQOPC DA server is as follows:

Server name: **Yokogawa.ExaopcDADAQOPCDARWIN1**

Note

You can also check the server name (ProgID) in the Version Information dialog box of the DAQOPC configuration window.

OPC Custom Interface and OPC Automation Interface

The OPC specification defines two types of interfaces: OPC custom interface and OPC automation interface. Both of these interfaces have approximately the same data access functions, but they are designed for different client programs.
The DAQOPC OPC server implements both interfaces and supports both types of client programs.

	Custom Interface	Automation Interface
Application	For dedicated applications such as SCADA/MES/analysis software programs	For easy access from script languages
Number of client languages	VC++	Visual Basic
Performance	Good	Poor

The OPC custom interface uses the basic OLE/COM functions directly and operates at a high speed.
In contrast, the OPC automation interface complies with the OLE automation interface that allows access from Visual Basic. The process that facilitates the access from script languages leads to an overhead, and, therefore, the performance is slightly lower than the OPC custom interface.

VB and VC++ versions

If you are creating an application program (OPC client), use the following versions of VB and VC++.

		DAQOPC and User Application on the Same PC	DAQOPC and User Application on Different PCs.
DAQOPC	R3.01	VB6.0, VC++6.0 (SP5)	VB5.0/6.0, VC++5.0/6.0

If you are creating a program using VB, select the Yokogawa Exaopc Data Access Automation Server check box by choosing Project > References.

2.1 Flow of DAQOPC Operation

This section will describe the operations of DAQOPC. For the access method from the OPC client software, see chapter 3, "DAQOPC DA Server Function."
DAQOPC refers to the setting configurations at startup and communicates with the DARWIN. The DAQOPC Configurator provides easy-to-use user interface (like a typical Windows application) for displaying and setting the communication parameters of the DARWIN from which DAQOPC is to retrieve data. In addition, the DAQOPC Configurator shows information that is required for the client to connect to DAQOPC (ProgID).

Flow of Operation

The general flow of operation is as follows:

1. Determine the method of connection with the DARWIN from which to retrieve the data using the Configurator.
2. Start DAQOPC.
3. Set up the client software if the client is on a different PC.

Changing the Parameter during DAQOPC Operation

You can change parameters on the DAQOPC Configurator even when DAQOPC is in operation. However, the specified parameters take effect the next time DAQOPC is started.

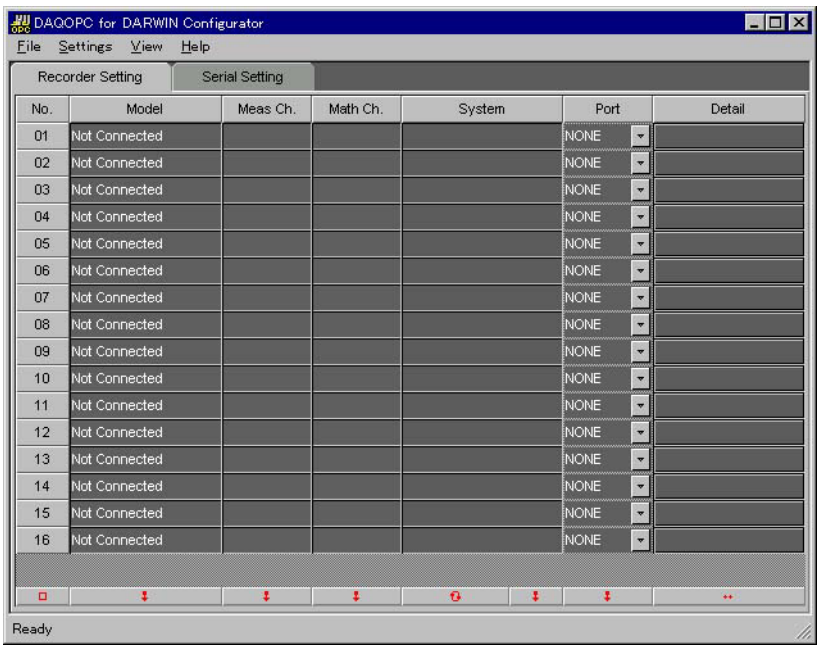
2.2 Starting the Configurator and Setting Parameters

Configurator

Configurator is used to set the connection method and operating conditions between DAQOPC and the DARWIN from which to retrieve the data.

Starting the Configurator

Choose **Start** > **Programs** > **DAQOPC**> **DAQOPC for DARWIN Configurator**. The window that appears when the program is started is shown below.



A List of Menu Commands

The functions of menu commands are indicated below.

File > Revert
Reloads the Configuration file without saving the information that you are currently editing.

File > Save
Saves the information that you are currently editing to the Configuration file.

File > Print
Prints the recorder settings and serial settings that you are currently editing.

File > Print Preview
Prints the preview of the recorder settings and serial settings that you are currently editing.

File > Printer Setup
Sets the printer.

File > Exit
Exits the Configurator.

Setting > Working Condition
Displays the Working Condition dialog box.

Setting > Ethernet Setting
Displays the Setting of Ethernet dialog box.

View > Recorder Setting
Switches to the Recorder Setting tab.

View > Serial Setting
Switches to the Serial Setting tab.

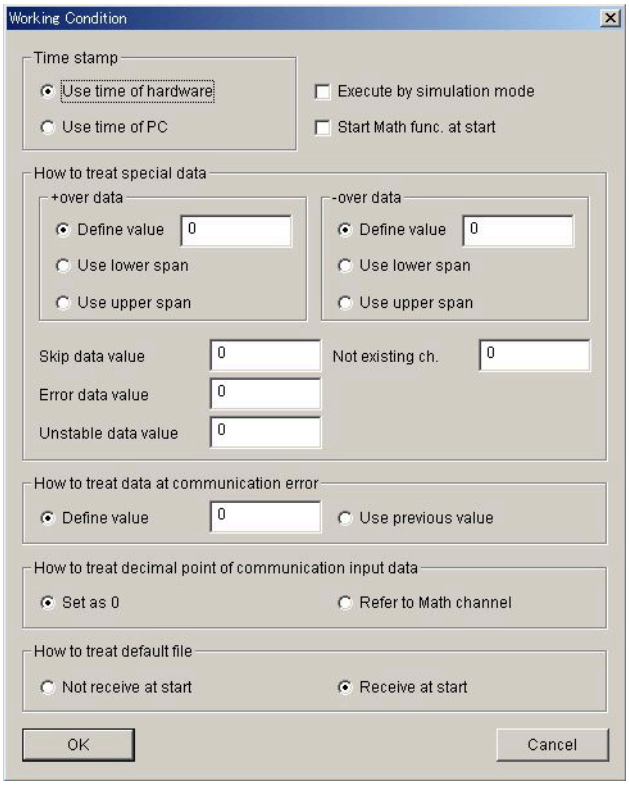
View > Tool Bar
Shows or hides the toolbar.

View > Status Bar
Shows or hides the status bar.

Help > About
Displays the Version Information dialog box.

Working Condition Dialog Box

Set the following items on the Working Condition dialog box.



- **Time Stamp**
  Select whether to use the time of the connected recorder or the time of the PC in which DAQOPC is installed for the time stamp that is added when the data is retrieved.

Note

When the connected device is the DA100, the time on the PC is used even if you select Use time of DARWIN.

- **Execute by simulation mode**
  If you select this check box, DAQOPC does not perform communications with the DARWIN and operates as a simulator.

Note

To execute DAQOPC in demo mode, the configuration file that was specified in the Detail Setting dialog box of each device must exist.

- **Start Math Func. at Start**
  If you select this check box, the computation operation will start when the server is started.
- **How to treat special data**
  Assigns values to special data that is retrieved from the DARWIN. For values over or under the range, you can specify a particular value or assign upper and lower limits of the span. You can also assign values for skip, error, and no-data data. You can assign a value between -100000000 and 1000000000. A decimal point is added to the appropriate position to the value that is actually retrieved.
  In addition, you can assign a value when a nonexistent channel is specified as an item. The selectable range is -100000000 to 1000000000.

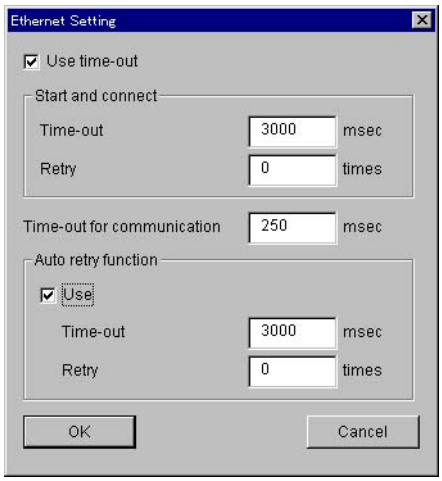
Note

You can specify the span in the range setting for the DR and DC, but the span referred here is the upper and lower limits of the selectable range to be used when using the range setting on the DR and DC. In addition, when the scale is specified on the DR, DC, or DA, the specified scale range becomes the upper and lower limits.

- **How to treat data at communication error**
  Specify the handling of the value when an error occurs while data is being retrieved.
  If the previous value is used, the value before the communication error is retrieved. If you are specifying a particular value, it is handled in the same fashion as "How to treat special values." If a communication error occurs when DAQOPC initially connects to the DARWIN, the value is always set to 0.
- **How to treat decimal point**
  Select whether to set the decimal point position of the communication input data the same as that of the computation channel or not use the decimal point and the numbers below the decimal point.
  If you select Set as 0, the value is transmitted with the value below the decimal point truncated.
  If you select Refer to Math channel, the decimal position of the computation channel is set to the decimal point position of the specified communication input data when computation input data is specified in the computing equation of the computation channel within the setting data that is specified by each device. The value less than the number of digits below the decimal point that is specified for the computation channel is truncated. When multiple channels are using the same communication input data, the decimal position for the measurement channel with the smallest number is used. However, if communication input data is not used on the computation channel, the decimal point and the value below it are truncated and transmitted.
- **How to treat default file**
  If the default file is specified for the setting data for each device, select whether to receive the setting conditions by communicating to the DARWIN at startup.
  If you select Receive at start, the setting data is received from the connected device and stored to the default file at startup. However, if the DARWIN setting conditions are specified in the detail setting of each device, the setting conditions are not received at startup.
  If you select No receive at start, the setting data is not received from the connected device at startup nor when ItemID Common.Status is set to 2. However, if the default file is specified in the detail setting of each device and the file does not exist, setting data is received at startup.

Setting of Ethernet Dialog Box

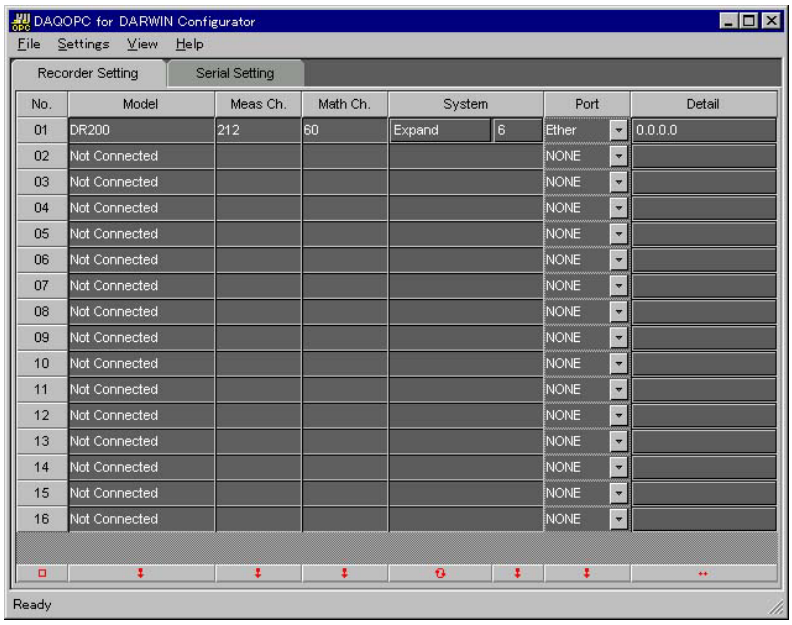
Set the following items on the Setting of Ethernet dialog box.



- **Use Time-out**
  Select this check box when setting a timeout.
- **Start and Connect**
  Set the timeout time and the retry count for establishing connection at the startup of the server. These values also apply to the reestablishment of the connection when 2 is written to Common.Status. You can set 1 ms to 60000 ms for Time-out. You can set 0 to 10 times for Retry. When connection is established, retry is stopped before the specified count is reached. If Retry is set to 0 and the connection fails, the communication fails and the connection is not retried.
- **Time-out for communication**
  Select this check box to set the timeout for the communication error when retrieving data or requesting write operation after connection. You can set 1 ms to 60000 ms for Time-out.
- **Auto retry function**
  Select this check box to reestablish the connection when retrieving the next data or requesting the next data write operation when communication failed or communication error occurred. The settings for Time-out and Retry are the same as those for Start and Connect.

Setting the Recorder

The Recorder Setting tab page is shown below.



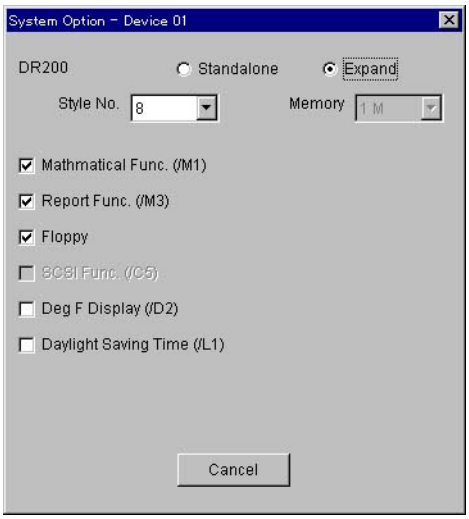
The following items are specified on the Recorder Setting tab page.

Model: If the file that was selected in Detail exists, the corresponding model information is displayed.

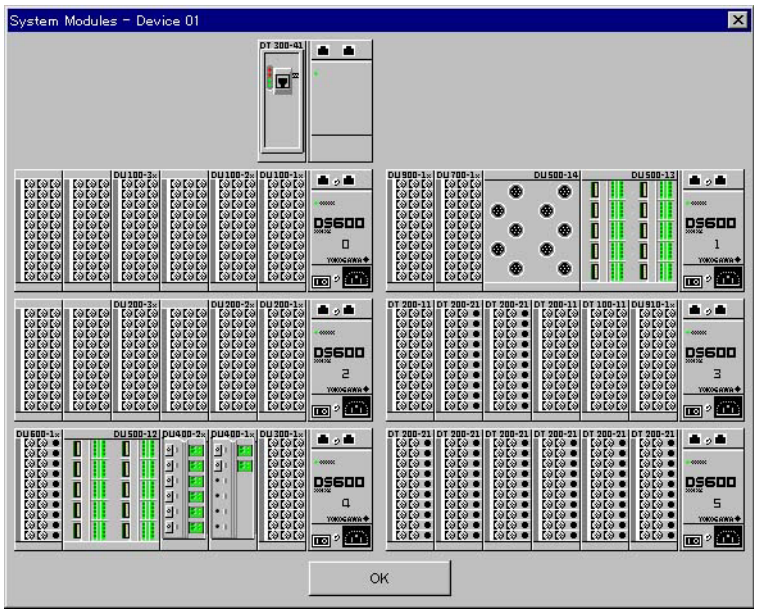
Measurement Channel: If the file that was selected in Detail exists, the corresponding number of measurement channels is displayed.

Computation channel: If the file that was selected in Detail exists, the corresponding number of computation channels is displayed.

System: If the file that was selected in Detail exists, you can refer to the system and module configuration within the file. If you click the left item under System, the following dialog box appears. You cannot change the information.



If you click the right item under System, the following dialog box appears. You cannot change the information.

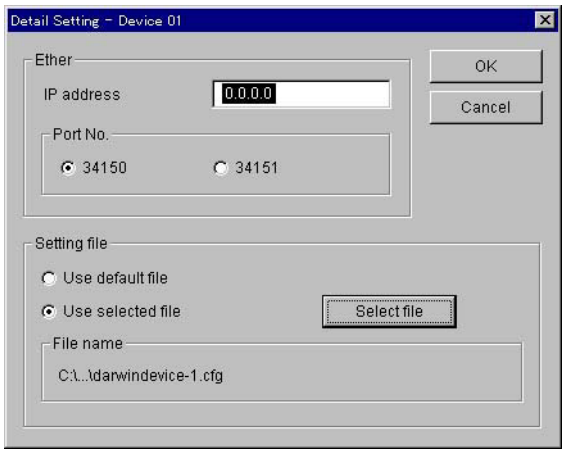


Port: Select the port to be connected. For COM, only the ports that are valid in the serial settings are displayed.

Detail: This is valid when Port is not set to NONE. Sets the detail settings of communication and the handling of the DARWIN setting conditions.

When the port is an Ethernet port

Click Detail to open the following dialog box.



Specify the following parameters.

IP Address: Enter the IP address assigned to the DARWIN that is to be connected.

Port No.: Select the port number to be used.

Note

If you set Port No. to 34151, you cannot receive setup data. Use selected file is automatically selected. In addition, you cannot specify communication input data and command DO.

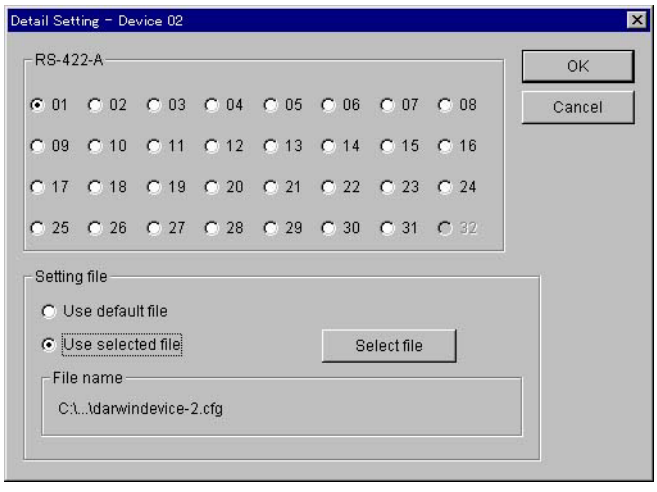
Setting file: Specify the setting file that is used when a server retrieves properties. If you had set How to treat default file to Receive at start on the Working Condition dialog box and you select Use default file here, the server retrieves the properties at startup and creates a default file. If you select Use selected file, you can specify a setting data (.ast, .rst, or .cst) for the connected device that was created using the DAQ32 or DAQ32Plus Hardware Configurator.

Note

- If the parameters are not correct, connection to the DARWIN fails.
- The setting data that is created as a default file is not compatible with the setting data that is created using the DAQ32 or DAQ32Plus Hardware Configurator.

When the port is COM

Click the address to display the following dialog box.

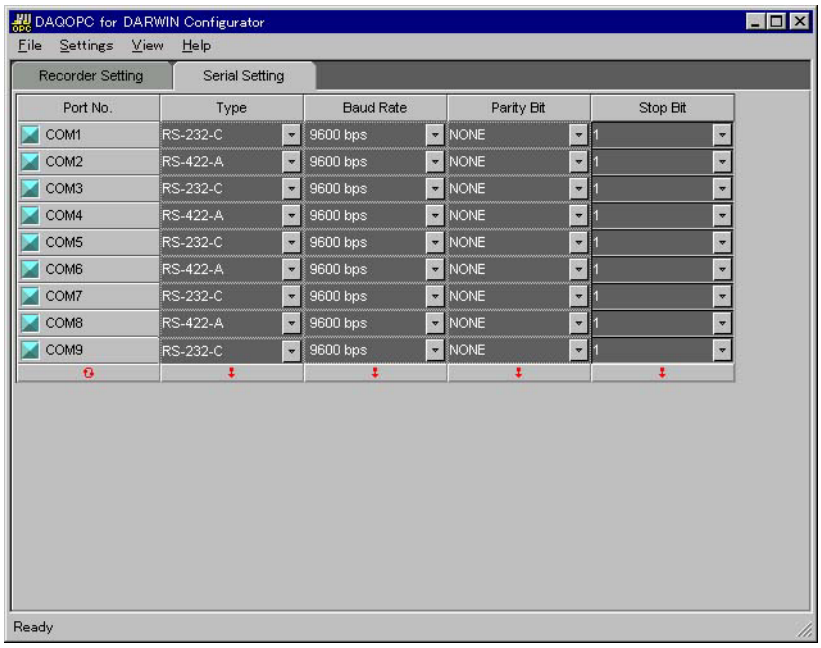


Select the RS-422-A address (you cannot select the address for RS-232-C).

Setting file: This is the same as the description for "When the port is an Ethernet port." However, for COM, all settings can be received.

Serial Setting Tab Page

The following items are specified on the Serial Setting tab page.

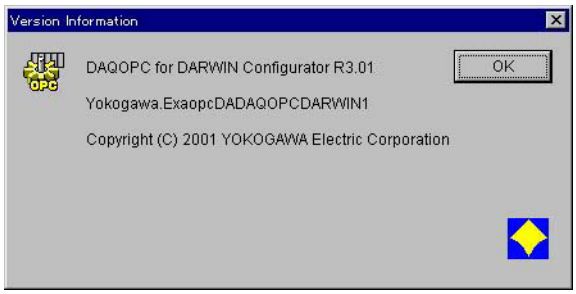


Port No.: Select the check box corresponding to the port No. to be used.
Type: Set the type of port to be used.
Baud Rate: Select the baud rate for the port to be used.
Parity: Set the parity for the port to be used.
Stop Bit: Select the stop bit for the port to be used.

Version Information Dialog Box

The Version Information dialog box shows the following information.

- Version information
- ProgID
- Serial No.



2.3 Starting and Stopping DAQOPC

Starting DAQOPC

The DA server process automatically starts as a background process when the Windows system is started. At this point, DAQOPC starts communications with the DARWIN according to the communication conditions that were specified using the Configurator.

The setup information of the Configurator is loaded during the startup of the Windows system. If you change the Configurator settings, restart the system to apply the new settings.

Stopping DAQOPC

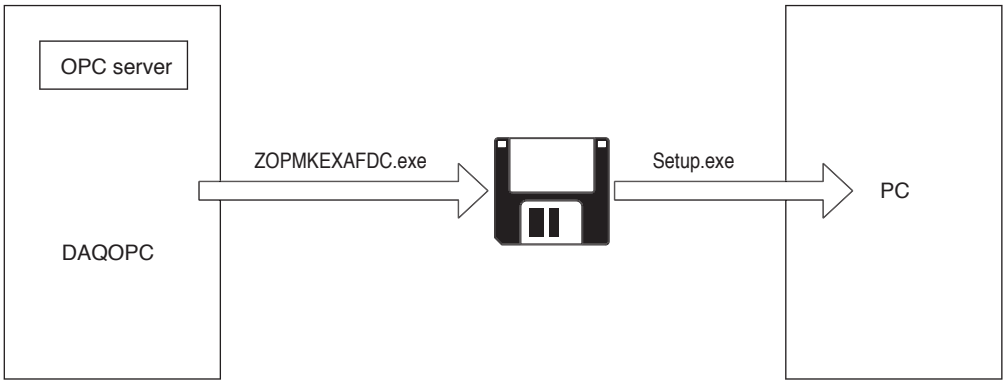
The DA server process automatically stops when the Windows system is shut down.

2.4 Setting Up the DAQOPC Client

If you are using DAQOPC remotely from a PC that is connected to the network, you must setup the DAQOPC client.

If you have not set up the DAQOPC client, follow the procedure below to set up the software.

1. Insert a formatted floppy disk into the floppy drive of the PC (PC server) in which you have installed DAQOPC.
2. On the server PC, run ZOPMKEXAFDC.EXE in the Program folder in the installation folder of the DAQOPC using a program such as Windows Explorer.
3. A dialog box appears when an OPC client setup disk is created.
   Click **OK** in the dialog box.
4. Log on to the PC (PC client) in which to setup the OPC client using a user name belonging to the Administrator group.
5. Insert the setup floppy disk that you have just created into the floppy drive of the client PC.
6. Run Setup.exe on the setup floppy disk. The OPC client is set up.



Access Method from the Client Software

The ProgID used in accessing DAQOPC from the client software is as follows:
Yokogawa.ExaopcDADAQOPCDARWIN1

2.5 Handling of Configuration Files

The DAQOPC for the DARWIN series uses the configuration file based on the following philosophy.

Basic Operation

The server receives the setup information from the connected remote DARWIN at startup and operates based on the received information.

How to Use Port No. 34151 of the Ethernet Module

When compared to port No. 34150, the commands that can be used on port No. 34151 are limited, and the information required by the server cannot be retrieved. If you are using the DAQOPC through port No. 34151 of the Ethernet module simultaneously with other software programs, the required information is retrieved using DAQ32, a DARWIN standard software program.

To Cut Down the Server Startup Time

The time needed in retrieving setup information from the DARWIN can be reduced by receiving the settings and saving them to a file beforehand or by using the DAQ32 setting data.

Operation When the DARWIN Setting Conditions Is Missing

The server operation is not automatically recovered in the following cases. An explicit recover instruction or loading of properties is required.

- When reception fails at startup.
- When reloading of properties fails.

If reloading of properties fails, the channels that were accessed up to this point remain as invalid channels. The server operation is not affected.
Also, if the PC does not receive the settings file when starting up, the server must be restarted.

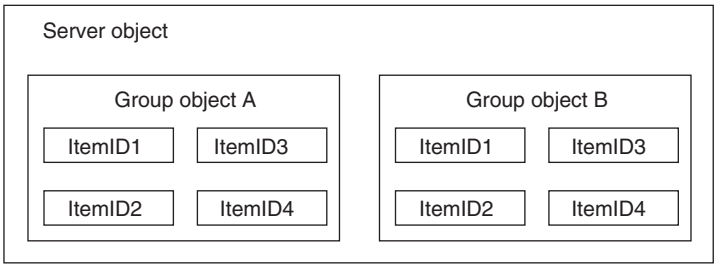
Communication Input Data

Communication input data cannot be retrieved from the DARWIN (no such command exists). Therefore, the communication input data values are stored within the server. When writing of communication input data is successful, the saved values are overwritten with the successful values. The default value is 0. Therefore, the values retrieved at the client may be different from the values that are actually saved on the DARWIN.

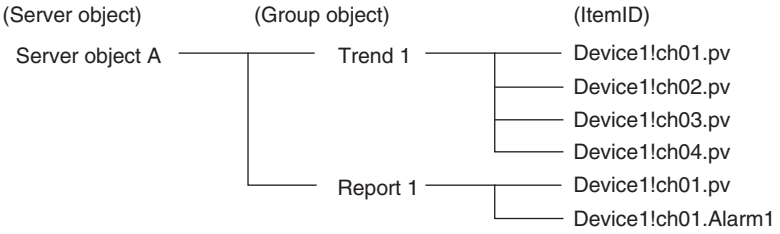
3.1 Overview of the DAQOPC DA Server Function

Data Access Method via the OPC Interface

Through the OPC Interface, the OPC client creates a group object in the server object and registers the process data to be accessed as an ItemID in the group object. ItemIDs are registered in the form "tag, tag item." Using this scheme, you can specify the data acquisition rate for each group object. You can also register the same ItemID in different group objects according to your application.



In the example below, two group objects, Trend 1 and Report 1, are created in the server object A. Device1!ch01.PV through ch04.PV are registered as ItemIDs in the Trend 1 group object. Device1!ch01.PV and Device1!ch04.Alarm01 are registered as ItemIDs in the Report 1 group object.
Trend 1 and Report 1 are accessed as independent group objects. In addition, the value of Device1!ch01.PV exists in Trend 1 and Report 1 in this example.



OPC Interface Compliance

The DAQOPC DA server is an OPC server that provides the interface complying with the following OPC DA Specification Version 2.05a.

- OPC DA Custom Interface
- OPC DA Automation Interface

It supports all the standard functions that are defined in these OPC Specifications.
In addition, those items that are defined as options (browse function of items) are also supported.

Note

For details on the OPC Custom Interface and OPC Automation Interface, see the corresponding sections in section 1.3, "Server Functions."

3.2 OPC Interface Functions

The DAQOPC DA Server supports the standard interface of OPC Version 2.05a. It also supports a portion of the interface that is defined to be options. For clients that use the older version of the OPC interface, functions that were supported in OPC Version 1.0A are also supported.
This section will mainly focus on the vender-specific option interface of the DAQOPC DA Server.
For details on the OPC Interface, see the specifications that are released by the OPC Foundation.

A List of Interfaces

A list of interfaces that are supported is indicated for the OPC Custom Interface and OPC Automation Interface.

Custom Interface

The table below indicates whether or not the DAQOPC DA Server supports various interfaces of the Custom Interface.

Object	Interface Name	Description	Support
OPCServer	IOPCServer	A standard interface of the OPC DA server. Adds and Deletes group objects.	Yes
	IOPCCommon	OPC common interface. Sets the locale and retrieves error strings.	Yes
	IConnectionPointContainer	OPC common interface. Interface for asynchronous communication used to notify the client that the server is going to shut down.	Yes
	IOPCItemProperties	Interface. Retrieves the properties of the ItemID.	Yes
	IOPCBrowseServerAddress Space(optional)	Browses the ItemIDs in the OPC DA server.	Yes
	IOPCServerPublicGroups (optional)	Connects to the public group; deletes the public group.	No
	IPersistFile (optional)	Loads and saves configuration information.	No
OPCGroup	IOPCGroupStateMgt	Manages the group object.	Yes
	IOPCItemMgt	Manages the ItemIDs.	Yes
	IOPCSyncIO	Performs synchronous write and read operations.	Yes
	IOPCAsyncIO2	Performs asynchronous write and read operations.	Yes
	IConnectionPointContainer	Interface for creating connections for asynchronous read and write operations.	Yes
	IOPCPublicGroupStateMgt (optional)	Convert a private group to a public group.	No
	IOPCAsyncIO (old)	Performs asynchronous write and read operations (old interface for compatibility).	Yes
	IDataObject (old)	Performs connection and disconnection to the asynchronous I/O (old interface for compatibility).	Yes
EnumOPCItem Attributes	IEnumOPCItemAttributes	Retrieves a list of ItemIDs that are registered in the group object.	Yes

Yes: Supported, O: Not supported

Automation Interface

The DAQOPC DA Server only supports the automation interfaces that correspond to the custom interfaces that are supported. The table below shows whether or not the interface is supported. (Since those that are not supported may result in error, error handling for Visual Basic must be provided.)

Object	Type	Name	Description	Support
OPCServer	Properties	StartTime	Time when the server was started	Yes
		CurrentTime	Current time	Yes
		LastUpdateTime	Time that was notified last	Yes
		MajorVersion	Major version	Yes
		MinorVersion	Minor version	Yes
		BuildNumber	Build number	Yes
		VendorInfo	Vendor information	Yes
		ServerState	Server state	Yes
		LocaleID	Locale ID	Yes
		Bandwidth	Bandwidth	Yes
		OPCGroups	Collection of group objects	Yes
		PublicGroupNames	Public group name	No
		ServerName	Server name	Yes
		ServerNode	Node name	Yes
		ClientName	Client name	Yes
	Methods	GetOPCServers	Gets a list of server names.	Yes
		Connect	Established connection.	Yes
		DisConnect	Releases connection.	Yes
		CreateBrowser	Creates a browser object.	Yes
		GetErrorString	Gets the error string.	Yes
		QueryAvailbleLocaleIDs	Gets a list of supported locale IDs.	Yes
		QueryAvailableProperties	Gets a list of properties.	Yes
		GetItemProperties	Gets properties.	Yes
		LookupItemIDs	Converts the ItemID of properties.	No
	Events	ServerShutDown	Shutdown event	Yes

Yes: Supported, No: Not supported

Object	Type	Name	Description	Support
OPCBrowser	Properties	Organization	Hierarchical type	Yes
		Filter	Filter specification	Yes
		DataType	Data type	Yes
		AccessRights	Access rights	Yes
		CurrentPosition	Current position	Yes
		Count	Number of collections	Yes
	Methods	Item	Gets the object.	Yes
		ShowBranches	Gets a list of current positions.	Yes
		ShowLeafs	Gets a list of current positions.	Yes
		MoveUp	Moves the hierarchy.	Yes
		MoveToRoot	Moves the hierarchy.	Yes
		MoveDown	Moves the hierarchy.	Yes
		MoveTo	Gets the absolute position.	Yes
		GetItemID	Gets the ItemID.	Yes
		GetAccessPaths	Gets access paths.	No
OPCGroups	Properties	DefaultGroupIsActive	Default active property	Yes
		DefaultGroupUpdateRate	Default cache update	Yes
		DefaultGroupDeadband	Default deadband	Yes
		DefaultGroupLocaleID	Default locale ID	Yes
		DefualtGroupTimeBias	Default time bias	Yes
		Count	Number of collections	Yes
	Methods	Item	Gets the group object.	Yes
		Add	Adds a group.	Yes
		GetOPCGroup	Gets the group object.	Yes
		Remove	Deletes the group.	Yes
		RemoveAll	Deletes all groups.	Yes
		ConnectPublicGroup	Gets the public group.	No
		RemovePublicGroup	Deletes the public group.	No

Yes: Supported, No: Not supported

Object	Type	Name	Description	Support
OPCGroup	Properties	Name	Group name	Yes
		IsPublic	Public property (always FALSE)	No
		IsActive	Active property	Yes
		IsSubcscribed	Asynchronous property	Yes
		ClientHandle	Client handle	Yes
		ServerHandle	Server handle	Yes
		LocaleID	Locale ID	Yes
		TimeBias	Time bias	Yes
		DeadBand	Deadband	Yes
		UpdateRate	Cache update rate	Yes
		OPCItems	Item collection	Yes
	Methods	SyncRead	Performs a synchronous read.	Yes
		SyncWrite	Performs a synchronous write.	Yes
		AsyncRead	Performs an asynchronous read.	Yes
		AsyncWrite	Performs an asynchronous write.	Yes
		AsyncRefresh	Refreshes.	Yes
		AsyncCancel	Cancels asynchronous request.	Yes
	Events	DataChange	Change notification	Yes
		AsyncReadComplete	Asynchronous read response	Yes
		AsyncWriteComplete	Asynchronous write response	Yes
		AsyncCancelComplete	Cancel response	Yes

Yes: Supported, No: Not supported

Object	Type	Name	Description	Support
OPCItems	Properties	Parent	Parent group object	Yes
		DefaultRequestedDataType	Default requested data type	Yes
		DefaultAccessPath	Default access path	No
		DefaultActive	Default active property	Yes
		Count	Number of collections	Yes
	Methods	Item	Gets the item object.	Yes
		GetOPCItem	Gets the item object.	Yes
		Remove	Removes the item object.	Yes
		Validate	Checks the item.	Yes
		SetActive	Sets the active property.	Yes
		SetClientHandles	Sets the client handle.	Yes
		SetDataTypes	Sets the data type.	Yes
		AddItem	Adds an item.	Yes
		AddItems	Adds multiple items.	Yes
OPCItem	Properties	Parent	Parent group object	Yes
		ClientHandle	Client handle	Yes
		ServerHandle	Server handle	Yes
		AccessPath	Access path	No
		AccessRights	Access rights	Yes
		ItemID	ItemID	Yes
		IsActive	Active property	Yes
		RequestedDataType	Requested data type	Yes
		Value	Data value	Yes
		Quality	Quality flag	Yes
		TimeStamp	Time stamp	Yes
		CanonicalDataType	Data type assigned by the server	Yes
		EUType	Engineering unit type	No
		EUInfo	Engineering unit information	No
	Methods	Read	Performs a synchronous read.	Yes
		Write	Performs a synchronous write.	Yes

Yes: Supported, No: Not supported

Process Data

The process data of the OPC specification consists of the following three elements.

- Value
- Quality Flag
- Time Stamp

Value

OPC uses a data type called VARIANT.

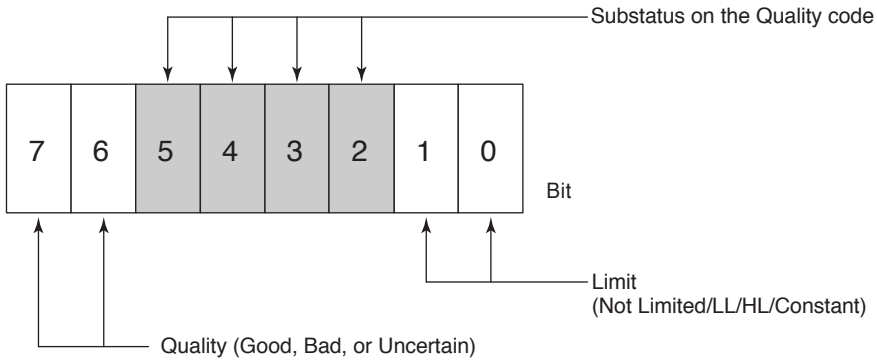
Quality Flag

This flag indicates whether the Value was retrieved correctly. Notifies the reason if erroneous.

The quality flag of DAQOPC follows the system of the OPC specifications. The quality flag system of the OPC specifications consists of the following three contents.

- Quality (Good, Bad, or Uncertain)
- Substatus (details dependent on the Quality)
- Limit (additional information for the substatus)

The quality flag is expressed using the following 8 bits.



DAQOPC sets these three types of information as a quality flag.

Quality and Substatus

The Substatus of the Quality code contains information that can be expressed using 4 bits for each Quality (Good, Bad, and Uncertain). The Substatus codes are defined by the OPC specifications. DAQOPC uses these codes to add details. The table below shows the information that the OPC specifications define.

Code	Substatus for Each Data Quality Code		
	Good(3)	Bad(0)	Uncertain(1)
0	Non-specific	Non-specific	Non-specific
1	N/A	Configuration Error	Last Usable Value
2	Local Override	Not Connected	N/A
3		Device Failure	Sensor Not Accurate
4		Sensor Failure	EngineeringUnitsExceeded
5		Last Known Value	Sub-Normal
6		Comm Failure	
7		Out of Service	
8			
9			
10			
11			
12			
13			
14			
15			

Limit

Limit is yet another Quality code information that is added to the combination of Quality and Substatus.

Code	Description
0	Not Limited
1	Low Limited
2	High Limited
3	Constant

Data and Quality code

The data from the DARWIN is converted to the following Quality codes.

Data status	Quality	Substatus	Limit
Normal value	Good	Non-specific	Not Limited
Positive overrange value	Good	Non-specific	High Limited
Negative overrange value	Good	Non-specific	Low Limited
Skip or computation Off	Bad	Out of Service	Not Limited
Error value	Bad	Sensor Failure	Not Limited
No data	Bad	Out of Service	Not Limited
Communication error	Bad	Comm Failure	Not Limited
The specified item does not exist.	Bad	Configuration Erroe	Not Limited

By assigning values other than normal values using the Configurator, you can check the data from the DARWIN even without the Quality code.

Time Stamp

Retrieves either the time of the DARWIN or the time of the PC. Using the Configurator, you can change the destination from which to retrieve the time.

Selection on the Configurator	Description
Time of the device (DARWIN)	Retrieves the time of the device.
Time of the PC	Retrieves the time of the PC in which the Server for retrieving the data is installed in UTC.

Note: The "DEVICE" section is fixed. In the number section that follows, specify the device position that you assigned using the Configurator.

ItemID

An arbitrary string used to identify items. It is generally called tags.

Defining the ItemID

DAQOPC defines ItemIDs as follows:

Device!tag number.data item

Example: DEVICE1!CH001.PV

The "DEVICE" section is fixed. In the number section that follows, specify the device position that you assigned using the Configurator.

A list of ItemIDs

On DAQOPC, the following items can be accessed using ItemIDs.

ItemID	Description	Canonical data type	Access Rights	Notes
DEVICEx!CHxxx.PV	Measured value or computed result	VT_R8	Read Only	Measurement and computation channels only
DEVICEx!CHxxx.ALARMx	Alarm status of the specified channel	VT_I2	Read Only	Measurement and computation channels only
DEVICEx!CHcxx.INPUT	Value of the communication input data	VT_R8	Read/Write	Communication input data only
DEVICEx!COMMON.STATUS	Device status	VT_I2	Read/Write	
DEVICEx!COMMON.PROP	Property read status	VT_I2	Read/Write	
DEVICEx!Rxxx.STATUS	Command DO status	VT_BOOL	Read/Write	Command DO only

The retrievable process values are the following two values.

- Measured value and computed value
  Syntax Device name!channel number.pv
  Example: Device1!Ch01.PV
  For the device name, enter the name of the device that you specified using the Configurator
- Alarm value
  Syntax Device name!channel number.ALARM1
  Example: Device1!Ch01_ALARM1
  You can specify ALARM1 through ALARM4 for the alarm.

The read/writable values are the following two values.

- Input value
  Syntax Device name!communication input data number.INPUT
  Example: Device1!ChC01.INPUT
  Add the letter C as in ChC01 for the communication input data.
- Command DO
  Syntax Device name!communication input data number.STATUS
  Example: Device1!R001.STATUS
  For the relay number, the xxx of Rxxx is the same as the Ixx, Sxx, 0xx, 1xx, 2xx, 3xx, 4xx, and 5xx of the DARWIN.

Item name PV

Specifiable tag: Existing measurement and computation channels only

Item name ALARM

Specifiable tag: Existing measurement and computation channels only
Item names are ALARM1, ALARM2, ALARM3, and ALARM4.
The alarm value is 0 if there is no alarm occurring. The value is set to the alarm type (alarm type value 1 through 6 as written in property ID: 6004), which is an alarm item property, if an alarm is occurring (see page 3-14).

Item name INPUT

Specifiable tag: Existing communication input data only
The input range is the range that can be input to the DARWIN.
The server does not check whether the input value is within the allowed input range.
Cannot be used when the port number used on the Ethernet network is set to 34151.

Item name STATUS(Rxxx)

Specifiable tag: Rxxx
Only command DO that can be used on the DARWIN DA model (style 8 or later) can be specified.
The status of the specified relay is as follows:
Relay off FALSE
Relay on TRUE
Cannot be used when the port number used on the Ethernet network is set to 34151.

Item name STATUS(COMMON)

Specifiable tag: COMMON
Indicates the status of the specified device (see below).

Operating normally.	0
The specified device does not exist.	1
Failed to allocate memory area.	2
Failed to open communications.	3
Communication error.	4

When the status is 3 and 4, and 0 is written, the DAQOPC server attempts to recover the communication of the specified device. When the communication recovers, the device status is received and the property information is retrieved. The device status also written to a fixed file.

Writing 0 when the status is 0, 1, or 2 is void.

Note

If the module configuration is changed after receiving the settings and the channel that was valid before no longer exists, the value is set to the value specified by the Configurator, and the quality code is change to "The specified item does not exist."

Item name PROP

Specifiable tag: COMMON

Indicates the property read status of the specified device (see below).

The properties of the specified device have not been read.	0
The properties of the specified device have been read.	1
Performs a read operation to the specified device.	2

When 2 is written, the properties are retrieved from the specified device. Normally, if the device status is set to be received at startup by the Configurator, they are received at startup and the properties are retrieved. If a file is specified, the properties are read from the file at startup. When a retrieve request for a property value is received, the server returns a value based on this value rather than actually requesting the device. In addition, the server uses the decimal position information of the measured and computed values that are retrieved at the start of DAQOPC. Therefore, if you change the range and other settings on the specified device, the settings are reread from the specified file. The settings are not received.

Note

If the module configuration is changed after executing a reread and the settings and the channel that was valid before no longer exists, the value is set to the value specified by the Configurator, and the quality code is change to "The specified item does not exist."

Access path

OPC defines access path for distinguishing the COM (Component Object Model) ports, but the DAQOPC DA Server does not use it.

Blob

OPC defines a parameter called Blob to increase the efficiency of ItemID searches, but the DAQOPC DA Server does not use it.

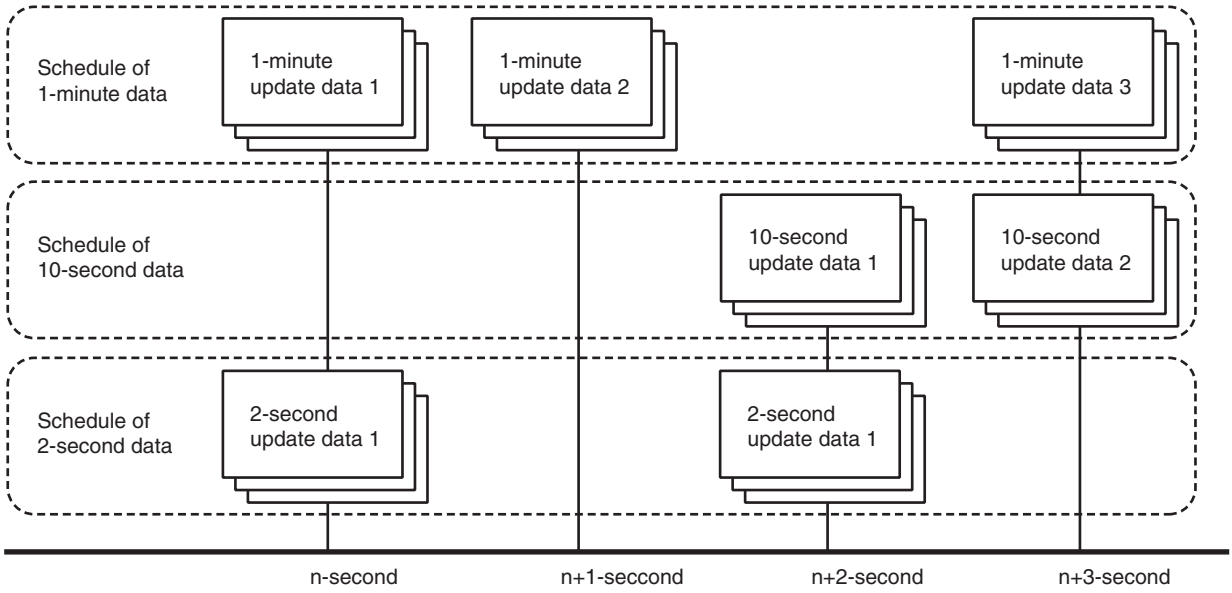
Data acquisition operation

The data acquisition operation complies with the OPC specifications. However, if the acquisition request from the client software exceeds the specifications of the maximum number of data points of DAQOPC, the process is temporarily suspended. Therefore, the desired response will not be obtained.

Cached data update

The cached data is scheduled in units of the update rate as follows:

1. The cached data is divided into update rate communication units (the maximum number of data points that can be transferred each time: 10000).
2. If the data and the update rate are the same, it is scheduled once to avoid duplication.
3. Each communication unit is scheduled as follows:
   - Each communication unit maintains its update rate.
   - Scheduling is dispersed so that duplication of communication units within the same second with the same update rate is avoided as much as possible up to a range of one minute.
   - Scheduling is performed so that duplication within the same second with communication units of other update rates is minimized.
   - The communication unit of each update rate is scheduled with the start point at each 0 s of the system time. If multiple communication units of the same update rate exist, they are scheduled in order every 1 s with the update rate as the maximum width.



Subscription

DAQOPC rules regarding the data change check for the subscription are given below.

- For data of which the type is VT_R8 (measured and computed values (PV)), if the ratio of the difference between the current cached data and the new value is greater than the deadband, cached data is updated.
- For data of which the type is VT_I2 (alarm status (ALARMx), device status (Common.STATUS), property read status (PROP)), and VT_BOOL (command DO status (Rxxx.Status)), if there is a difference between the current cached data and the new value, cached data is updated.

Group Object Attribute (IOPCGroupStateMgt)

"Groups" are provided as means by which the OPC client can efficiently access the process data via the DA server. The OPC client is able to register arbitrary number of items in a group, and, in general, this group is handled as a unit for process data access. The handling of group object properties that are vender-specific is indicated below.

Group name

For the DAQOPC DA Server, if no name is specified when creating a group object, a group object with the following name is created.

Name of the created group: CSGroup1, CSGroup2, ..., CSGroupN

where N is an integer string.

Item Attribute (IOPCItemProperties)

Item attributes are attributive values that can be retrieved by specifying the ItemID and property ID. The following types of data can be acquired.

Specifying the data item PV (measurement channel and computation channel)

ItemID is specified as follows:

Device name!measurement or computation channel.PV

Example: DEVICE1!CH001.PV

Property ID	VARIANT type	Description
1	VARTYPE	"Item Cannonical Data Type" Allows retrieval of VARIANT data type of items.
5	VT_I4	"Item Access Rights" 1: Read only. Access level of item.
6	VT_R4	"Server Scan Rate" Example "250" Allows retrieval of the DARWIN measurement interval in the ms order.
100	VT_BSTR	"EU Unit" Example ""C" Allows retrieval of the engineering unit specified on the DARWIN. *1
102	VT_R8	"High EU" Example "2.0000" Allows retrieval of the upper limit of the span or scale that is specified on the DARWIN.*2
103	VT_R8	"Low EU" Example "-2.0000" Allows retrieval of the lower limit of the span or scale that is specified on the DARWIN.*2

*1 When a setting data is received from the DA100, DC100, or DR or when a setting data that was created using the DAQ32 or DAQ32Plus Hardware Configurator is opened, Ω ,°, and ϖ are converted to spaces, μ is converted to u, and ε is converted to e. Once a character is converted, it cannot be converted back.

*2 The upper and lower limits of the selectable measurement range for each measurement range of the DARWIN.
If a linear scaling is used on the DARWIN side, they become left and right scales set by scaling. When the left scale and right scale are reversed, the Property IDs 102 and 103 become the lower limit and the upper limit of the scale, respectively.
For computation channels, the two Property IDs represent the specified left span and right span. When the left span and right span are reversed, Property IDs 102 and 103 become the lower limit and the upper limit of the span, respectively.

Specifying the data item ALARM (measurement channel and computation channel)

ItemID is specified as follows:

Device name!measurement or computation channel.ALARM1 or ALARM 2-4

Example: DEVICE1!CH001.ALARM1

Property ID	VARIANT type	Description
1	VARTYPE	"Data Type" Allows retrieval of VARIANT data type of items.
5	VT_I4	"Item Access Rights" 1: Read only. Access level of item.
6	VT_R4	"Server Scan Rate" Example "250" Allows retrieval of the DARWIN measurement interval in the ms order.
100	VT_BSTR	"EU Unit" Example "++" Allows retrieval of the engineering unit specified on the DARWIN.*
6004	VT_I2	"Alarm Type" 0: Alarm OFF 5: RH alarm 1: H alarm 6: RL alarm 2: L alarm 3: DH alarm 4: DL alarm Allows retrieval of the type of alarm specified on the DARWIN. If the range is set to SKIP or the computation channel is OFF, Alarm OFF is output for all channels.
6005	VT_R8	"Alarm Trigger" Example "1.583" Allows retrieval of the alarm trigger value specified on the DARWIN. It is set to 0 when the alarm is OFF.

* When a setting data is received from the DA100, DC100, or DR or when a setting data that was created using the DAQ32 or DAQ32Plus Hardware Configurator is opened, Ω,°, and ℧ are converted to spaces, μ is converted to u, and ε is converted to e. Once a character is converted, it cannot be converted back.

Specifying the data item INPUT (communication input data)

ItemID is specified as follows:

Device name!communication input data.INPUT

Example: DEVICE1!CHC01.INPUT

Property ID	VARIANT type	Description
1	VARTYPE	"Data Type" Allows retrieval of VARIANT data type of items.
5	VT_I4	"Item Access Rights" 3: Read and write. Access level of item.
102	VT_R8	"High EU" Allows the retrieval of the upper limit that can be input.
103	VT_R8	"Low EU" Allows the retrieval of the lower limit that can be input.

Specifying the data item STATUS (Rxxx)

ItemID is specified as follows:

Device name!relay number.STATUS

Example: DEVICE1!R001.STATUS

Property ID	VARIANT type	Description
1	VARTYPE	"Data Type" Allows retrieval of VARIANT data type of items.
5	VT_I4	"Item Access Rights" 3: Read and write. Access level of item.

Specifying the data item STATUS (COMMON)

ItemID is specified as follows:

Device name!COMMON.STATUS

Example: DEVICE1!COMMON.STATUS

Property ID	VARIANT type	Description
1	VARTYPE	"Data Type" Allows retrieval of VARIANT data type of items.
5	VT_I4	"Item Access Rights" 3: Read and write. Access level of item.

Specifying the data item PROP (COMMON)

ItemID is specified as follows:

Device name!COMMON.PROP

Example: DEVICE1!COMMON.PROP

Property ID	VARIANT type	Description
1	VARTYPE	"Data Type"
		Allows retrieval of VARIANT data type of items.
5	VT_I4	"Item Access Rights" 3: Read and write. Access level of item.

Specifying the tag number (measurement channel)

ItemID is specified as follows:
Device name!measurement channel
Example: DEVICE1!CH001

Property ID	VARIANT type	Description
101	VT_BSTR	"Item Description" Example "Funace 1" Allows retrieval of the tag strings specified on the DARWIN.* For DA, "?????????"
6003	VT_BSTR	"Input Range" Example "TC, TypeK" Allows the retrieval of range strings of measurement channels.

* When a setting data is received from the DA100, DC100, or DR or when a setting data that was created using the DAQ32 or DAQ32Plus Hardware Configurator is opened, Ω, °, and ℧ are converted to spaces, μ is converted to u, and ε is converted to e. Once a character is converted, it cannot be converted back.

Specifying the tag number (computation channel)

ItemID is specified as follows:
Device name!computation channel
Example: DEVICE1!CH031

Property ID	VARIANT type	Description
101	VT_BSTR	"Item Description" Example "Funace 1" Allows retrieval of the tag strings specified on the DARWIN.* For DA, "?????????"

* When a setting data is received from the DA100, DC100, or DR or when a setting data that was created using the DAQ32 or DAQ32Plus Hardware Configurator is opened, Ω, °, and ℧ are converted to spaces, μ is converted to u, and ε is converted to e. Once a character is converted, it cannot be converted back.

Specifying the tag number (communication input data)

There are no item properties that can be retrieved.

Specifying the tag number (relay)

There are no item properties that can be retrieved.

Specifying the tag number (COMMON)

There are no item properties that can be retrieved.

Specifying the device

ItemID is specified as follows:
Device name
Example: DEVICE1

Property ID	VARIANT type	Description
6001	VT_BSTR	"Model" Example "DX120" On DARWIN, the DARWIN model name, DA100, DR130, DR2xx, or DC100, is displayed.
6002	VT_I2	"Login Level" 1: For RS-232-C, RS-422-A, and Ethernet port No. 34150 2: For Ethernet port No. 34151 Allows retrieval of the access level to the DARWIN.

Locale ID (LCID)

The locale ID (LCID) is a language identifier that is used when the OPC server returns values as strings. It is used in alarms, status, and other parameters that include engineering units.
In general, the DAQOPC DA server ignores the locale ID.
The unit and tag strings of the DARWIN are passed without any modification.*
For error strings (IOPCServer::GetErrorString, IOPCCommon::GetErrorString), the DAQOPC Server only supports the locale or the Windows system. However, all error strings that are defined by the OPC are returned in English (Windows system errors are returned in the local language).

* When a setting data is received from the DA100, DC100, or DR or when a setting data that was created using the DAQ32 or DAQ32Plus Hardware Configurator is opened, Ω, °, and ℧ are converted to spaces, m is converted to u, and e is converted to e. Once a character is converted, it cannot be converted back.

Structures Defined by the OPC

The DAQOPC DA server handles the vendor-specific section of the structures that are defined by the OPC specifications as follows:

Item attributte structures (OPCITEMATTRIBUTES)

- Engineering Unit
  The engineering unit is the range information of the item ID.

Server status structures (OPCSERVERSTATUS)

- Bandwidth
  On the DAQOPC DA server, the bandwidth is set to the number of ItemIDs that are registered in the cache update.
- VenderInfo
  "**Yokogawa Electric Corporation**" is set on the DAQOPC server.

Support for OPC Optional Specifications

The OPC optional functions that DAQOPC supports are described below.

Browsing (retrieves a list of ItemIDs in the server)

Hierarchy

IOPCBrowseServerAddressSpace is an interface used to retrieve a list of tags.
There are two methods available for viewing the server-side list, FLAT or HIERARCHICAL. For the DAQOPC, use the HIERARCHICAL method specifying the device name, tag number, and data item in that order.

ItemID retrieval through GetItemID

The following string is returned for GetItemID.

- When a device name is specified
  Device name
  Example: Device1
  (Cannot be used in IOPCItemMgt::AddItems)

- When a tag number is specified
  Device name!tag number
  Example: Device1!ch001
  (Cannot be used in IOPCItemMgt::AddItems)

- When a data item is specified
  Device!tag number.data item
  Example: Device1!ch001.PV
  (Can be used in IOPCItemMgt::AddItems)

- BrowseOPCItemIDs filter
  If you specify OPC_FLAT for the filter type, the operation is the same as when both OPC_BRANCH and OPC_LEAF are specified. Sorting is not performed on the list, and there is no limit in the number of data points that can be entered in the list. Therefore, the larger the number of tag numbers, more memory space is consumed. In such case, you can use the following types of filters to suppress the amount of memory that is consumed at any given time.

[szFilterCriteria]:	DAQOPC ignores this parameter.
[dwAccessRightsFilter]:	DAQOPC supports this parameter.

- BrowseAccessPaths
  Since AccessPaths is not used, this is not supported.

3.3 Error Codes

The error codes that DAQOPC specifies are shown below.

Number	Message	Description
0xC0049001	“Fail to allocate memory.”	Failed to allocate memory area.
0xC0049002	“Fail to read configuration file.”	Failed to load the communication setting data.
0xC0049003	“Selected device doesn’t exist.”	A nonexistent device is specified by the Configurator.
0xC0049004	“Fail to open device.”	Failed communications at startup.
0xC0049005	“Communication error.”	A communication error occurred.
0xC0049006	“Irrelevant value.”	Invalid value was input for communication input data.
0xC0049007	“Fail to get time stamp from PC.”	Failed to get the time stamp from the PC.
0xC0049008	“Selected tag doesn’t exist.”	A nonexistent channel or relay is specified as an item.

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