Hitachi appliance Ltd.
Hitachi environmental examination device provider

Version 1.1.3

User's guide

November 30, 2018

Remarks:

・This document uses the machine translation.

【 revision history 】

Version	Date	Content
1.1.0	2018-09-28	Add the following variables. @LASTMEAS_PRG_SET_STATUS PRG_SET_STATUS An optional ..retrying.. frequency is added to the following variables. @MEASUREMENT_STATUS @FIX_SET_STATUS @LASTMEAS_PRG_SET_STATUS PRG_SET_STATUS
1.1.1	2018-10-01	Correct trouble to have treated the argument to which each command of CaoController::Execute can be omitted as an indispensable argument.
1.1.2	2018-10-30	Correct the problem that the memory leak is generated when CaoController is deleted. Correct the explanation of the data of the variable.
1.1.3	2018-11-30	The trouble of the argument of the Execute method is corrected. The operation when the data of the mode difference is received is corrected. Operation when connecting it with an Ethernet optional substrate is corrected. Objection correction.

【 Operation confirmation model 】

Model	Version	Notes
EC-46MHHPES	CPU: 04.04.04 [Nurutotono] substrate: 01.03.09 Cycle substrate: 04.04.02 LCD indicator: 05.02.08	Note that there is a possibility that the dryness of the port occurs when communicating frequently for Web optional substrate.
EC-25EXHHS	CPU: 02.11.18 [Nurutotono] substrate:	Note that there is a possibility that the dryness of the port occurs when

	01.04.02 Cycle substrate 1/2: 02.10.14 LCD indicator: 02.02.07	communicating frequently for Web optional substrate.

Contents

1. Introduction

This book is an user's guide of the HITACHI ThermoStat provider that receives data according to the network communication with the Ethernet communication option base of the Hitachi environmental examination device made of Hitachi appliance Ltd.. Figure1-1However, it becomes a whole of device block diagram with [hon] provider. This provider is named ThermoStat provider later.

The ThermoStat provider is made based on information described in "Optional Ethernet communication.pdf of (90R04187)" of the Hitachi appliance Ltd. making, and connects it with the Hitachi environmental examination device by the communication by TCP/IP or RS-232C･RS-485. The Hitachi environmental examination device is named a testing set at the following.

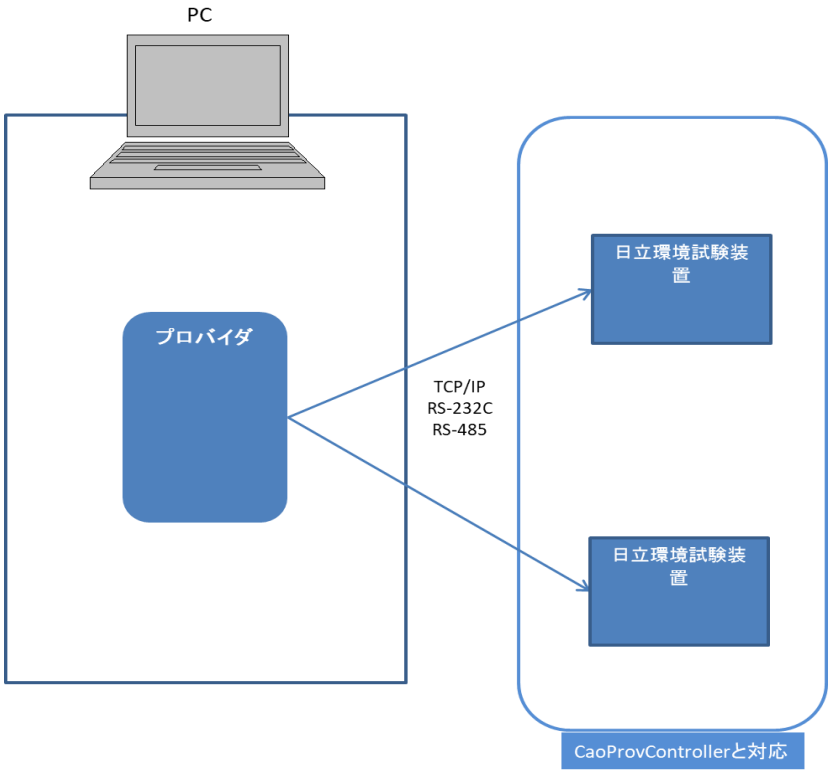


Figure1-1Block diagram

Moreover, this provider and correspondence each deviceFigure1-2[Ni] is shown.
(* It is one example. It is not because everything is shown.)

Figure1-2Composition of provider and correspondence chart with device information

1.1. Environment and version that this book assumes

Client PC operates on Windows, and the targeted testing set assumes the environment that Ethernet connection is possible. The development setting of PC can be developed in case of the programming environment that supports Component Object Model (COM and Component Object Model).

1.2. Source that becomes reference

C++ and Java though all the programming cases with this book have been described with Visual Basic 6.0. It is possible to develop in various program languages such as NET. Refer to "ORiN2 programming guide" for use.

"ORiN 2 programming guide" corresponds to the following files of the ORiN2 SDK installation folder.

- ORiN2¥CAO¥Doc¥ORiN2_ProgrammersGuide_<lang>.pdf

- Replace with the language character string of each environment and read the part of < lang >.

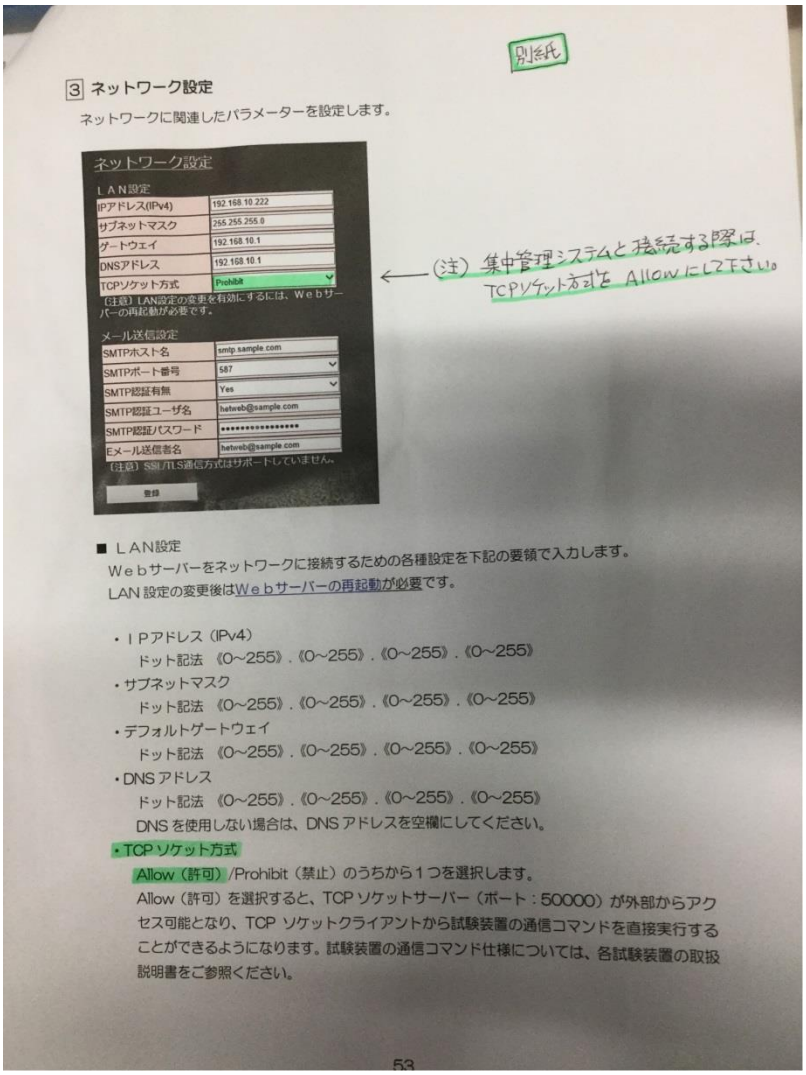
ORiN2 needed in developing the application that uses the provider and COM/DCOM are explained while exchanging the example for basic knowledge and the technology.

2. Environmental setup for application development

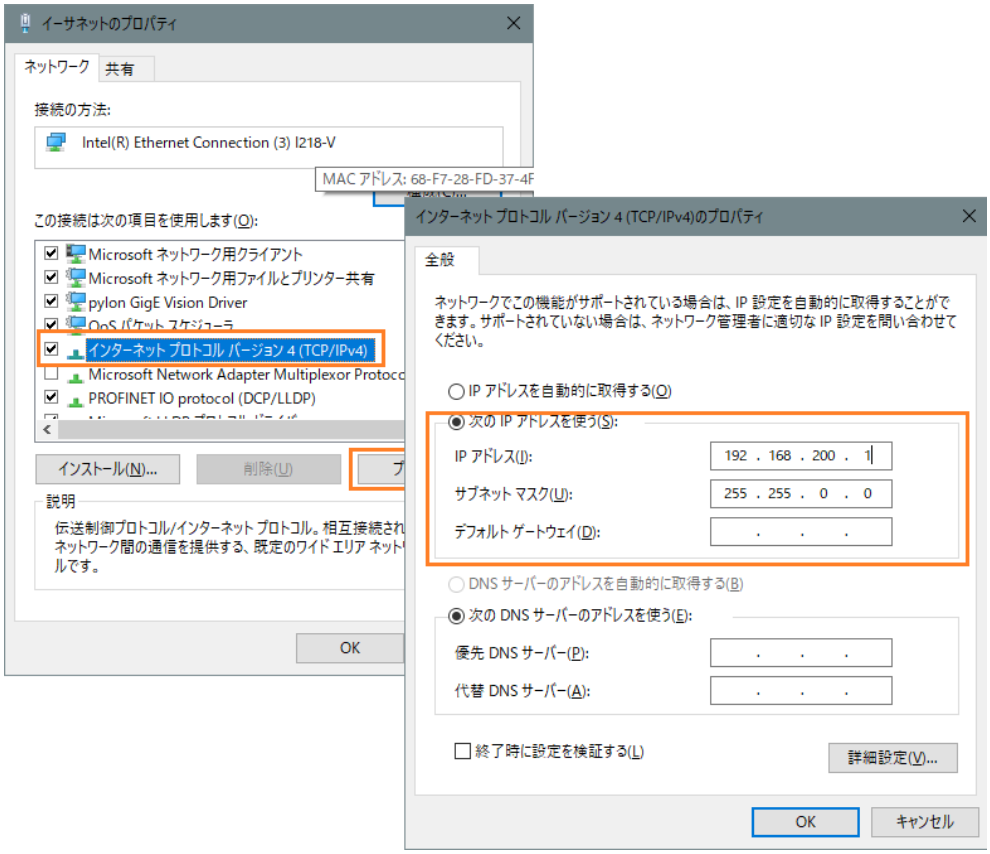
2.1. Connection of Hitachi environmental examination device and client PC

The procedure for connecting client PC with the Hitachi environmental examination device by TCP/IP is described.

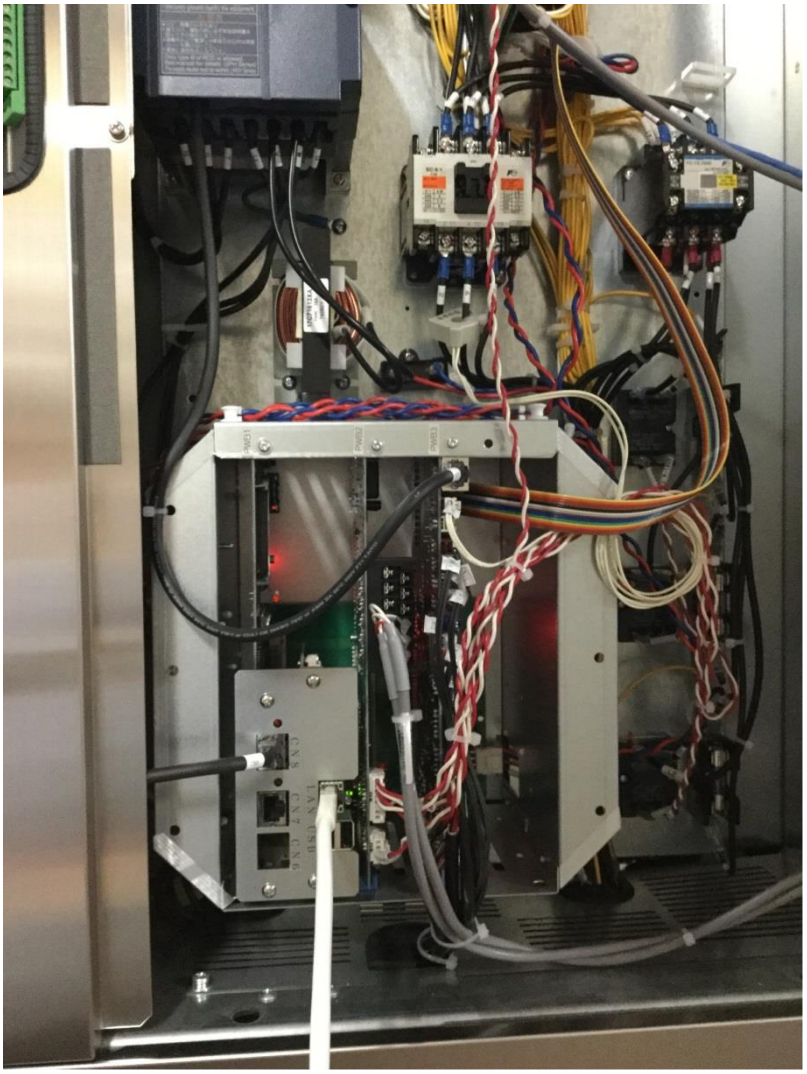
1. Input Allow to the TCP socket method of LAN setting → described in "Environmental examination device Web interface quick start guide" and reactivate.



2. Execute Internet portal site version 4(TCP/Ipv4) → property button from the property in the communication port to be used on client PC, and set Internet Protocol address and the subnet mask according to the network transmission setting of the Hitachi environmental examination device.



3. A right side of the Hitachi environmental examination device is opened, and connect a part of LAN cable with LAN port, and connect another edge with LAN port of client PC as shown in the figure below.



2.2. Setup of PC development setting

2.2.1. Automated install of ThermoStat provider

If it is an environment in which ORiN2 SDK is installed, the preparation for the system requirements to connect it with the testing set is completed.

Prepare the programming environment that separately supports Component Object Model (COM and Component Object Model) such as Microsoft Visual Studio 6.0, 2003/2005/2008/2010, and LabVIEW for the setup of the development setting.

2.2.2. Manual installation of ThermoStat provider

It is necessary to register the following registry by the hand work to use the ThermoStat

provider. Start the command prompt by the manager authority, and execute the regsvr32 command when you register the registry. Specify by the absolute path when you execute the command or move to the folder with the file and execute it.

Moreover, if one regular ORiN2 SDK license of each PC is not registered beforehand so that the CAO engine may work, it doesn't become it. Refer to the paragraph of "Addition and deletion of the license" in the ORiN2 SDK user's guide.

Table2-1ThermoStat provider

File name	CaoProvHITACHIThermoStat.dll
ProgID	CaoProv.HITACHI.ThermoStat
Registry registration	regsvr32 CaoProvHITACHIThermoStat.dll
Blotting out of registry registration	regsvr32 /u CaoProvHITACHIThermoStat.dll

3. Programming by ThermoStat provider

In the ThermoStat provider, client PC and the testing set can be connected according to the following procedures.

- Making of CaoEngine
- Making of CaoWorkspace
- Making of CaoController

After it connects it with the testing set, it can access information on the testing set by using the Execute method of CaoController or generating the CaoVariabe object.

3.1. Sample programming that receives measurement of Hitachi environmental examination device

The sample program that receives the measurement as an example is shown here. Table3-1The requirement for [ni] sample programFigure3-1The flow of [ni] sample program is described respectively.

Table3-1Requirement for sample program

Requirement	Explanation
Connection destination	Connect it by TCP/IP.
	Connection destination Internet Protocol address is 192.168.1.2.
	The communications infrastructure of the connection destination is an Ethernet communication option substrate.
	The connection destination port number is 50000.
Content of processing	Receive the measurement.

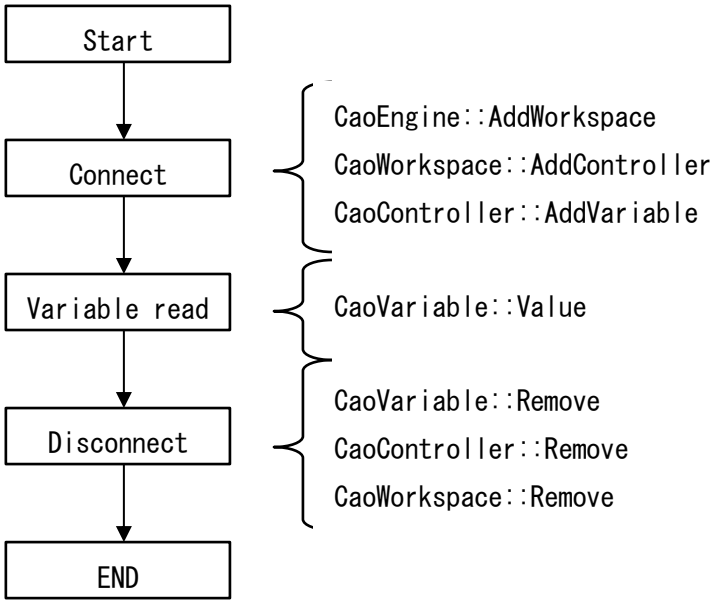


Figure3-1Flow of measurement reception

A concrete code is shown from the following paragraphs.

3.1.1. Sample program

The whole image of the sample program is shown as follows.

Sample ReceiveMeasurement.vb

```
Sub Main
    ' object
    Dim engine As caoEngine
    Dim workspace As caoWorkspace
    Dim controller As CaoController
    Dim var As CaoVariable

     ' generation of CaoEngine object
    Set engine = New caoEngine
     ' generation of CaoWorkspace object
    Set workspace = engine.AddWorkspace("NewWrks", "")
     ' generation of CaoController object
    Set controller = workspace.AddController("ThermoStat", _
                                        "CaoProv.HITACHI.ThermoStat", _
                                        "", _
                                        "conn=eth:192.168.1.2")

    ' Variable  addition
    Set var = controller.AddVariable("@MEASURE_STATUS")
    ' Value acquisition
    Dim values As Variant
    values = var.value

    ' program number
```

```
    Dim programNo As Long
    programNo = values(0)
    Step ' number
    Dim stepNo As Long
    stepNo = values(1)
    ' measurement temperature
    Dim temp As Single
    temp = values(2)
    It is ' numerical ..set and repeat...
    Dim repeatSetNum As Long
    repeatSetNum = values(3)

    ' time left (amount)
    Dim minTime As Long
    minTime = values(4)
    ' time left (second)
    Dim secTime As Long
    secTime = values(5)
    Set ' humidity
    Dim setHum As Long
    setHum = values(6)
    Return step ' number
    Dim returnStepNo As Long
    returnStepNo = values(7)
    Time ' signal
    Dim timeSignal As Long
    timeSignal = values(8)
    ' maintenance
    Dim retention As Long
    retention = values(9)
    ' state of tank
    Dim tankCondition As Long
    tankCondition = values(10)
    Alarm ' number
    Dim alarmNum As Long
    alarmNum = values(11)

     ' delete the variable from CaoController.
    Call controller.Variables.Remove(var.Index)
    Set var = Nothing

     ' delete CaoController from CaoWorkspace.
    Call workspace.Controllers.Remove(controller.Index)
     ' deletion of CaoController
    Set controller = Nothing

     ' delete CaoWorkspace from CaoEngine.
    Call engine.Workspaces.Remove(workspace.Index)
```

```
    ' deletion of CaoWorkspace
    Set workspace = Nothing

    ' deletion of CaoEngine
    Set engine = Nothing
End Sub
```

3.1.1.1. Connection

Take the following procedures to connect it with the temperature controlled bath.

(1) Prepare the variable to maintain the object. The object necessary for the controller connection is CaoEngine object, CaoWorkspace object, and CaoController object. When it uses CaoWorkspace of default, the CaoWorkpace object need not prepare the variable. Moreover, the CaoVariable object to access the variable is needed. The example of the code in VB6 is shown as follows.

```
    Dim engine As caoEngine             ' variable for CaoEngine object
    Dim workspace As caoWorkspace       ' variable for CaoWorkspace object
    Dim controller As CaoController     ' variable for CaoController object
    Dim var As CaoVariable              ' variable for CaoVariable object
```

(2) Generate the CaoEngine object. The CaoEngine object uses and generates the New key word.

```
    ' generation of CaoEngine object
    Set engine = New caoEngine
```

(3) Acquire the CaoWorkspace object or generate it. When the CaoEngine object is generated, the CaoWorkspaces object and the CaoWorkspace object are generated with default one by one. The example of the code of newly generating the CaoWorkspace object are shown as follows.

```
    ' generation of CaoWorkspace object
    Set workspace = engine.AddWorkspace("NewWrks", "")
```

(4) Generate the CaoController object. Set the CaoController object and set the provider name used and the parameter to use it to generate it. In the ThermoStat provider, specify an optional substrate of connection destination information and the connection destination. The example of the code is shown as follows.

```
    ' generation of CaoController object
    Set controller = workspace.AddController("ThermoStat", _
                                             "CaoProv.HITACHI.ThermoStat", _
                                             "", _
                                             "conn=eth:192.168.1.2")
```

(5) Generate the CaoVariabl object to receive the measurement. The variable that receives the measurement in the ThermoStat provider is @MEASURE_STATUS.

```
Variable ' addition
Set var = controller.AddVariable("@MEASURE_STATUS")
```

3.1.1.2. Acquire the measurement.

Use the Value property of the @MEASURE_STATUS variable to acquire the measurement. Details4.3.1.3Refer to [wo].

```
Value ' acquisition
Dim values As Variant
values = var.value

' program number
Dim programNo As Long
programNo = values(0)
Step ' number
Dim stepNo As Long
stepNo = values(1)
' measurement temperature
Dim temp As Single
temp = values(2)
It is ' numerical ..set and repeat...
Dim repeatSetNum As Long
repeatSetNum = values(3)

' time left (amount)
Dim minTime As Long
minTime = values(4)
' time left (second)
Dim secTime As Long
secTime = values(5)
Set ' humidity
Dim setHum As Long
setHum = values(6)
Return step ' number
Dim returnStepNo As Long
returnStepNo = values(7)
Time ' signal
Dim timeSignal As Long
timeSignal = values(8)
' maintenance
Dim retention As Long
retention = values(9)
' state of tank
Dim tankCondition As Long
tankCondition = values(10)
```

```
    Alarm ' number
    Dim alarmNum As Long
    alarmNum = values(11)
```

3.1.1.3. Cutting

Delete the generated object, and delete the object deleted from the collection class that manages the object when cutting it with the controller. The example of the code is shown as follows.

```
     ' delete the variable from CaoController.
    Call controller.Variables.Remove(var.Index)
    Set var = Nothing
     ' delete CaoController from CaoWorkspace.
    Call workspace.Controllers.Remove(controller.Index)
     ' deletion of CaoController
    Set controller = Nothing
     ' delete CaoWorkspace from CaoEngine.
    Call engine.Workspaces.Remove(workspace.Index)
     ' deletion of CaoWorkspace
    Set workspace = Nothing
     ' deletion of CaoEngine
    Set engine = Nothing
```

4. Command reference

4.1. Method/property list

Table4-1Method/property list

Category	[1]Method/property		Function	Reference
CaoWorkspace				
	Addcontroller	M	Connect it with the controller.	P. 18
CaoController				
	VarialbeNames	P	Acquisition of variable identifier list that can be connected	P. 21
	Variables	P	Acquisition of variable collection that controller maintains	P. 21
	AddVariable	M	Addition of variable object	P. 22
	Execute	M	Execution of enhancing command	P. 22
CaoVariable				
	Value	P	Acquisition/setting of value	P. 29

4.2. Method property

4.2.1. CaoWorkspace class

4.2.1.1. AddController method

Add the controller object to CaoWorkspace. In the ThermoStat provider, connect it with the corresponding testing set referring to the parameter passed when the AddController method is executed. The specification of the AddController method is shown as follows.

Format

CaoController AddController

```
(
        "< controller name >"           // Controller name (arbitrariness)
        "CaoProv.HITACHI.ThermoStat",   // Provider name (fixation)
        "< machine name >"              // Provider execution machine name (unused)
        "< option >"                    // Optional character string
)
```

[1] M:メソッド, P:プロパティ, E:イベントをそれぞれ示します.

Usage example

```
Engine ..Dim caoEng As CaoEngine '.. object
WorkSpace ..Dim workspace As CaoWorkspace '.. object
Controlle ..Dim controller As CaoController '.. object

Set caoEng = New CaoEngine
Set workspace = caoEng.CaoWorkspaces.Item(0)
Set controller = workspace.AddController("ThermoStat", _
                                         "CaoProv.HITACHI.ThermoStat", _
                                         "", _
                                         "conn=eth:192.168.1.2")
```

Option

The option specified for an optional character string is shown as follows. An optional character string becomes a character string to which each option shown in the following ties by comma (,).

Option	Indispensability	Explanation	Range of value	Default value
Conn=	✓	Specify parameter in communication tools. About the specification method4.2.1.1.1Refer to [wogo].	-----	-----
Timeout=	--	The maximum standby time from the transmission of the command to returning of the response is specified. (msec)	1000 - 65535	1000
Delimiter=	--	Specification of delimiter ETH is disregarded when specifying it optional Conn it.	0:CR+LF 1:CR 2:LF	1
Board=	--	Specification of connection destination substrate when Ethernet (socket) is communicated. COM is disregarded when specifying it optional Conn it.	0:Ethernet communication option substrate 1:Web optional substrate	0
Retry=	--	The frequency is specified maximum.. retrying ..the communication failure...	0 - 50	4
RetryInterval=	--	Specify rest time (ms) of each retrying when the	0 - 10000	250

Option	Indispensability	Explanation	Range of value	Default value
		communication fails.		
Delay=	--	DeLay time (ms) between communications is specified.	0 -	250

4.2.1.1.1. Conn is optional.

The testing set corresponds to the communication by TCP/IP and RS-232C･RS-485 like future [shita]. This provider tries the connection with the testing set in the option Conn to correspond to these two communication methods by the specified communication method.

Connected parameter character string of optional Conn is shown as follows. It is shown to omit it here in the brace) and the underlined part under the explanation of each parameter shows the default value when the option is not specified respectively.

･When connecting it by TCP/IP

"Conn=ETH:< connection destination IP > connection destination port of :< > :< local IP > :< local port >"

< connection destination IP > : It is *** as for connection destination Internet Protocol address . ***. ***. Specify it in the form of ***.
Specify this item.

< connection destination port > : Specify the connection destination port number. 50000

< local IP >: It is *** as for Internet Protocol address on the PC side . ***. ***. Specify it in the form of ***.
Default: Unspecification

< local port > : Default: Unspecification

･When connecting it with RS-232C･RS-485(COM)

"Conn=COM:<COM number > :< baud rate > data bit >:< of :< parity >:< stop bit >:< flow control >"

< COM number > : Use COM number. Specify this item. 1

< baud rate > : Transmission rate. 9600

< parity > : Parity. NOPARITY

< data bit > : Default: 7

< stop bit > : Default: ONESTOPBIT

< flow control > : Default: Unspecification

4.2.1.1.2. Notes when connecting it

The temperature controlled bath of Web optional substrate cannot usually be connected with client PC. Input Allow to the TCP socket method of LAN setting → described in "Environmental examination device Web interface quick start guide" of the Hitachi appliance Ltd. making before it connects it and reactivate.

Moreover, repeat connection/cutting the communication at each sending and receiving of data when connecting it with Web optional substrate. Note that the sending and receiving of frequent data has the possibility that the port of client PC dries up.

4.2.2. CaoController class

4.2.2.1. VarialbeNames property

Acquire the variable identifier list that can be connected. Describe the variable identifier acquired in this property later. It is possible to use it for one argument drinking.

Usage example

```
    Engine ..Dim caoEng As CaoEngine '.. object
    WorkSpace ..Dim workspace As CaoWorkspace '.. object
    Controlle ..Dim controller As CaoController '.. object

   Set caoEng = New CaoEngine
   Set workspace = caoEng.CaoWorkspaces.Item(0)
   Set controller = workspace.AddController("ThermoStat", _
                                    "CaoProv.HITACHI.ThermoStat", _
                                    "", _
                                    "conn=eth:192.168.1.2")

   Variable identifier list ' acquisition
   Dim variables as Variant
   variables = controller.VariableNames
```

4.2.2.2. Variables property

Acquire the variable collection that the controller maintains.

Usage example

```
    Engine ..Dim caoEng As CaoEngine '.. object
    WorkSpace ..Dim workspace As CaoWorkspace '.. object
    Controlle ..Dim controller As CaoController '.. object

   Set caoEng = New CaoEngine
   Set workspace = caoEng.CaoWorkspaces.Item(0)
   Set controller = workspace.AddController("ThermoStat", _
                                    "CaoProv.HITACHI.ThermoStat", _
                                    "", _
                                    "conn=eth:192.168.1.2")
```

```
Variable collection ' acquisition
Dim variables as CaoVariables
Set variables = controller.Variables

Variable ' acquisition
Dim variable as CaoVariable
Set variable = variables.Item(0)
```

4.2.2.3. AddVariable method

Add the variable object to CaoController. The name described in Chapter 4.3.1 can be used for the variable identifier.

The specification of AddVariable is shown as follows.

Format

CaoVariable AddVariable

```
(
        "< variable identifier >"       // Variable identifier
        "< option >"                    // Optional character string
)
```

4.2.2.4. Execute method

Execute the enhancing command of ConController. The specification of Execute is shown as follows.

Format

Variant Execute

```
(
        "< enhancing command name >"            // Enhancing command name
        "< optional character string >"         // Optional character string (It is possible to omit it).
)
```

The enhancing command list that can be specified with Execute is shown as follows. The enhancing command is detailed and the usage example is described.

Command	Explanation	Reference
GetMeasurementData	Acquire the measurement.	P. 23
GetFixSettings	Acquire the driving setting of the fixed value mode.	P. 24

4.2.2.4.1. GetMeasurementData command

Acquire the measurement.

Item	Type explanation			
Argument	VT_I4			A mode of receive data abnormality (0x80110007) specifies the frequency retrying..generation... It is possible to omit it. Range of value: 0 - 50 Default value: 4
Return value	VT_ARRAY | VT_VARIANT			
	0	VT_I4		The program number is returned.
	1	VT_I4		The step number is returned.
	2	VT_R4		The measurement temperature is returned.
	3	VT_I4		The number is returned remaining and repeatedly.
	4	VT_I4		The time left (amount) is returned.
	5	VT_I4		The time left (second) is returned.
	6	VT_I4		Set humidity is returned.
	7	VT_I4		The return step number is returned.
	8	VT_I4		The time signal is returned.
	9	VT_I4		Maintenance is returned.
	10	VT_I4		The state of the tank is returned. STP:0, RUN=1, ALARM=2
	11	VT_I4		The alarm number is returned.

Usage example

```
Dim engine As caoEngine
Dim workspace As caoWorkspace
Dim controller As CaoController

Set engine = New caoEngine
Set workspace = engine.AddWorkspace("NewWrks", "")
Set controller = workspace.AddController("ThermoStat", _
                                         "CaoProv.HITACHI.ThermoStat", _
                                         "", _
                                         "conn=eth:192.168.1.2")

 GetMeasurementData ' execution
Dim val As Variant
val = controller.Execute("GetMeasurementData")

' program number
Dim programNo As Long
```

```
programNo = val(0)
Step ' number
Dim stepNo As Long
stepNo = val (1)
' measurement temperature
Dim temp As Single
temp = val(2)
It is ' numerical ..set and repeat...
Dim repeatSetNum As Long
repeatSetNum = val(3)

' time left (amount)
Dim minTime As Long
minTime = val(4)
' time left (second)
Dim secTime As Long
secTime = val(5)
Set ' humidity
Dim setHum As Long
setHum = val(6)
Return step ' number
Dim returnStepNo As Long
returnStepNo = val(7)
Time ' signal
Dim timeSignal As Long
timeSignal = val(8)
' maintenance
Dim retention As Long
retention = val(9)
' state of tank
Dim tankCondition As Long
tankCondition = val(10)
Alarm ' number
Dim alarmNum As Long
alarmNum = val(11)
```

4.2.2.4.2. GetFixSettings command

Acquire the driving setting of the fixed value mode.

Item	Type explanation			
Argument	VT_I4			A mode of receive data abnormality (0x80110007) specifies the frequency retrying ..generation... It is possible to omit it. Range of value: 0 - 50 Default value: 4
Return value	VT_ARRAY | VT_VARIANT			
		0	VT_I4	The preset temperature is returned.

Item	Type explanation			
		1	VT_I4	The set time (amount) is returned.
		2	VT_R4	The set time (second) is returned.
		3	VT_I4	Set humidity is returned.
		4	VT_I4	Maintenance is returned.
		5	VT_I4	The state of the tank is returned. STP:0, RUN=1, ALARM=2
		6	VT_I4	The alarm number is returned.

Usage example

```
Dim engine As caoEngine
Dim workspace As caoWorkspace
Dim controller As CaoController

Set engine = New caoEngine
Set workspace = engine.AddWorkspace("NewWrks", "")
Set controller = workspace.AddController("ThermoStat", _
                                          "CaoProv.HITACHI.ThermoStat", _
                                          "", _
                                          "conn=eth:192.168.1.2")

 GetFixSettings ' execution
Dim val As Variant
val = controller.Execute("GetFixSettings")
```

4.2.2.4.3. GetLastMeasPrgSettings command

Acquire the driving setting of the program corresponding to the state of the measurement in the program mode acquired immediately before. The program number when there is no measurement in the program mode acquired immediately before: 1 and step number: Acquire the driving setting of one.

Item	Type explanation			
Argument	VT_I4			A mode of receive data abnormality (0x80110007) specifies the frequency retrying ..generation... It is possible to omit it. Range of value: 0 - 50 Default value: 4
Return Value	VT_ARRAY | VT_VARIANT			
		0	VT_I4	The program number is returned.
		1	VT_I4	The step number is returned.

Item	Type explanation			
		2	VT_R4	The preset temperature is returned.
		3	VT_I4	The number is returned setting and repeatedly.
		4	VT_I4	The set time (amount) is returned.
		5	VT_I4	The set time (second) is returned.
		6	VT_I4	Set humidity is returned.
		7	VT_I4	The return step number is returned.
		8	VT_I4	The time signal is returned.
		9	VT_I4	Maintenance is returned.
		10	VT_I4	The state of the tank is returned. STP:0, RUN=1, ALARM=2
		11	VT_I4	The alarm number is returned.

Exmaple

```
GetLastMeasPrgSettings '  execution
Dim val As Variant
val = controller.Execute("GetLastMeasPrgSettings")

'  program number
Dim programNo As Long
programNo = val(0)
Step '  number
Dim stepNo As Long
stepNo = val (1)
'  preset temperature
Dim temp As Single
temp = val(2)
' It is   numerical ..set and repeat...
Dim repeatSetNum As Long
repeatSetNum = val(3)

'  set time (amount)
Dim minTime As Long
minTime = val(4)
'  set time (second)
Dim secTime As Long
secTime = val(5)
' Set  humidity
Dim setHum As Long
setHum = val(6)
' Return step  number
Dim returnStepNo As Long
returnStepNo = val(7)
```

```
    Time '  signal
    Dim timeSignal As Long
    timeSignal = val(8)
    '  maintenance
    Dim retention As Long
    retention = val(9)
    '  state of tank
    Dim tankCondition As Long
    tankCondition = val(10)
    Alarm '  number
    Dim alarmNum As Long
    alarmNum = val(11)
```

4.2.2.4.4. GetPrgSettings command

Acquire specified program number and fixed state of step number [nono] [hako] [ten**].

Item	Type explanation			
Argument	VT_I4			Specify the program number (Specify one or more).
	VT_I4			Specify the step number (Specify one or more). It is possible to omit it. It operates by default value 1 when omitting it.
	VT_I4			A mode of receive data abnormality (0x80110007) specifies the frequency retrying ..generation... It is possible to omit it. Range of value: 0 ? 50 Default value: 4
Return value	VT_ARRAY | VT_VARIANT			
		0	VT_I4	The program number is returned.
		1	VT_I4	The step number is returned.
		2	VT_R4	The preset temperature is returned.
		3	VT_I4	The number is returned setting and repeatedly.
		4	VT_I4	The set time (amount) is returned.
		5	VT_I4	The set time (second) is returned.
		6	VT_I4	Set humidity is returned.
		7	VT_I4	The return step number is returned.
		8	VT_I4	The time signal is returned.
		9	VT_I4	Maintenance is returned.
		10	VT_I4	The state of the tank is returned. STP:0, RUN=1, ALARM=2

Item	Type explanation			
		11	VT_I4	The alarm number is returned.

Usage example

```
'   GetPrgSettingsexecution
Dim val As Variant
val = controller.Execute("GetPrgSettings", Array(1, 1))

'  program number
Dim programNo As Long
programNo = val(0)
Step '  number
Dim stepNo As Long
stepNo = val (1)
'  preset temperature
Dim temp As Single
temp = val(2)
It is '  numerical ..set and repeat...
Dim repeatSetNum As Long
repeatSetNum = val(3)

'  set time (amount)
Dim minTime As Long
minTime = val(4)
'  set time (second)
Dim secTime As Long
secTime = val(5)
Set '  humidity
Dim setHum As Long
setHum = val(6)
Return step '  number
Dim returnStepNo As Long
returnStepNo = val(7)
Time '  signal
Dim timeSignal As Long
timeSignal = val(8)
'  maintenance
Dim retention As Long
retention = val(9)
'  state of tank
Dim tankCondition As Long
tankCondition = val(10)
Alarm '  number
Dim alarmNum As Long
alarmNum = val(11)
```

4.2.3. CaoVariable class

4.2.3.1. Value property

Acquisition/set data from the connected testing set. Operation is different depending on the variable identifier. Plese refer to chapter 4.3 for details.

4.3. Variable list

Define the variable list that can be used in each class. The variable indicates the object of the CaoVariable class.

4.3.1. CaoController class variable

Variable identifier	Explanation	Value		Reference
		get	put	
@MAKER_NAME	Acquire the manufacturer name.	○	-	P.29
@VERSION	Acquire the DLL version.	○	-	P.30
@MEASUREMENT_STATUS	Acquire the measurement.	○	-	P.30
@FIX_SET_STATUS	Acquire the driving setting of the fixed value mode.	○	-	P.32
@LASTMEAS_PRG_SET_STATUS	Acquire the driving setting of the program corresponding to the state of the measurement in the program mode acquired immediately before.	○	-	P.34
PRG_SET_STATUS	Acquire the driving setting of specified program number and step number.	○	-	P.34

4.3.1.1. @MAKER_NAME

Acquire the manufacturer name.

Usage example

```
Dim engine As caoEngine
Dim workspace As caoWorkspace
Dim controller As CaoController

Set engine = New caoEngine
Set workspace = engine.AddWorkspace("NewWrks", "")
Set controller = workspace.AddController("ThermoStat", _
                                         "CaoProv.HITACHI.ThermoStat", _
                                         "", _
                                         "conn=eth:192.168.1.2")
Variable ' addition
Dim var As CaoVariable
```

```
    Set var = controller.AddVariable("@MAKER_NAME")
    Value ' acquisition
    Dim strVal As String
    strVal = var.value
```

Data type

Type explanation	
VT_BSTR	Acquire the manufacturer name.

4.3.1.2. @VERSION

Acquire the version of DLL.

Usage example

```
    Dim engine As caoEngine
    Dim workspace As caoWorkspace
    Dim controller As CaoController
    Set engine = New caoEngine
    Set workspace = engine.AddWorkspace("NewWrks", "")
    Set controller = workspace.AddController("ThermoStat", _
                                             "CaoProv.HITACHI.ThermoStat", _
                                             "", _
                                             "conn=eth:192.168.1.2")
    Variable ' addition
    Dim var As CaoVariable
    Set var = controller.AddVariable("@VERSION")
    Value ' acquisition
    Dim value As String
    value = var.value
```

Data type

Type explanation	
VT_BSTR	Acquire the version of DLL. *.*.*

4.3.1.3. @MEASUREMENT_STATUS

Acquire the measurement.

Option

Option	Indispensability	Explanation	Range of value	Default value
Retry	-	..retrying.. frequency when a mode of receive data abnormality	0 - 50	4

Option	Indispensability	Explanation	Range of value	Default value
		(0x80110007) is generated is specified.		

Data type

Type explanation			
VT_ARRAY | VT_VARIANT			
	0	VT_I4	Program number.
	1	VT_I4	Step number.
	2	VT_R4	Measurement temperature.
	3	VT_I4	It is a number remaining and repeatedly.
	4	VT_I4	Time left (amount).
	5	VT_I4	Time left (second).
	6	VT_I4	Set humidity.
	7	VT_I4	Return step number.
	8	VT_I4	Time signal.
	9	VT_I4	Maintenance.
	10	VT_I4	State of tank. 0:STP, 1:RUN, 2:ALARM
	11	VT_I4	Alarm number.

Usage example

```
Dim engine As caoEngine
Dim workspace As caoWorkspace
Dim controller As CaoController

Set engine = New caoEngine
Set workspace = engine.AddWorkspace("NewWrks", "")
Set controller = workspace.AddController("ThermoStat", _
                                         "CaoProv.HITACHI.ThermoStat", _
                                         "", _
                                         "conn=eth:192.168.1.2")
Variable ' addition
Dim var As CaoVariable
Set var = controller.AddVariable("@MEASURE_STATUS")
Value ' acquisition
Dim values As Variant
values = var.value
```

```
    ' program number
    Dim programNo As Long
    programNo = values(0)
    Step ' number
    Dim stepNo As Long
    stepNo = values(1)
    ' measurement temperature
    Dim temp As Single
    temp = values(2)
    It is ' numerical ..set and repeat...
    Dim repeatSetNum As Long
    repeatSetNum = values(3)

    ' time left (amount)
    Dim minTime As Long
    minTime = values(4)
    ' time left (second)
    Dim secTime As Long
    secTime = values(5)
    Set ' humidity
    Dim setHum As Long
    setHum = values(6)
    Return step ' number
    Dim returnStepNo As Long
    returnStepNo = values(7)
    Time ' signal
    Dim timeSignal As Long
    timeSignal = values(8)
    ' maintenance
    Dim retention As Long
    retention = values(9)
    ' state of tank
    Dim tankCondition As Long
    tankCondition = values(10)
    Alarm ' number
    Dim alarmNum As Long
    alarmNum = values(11)
```

4.3.1.4. @FIX_SET_STATUS

Acquire driving the fixed value mode.

Option

Option	Indispensability	Explanation	Range of value	Default value
Retry	-	..retrying.. frequency when a mode of receive data abnormality	0 - 50	4

Option	Indispensability	Explanation	Range of value	Default value
		(0x80110007) is generated is specified.		

Data type

Type explanation			
VT_ARRAY | VT_VARIANT			
	0	VT_R4	Preset temperature.
	1	VT_I4	Set time (amount).
	2	VT_I4	Set time (second).
	3	VT_I4	Set humidity.
	4	VT_I4	Maintenance.
	5	VT_I4	State of tank. 0:STP, 1:RUN, 2:ALARM
	6	VT_I4	Alarm number.

Usage example

```
Dim engine As caoEngine
Dim workspace As caoWorkspace
Dim controller As CaoController

Set engine = New caoEngine
Set workspace = engine.AddWorkspace("NewWrks", "")
Set controller = workspace.AddController("ThermoStat", _
                                         "CaoProv.HITACHI.ThermoStat", _
                                         "", _
                                         "conn=eth:192.168.1.2")
Variable ' addition
Dim var As CaoVariable
Set var = controller.AddVariable("@FIX_SET_STATUS ")

Value ' acquisition
Dim values As Variant
values = var.value

' preset temperature
Dim temp As Single
temp = values(0)

' set time (time)
Dim minutes As Long
```

```
    minutes = values(1)

    ' set time (second)
    Dim seconds As Long
    seconds = values(2)

    Set ' humidity
    Dim humidity As Long
    humidity = values(3)

    ' maintenance
    Dim retention As Long
    retention = values(4)

    ' state of tank
    Dim tankCondition As Long
    tankCondition = values(5)

    Alarm ' number
    Dim alarmNum As Long
    alarmNum = values(6)
```

4.3.1.5. @LASTMEAS_PRG_SET_STATUS

Acquire the driving setting of the program corresponding to the state of the measurement in the program mode acquired immediately before. The program number when there is no measurement in the program mode acquired immediately before: 1 and step number: Acquire the driving setting of one.

Option

Option	Indispensability	Explanation	Range of value	Default value
Retry	-	..retrying.. frequency when a mode of receive data abnormality (0x80110007) is generated is specified.	0 - 50	4

Data type

Type explanation			
VT_ARRAY | VT_VARIANT			
	0	VT_I4	Program number.
	1	VT_I4	Step number.
	2	VT_R4	Preset temperature.

Type explanation			
	3	VT_I4	It is a number setting and repeatedly.
	4	VT_I4	Set time (amount).
	5	VT_I4	Set time (second).
	6	VT_I4	Set humidity.
	7	VT_I4	Return step number.
	8	VT_I4	Time signal.
	9	VT_I4	Maintenance.
	10	VT_I4	State of tank. 0:STP, 1:RUN, 2:ALARM
	11	VT_I4	Alarm number.

Usage example

```
Variable '  addition
Dim var As CaoVariable
Set var = controller.AddVariable("@LASTMEAS_PRG_SET_STATUS")
Value '  acquisition
Dim values As Variant
values = var.value
'  program number
Dim programNo As Long
programNo = values(0)
Step '  number
Dim stepNo As Long
stepNo = values(1)
'  preset temperature
Dim temp As Single
temp = values(2)
It is '  numerical ..set and repeat...
Dim repeatSetNum As Long
repeatSetNum = values(3)

'  set time (amount)
Dim minTime As Long
minTime = values(4)
'  set time (second)
Dim secTime As Long
secTime = values(5)
Set '  humidity
Dim setHum As Long
setHum = values(6)
Return step '  number
Dim returnStepNo As Long
```

```
    returnStepNo = values(7)
    Time '  signal
    Dim timeSignal As Long
    timeSignal = values(8)
    '  maintenance
    Dim retention As Long
    retention = values(9)
    '  state of tank
    Dim tankCondition As Long
    tankCondition = values(10)
    Alarm '  number
    Dim alarmNum As Long
    alarmNum = values(11)
```

4.3.1.6. PRG_SET_STATUS

Acquire the driving setting of specified program number and step number. Input an arbitrary character string after PRG_SET_STATUS and give to me as a variable identifier, that is, (example . PRG_SET_STATUS_1_1.)

Option

Option	Indispensability	Explanation	Range of value	Default value
ProgNo	○	Specify the acquired program number.	1 -	1
StepNo	-	Specify the acquired step number.	1 -	1
Retry	-	..retrying.. frequency when a mode of receive data abnormality (0x80110007) is generated is specified.	0 ? 50	4

Data type

Type explanation			
VT_ARRAY | VT_VARIANT			
	0	VT_I4	Program number.
	1	VT_I4	Step number.
	2	VT_R4	Preset temperature.
	3	VT_I4	It is a number setting and repeatedly.
	4	VT_I4	Set time (amount).
	5	VT_I4	Set time (second).
	6	VT_I4	Set humidity.

Type explanation			
	7	VT_I4	Return step number.
	8	VT_I4	Time signal.
	9	VT_I4	Maintenance.
	10	VT_I4	State of tank. 0:STP, 1:RUN, 2:ALARM
	11	VT_I4	Alarm number.

Usage example

```
Variable '  addition
Dim var As CaoVariable
Set var = controller.AddVariable("PRG_SET_STATUS_24_2", "PROGNO=24, STEPNO=2")
Value '  acquisition
Dim values As Variant
values = var.value
'  program number
Dim programNo As Long
programNo = values(0)
Step '  number
Dim stepNo As Long
stepNo = values(1)
'  preset temperature
Dim temp As Single
temp = values(2)
It is '  numerical ..set and repeat...
Dim repeatSetNum As Long
repeatSetNum = values(3)

'  set time (amount)
Dim minTime As Long
minTime = values(4)
'  set time (second)
Dim secTime As Long
secTime = values(5)
Set '  humidity
Dim setHum As Long
setHum = values(6)
Return step '  number
Dim returnStepNo As Long
returnStepNo = values(7)
Time '  signal
Dim timeSignal As Long
timeSignal = values(8)
'  maintenance
Dim retention As Long
```

```
    retention = values(9)
    '   state of tank
    Dim tankCondition As Long
    tankCondition = values(10)
    Alarm '   number
    Dim alarmNum As Long
    alarmNum = values(11)
```

5. ThermoStat provider error code

In this provider, the following original error codes in which the mask is done with 0x8011**** exist. (Table5-1Reference)

About a common error of ORiN2, Refer to the chapter of the error code of "ORiN2SDK User's guide".

Table5-1Original error code table

Error number	Explanation
0x80110001	It is not specified that indispensability is optional.
0x80110002	The mistake is found in the optional Conn of CaoWorkspace::AddController specification. Specify Eth or COM for optional Conn.
0x80110003	Optional Timeout is outside the range.
0x80110004	Optional Delimiter is outside the range.
0x80110005	Optional Board is outside the range.
0x80110006	The numerical value of receive data is a unsetting. There is a possibility that the heat shock examination device initializes it. Inquire of the manufacturer.
0x80110007	[2]It is different from the mode that the mode of the received data demanded. Do and specify it for a bigger value of ..retrying.. frequency when happening frequently.
0x80110008	Optional RetryInterval is outside the range.
0x80110009	Optional Retry is outside the range.
0x8011000A	Data outside assumption was received. There is a possibility that is not the corresponding model. Inquire of the manufacturer.
0x8011000B	Optional Delay is outside the range.
0x8011000C	Optional Progno is outside the range.
0x8011000D	Optional Stepno is outside the range.

[2] When program state reception command (CF=P) is transmitted, the phenomenon that doesn't become a program mode but becomes a fixed value mode is confirmed though the cause of generation is uncertain..

AppendixA Table for communication protocol command

CaoController::Execute

Method property name	Communication command name
GetMeasurementData	C2 (state of measurement)
GetFixSettings	CF (state of confirmation)
GetLastMeasPrgSetttings	CF=P (Put it into the state of the confirmation of the program mode). C4 = program number (Set the program number). C5 = step number (Set the step number).
GetPrgSettings	

CaoVariable

Variable identifier	Communication command name
@MEASURE_STATUS	C2 (state of measurement)
@FIX_SET_STATUS	CF (state of confirmation)
@LASTMEAS_PRG_SET_STATUS	CF=P (Put it into the state of the confirmation of the program mode). C4 = program number (Set the program number). C5 = step number (Set the step number).
PRG_SET_STATUS	