AMADA MIYACHI
AMADA MM400 provider

Version 1.0.0

User's guide

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Remarks:
This document uses machine translation.

【 revision history 】

Version	Date	Content
1.0.0	2019-03-05	First edition.

【 Operation confirmation model 】

Model	Version	Notes
MM-400	A	

Contents

1. Introduction

This book is an user's guide of the provider that sends and receives a reception of measurement information and various settings for the MM400 series Weld checker of [amadamiyachi]. Figure1-1However, it becomes a whole of Weld checkered block diagram with [hon] provider. This provider is named and the MM400 provider and the MM400 series Weld checker are named the Weld checker later. The MM400 provider is made based on the communication specification of Ethernet (TCP/IP) described in version "W120M1192557-07" of "Weld checker MM400-A manual". It is assumed the one to indicate the above-mentioned manual when only describing, "Manual" at the following.

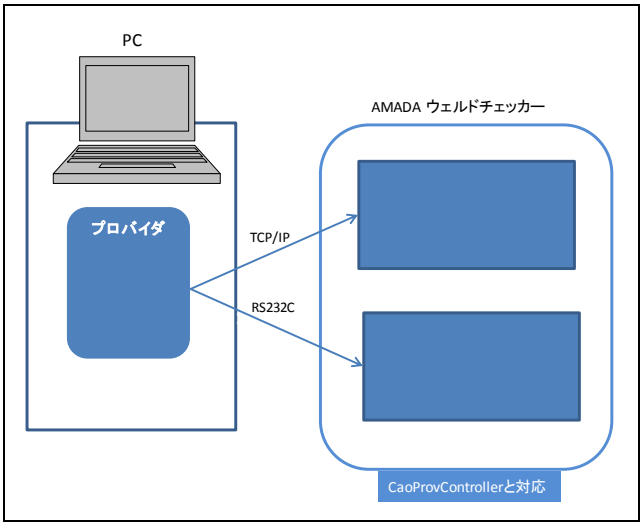


Figure1-1Block diagram

Moreover, the correspondence of the Weld checker with the MM400 providerFigure1-2[Ni] is shown. (* It is one example. It is not because everything is shown.)

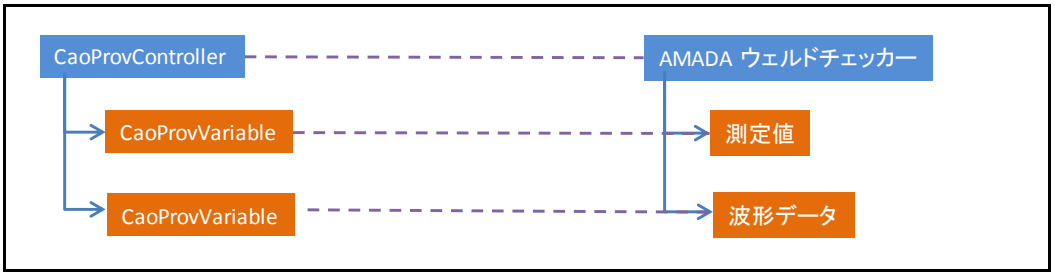


Figure1-2Composition of MM400 provider and correspondence chart with Weld checker information

1.1. Environment and version that this book assumes

Client PC operates on Windows, and the environment that targeted CNC is Weld checker of possible Ethernet connection's MM400 series, and is version "W12OM1192557-07" is assumed. 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. It is nerdy..the reference 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 with Weld the checker

It is possible to connect it with the Weld checker by TCP/IP. Moreover, the following two communication methods exist, and it is necessary to make CaoController of the MM400 provider according to the setting of the Weld checker.Please refer to 3.2.1.1 for the method of making controller object.

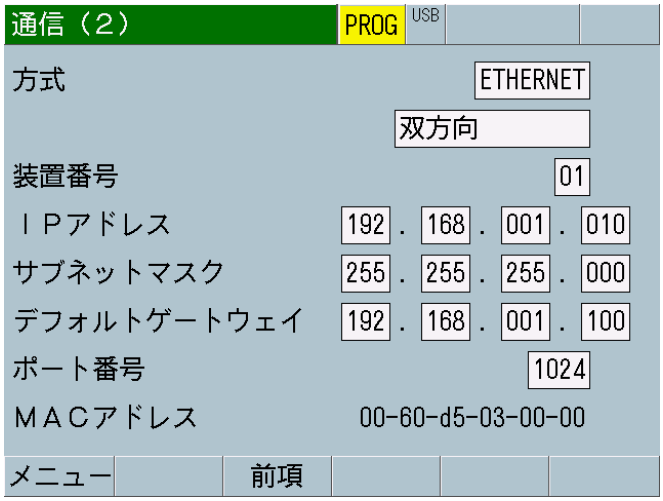
1. Two way communication method
   It is a method to do the data communication according to the demand from the client. The Weld checker from which this method has been selected does the data communication only when demanded from the client, and cannot transmit the message by the automatic operation at each measurement.

2. One-way communication method
   It is a method for the Weld checker to become a trigger and to do the data communication. The Weld checker from which this method has been selected does the data selected by the item of communication (1) screen, and the message is one-sidedly transmitted to the client on the condition of "Interval" and "Operation outside the judgment" at each measurement, and the data transmission request cannot be done from the client.

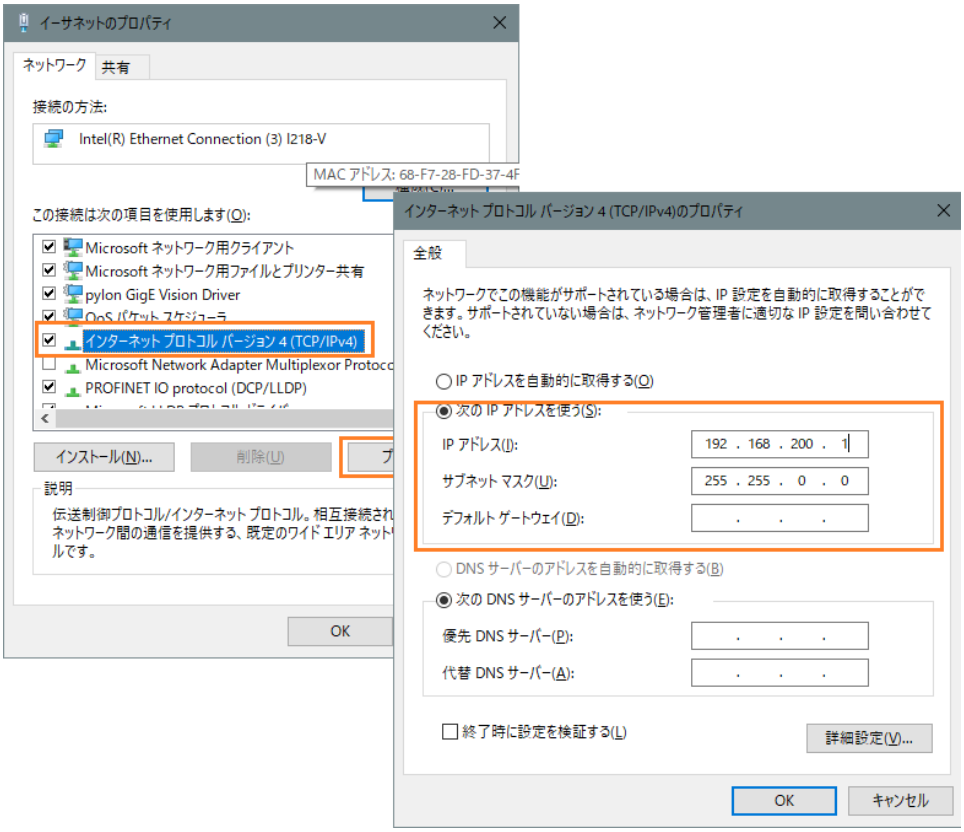
The method to connect by the Weld checker and TCP/IP is described by using client PC of Windows10 here.

2.1.1. Connect it by the two way communication method.

① Display menu → communication → communication (2) screen of the Weld checker, select "ETHERNET" "Interactive" by the method, and confirm Internet Protocol address, the subnet mask, and the port number.

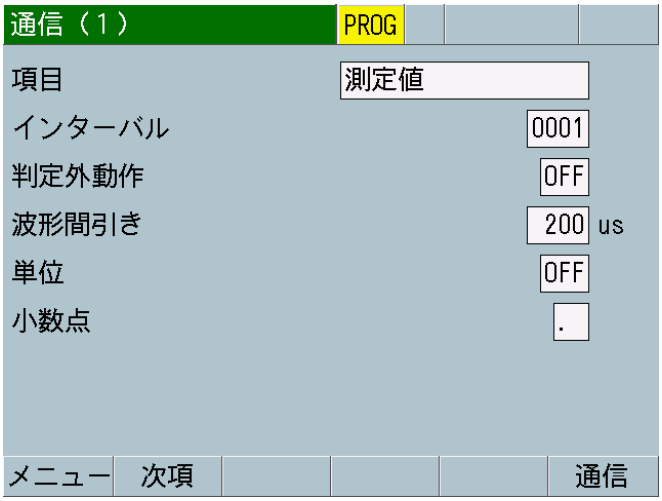


② Internet portal site version 4(TCP/Ipv4) → property button is executed from the property in the communication port where it wants to use client PC, and Internet Protocol address of client PC and set the subnet mask according to the network transmission setting on the Weld checker side.



2.1.2. Connect it by the one-way communication method.

① Display menu → communication → communication (1) screen of the Weld checker, and select the item to be acquired from the item.



② Display menu → communication → communication (2) screen of the Weld checker, select "ETHERNET" "Interactive" by the method, and confirm Internet Protocol address, the subnet mask, and the port number.

③ Internet portal site version 4(TCP/Ipv4) → property button is executed from the property in the communication port where it wants to use client PC, and Internet Protocol address of client PC and set the subnet mask according to the network transmission setting on the Weld checker side.

2.2. Setup of PC development setting

2.2.1. Automated install of MM400 provider

If it is an environment in which ORiN2 SDK is installed, the preparation for the system requirements (line time) to connect it with the Weld checker 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 MM400 provider

When the MM400 provider is installed by the hand work, it is necessary to register the following registry. Start the command prompt by the manager authority, and execute the regsvr32 command when you register the registry.

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-AMM400 provider

File name	CaoProvAMADAMM400.dll

ProgID	CaoProv.AMADA.MM400
Registry registration	regsvr32 CaoProvAMADAMM400.dll
Blotting out of registry registration	regsvr32 /u CaoProvAMADAMM400dll

3. Command reference

3.1. Method/property list

Table3-AMethod/property list

Category	[1]Method/property		Function	Reference
CaoWorkspace				
	Addcontroller	M	Connect it with the controller.	P.11
CaoController				
	VariableNames	P	Acquisition of variable identifier list that can be connected	P.13
	AddVariable	M	Making of variable object	P.13
	OnMessage	E	Message reception event	P.13
CaoVariable				
	Value	P	Acquisition/setting of value	P.14

3.2. Method property

3.2.1. CaoWorkspace class

3.2.1.1. AddController method

Add the controller object to CaoWorkspace. In the MM400 provider, connect it with the corresponding Weld checker 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.AMADA.MM400",         // Provider name (fixation)
        "< machine name >"                    // Provider execution machine name (unused)
        "< option >"                   // Optional character string
)
```

Usage example

[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.

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

   Set engine = New CaoEngine
   Set workspace = engine.CaoWorkspaces.Item(0)
    ..'.. making of CaoController object (interactive)
   Set controller = workspace.AddController("AMADA", _
                                             "CaoProv.AMADA.MM400", _
                                             "" _
                                             , _
                                             "conn=tcp:192.168.1.10:1024, Mode=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	Required	Explanation	Range of value	Default value
Conn	✓	Specify the parameter in communication tools set to the Weld checker. Please refer to 3.2.1.1.1 for details.	-	-
Timeout	--	Specify it by the unit of response standby time ms.	1 - 2147483647	500
Mode	--	Specify the communication method set to the Weld checker.	1: Single direction 2: Interactive	1
ID	--	Specify device No set to the Weld checker. This option is effective only that interactive is specified for optional Mode.	1 - 255	1
DecimalPoint	--	Specify the decimal point type set to the Weld checker.	1: Period (.) 2: Comma (,)	1

3.2.1.1.1. Conn is optional.

The Weld checker corresponds to the communication by TCP/IP like future [shita]. This provider tries the connection with the injection molding machine in the option Conn to correspond to this communication method 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=TCP:< connection IP >[: port number]>"

< connection IP > : Specify connection destination Internet Protocol address. Specify this item.

< port number > : Specify the connection destination port number. 1024

3.2.2. CaoController class

3.2.2.1. VariableNames property

Acquire the variable identifier list that can be connected. Describe the variable identifier acquired in this property later. The variable identifier acquired in this property can be used for the first argument of the AddVariable method of the following description.

Usage example

```
File name list ..'.. acquisition
Dim variables as Variant
variables = controller.VariableNames
```

3.2.2.2. AddVariable method

Add the variable object to CaoController. The character string shown in Chapter 3.3.1 can be used for the variable identifier.

The specification of AddVariable is shown as follows.

Format

```
CaoVariable AddVariable
(
        "< variable identifier >"       // Variable identifier
        "< option >"                    // Optional string (It is possible to omit it).
)
```

3.2.2.3. OnMessage event

Controller's error notification and the change in the state can be received as OnMessage event.

Please refer to capter 3.4 for the event that can be received.

3.2.3. CaoVariable class

3.2.3.1. Value property

Acquisition/set data from the connected Weld checker. Operation is different depending on the variable identifier. Please refer to chapter 3.3.1 for details.

3.3. Variable list

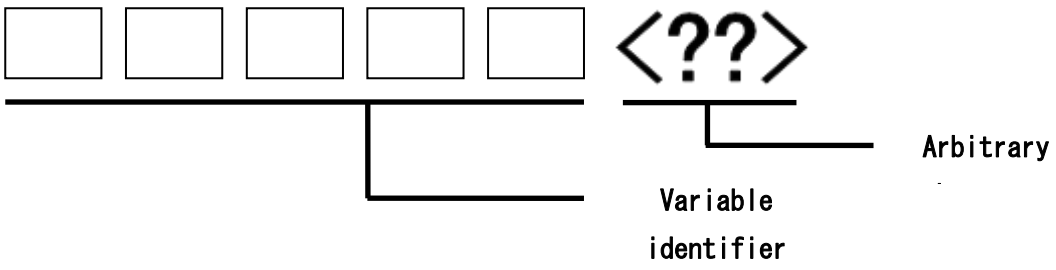
Define the variable list that can be used in each class. The variable indicates the object of the CaoVariable class.

3.3.1. CaoController class variable

To register two or more variables (usefulness to change only the option), an arbitrary character string can be given.

The format to give the variable identifier an arbitrary character string is shown below.

Two or more variable commonness and specification formats



Variable identifier	Explanation	Value		Reference
		get	put	
@MAKER_NAME	Acquire the manufacturer name. The controller can use it.	○	-	P.16
@VERSION	Acquire the DLL version. The controller can use it.	○	-	P.16
@MEASUREMENT	Acquire the measurement. Only an interactive controller can use it.	○	-	P.16

Variable identifier	Explanation	Value		Reference
		get	put	
@WAVEFORM	Acquire the shape of waves. Only an interactive controller can use it.	○	-	P.18
@CURRENT_ALLCYCLE	Acquire current all cycles. Only an interactive controller can use it.	○	-	P.20
@MEASUREMENT_HISTORY	Acquire the measurement history. Only an interactive controller can use it.	○	-	P.22
@ALARM_HISTORY	Acquire an abnormal history. Only an interactive controller can use it.	○	-	P.23
@DISPLAY_SETTING	Acquisition/set the display setting. Only an interactive controller can use it.	○	○	P.24
@SETTING_CONDITION	Acquisition/set the condition setting. Only an interactive controller can use it.	○	○	P.25
@EXTERNAL_IO	Acquisition/set the external I/O. Only an interactive controller can use it.	○	○	P.27
@PRINTING	Acquisition/set the print. Only an interactive controller can use it.	○	○	P.29
@COMMUNICATION	Acquisition/set the communication. Only an interactive controller can use it.	○	○	P.30
@USB	Acquisition/set USB. Only an interactive controller can use it.	○	○	P.32
@MEMORY	Acquisition/set an internal memory. Only an interactive controller can use it.	○	○	P.33
BASIC_CONDITION<??>	Acquisition/set the condition basic. Only an interactive controller can use it.	○	○	P.34
EXT_CONDITION<??>	Acquisition/set the condition enhancing. Only an interactive controller can use it.	○	○	P.37
SEAM_CONDITION<??>	Acquisition/set condition Sime. Only an interactive controller can use it.	○	○	P.43
RANGE_SETTING<??>	Acquisition/set the bound pair setting. Only an interactive controller can use it.	○	○	P.46
ENVELOPE<??>	Acquisition/set the envelope. Only an interactive controller can use it.	○	-	P.48

3.3.1.1. @MAKER_NAME

Acquire the manufacturer name.

Data type

Type explanation	
VT_BSTR	Acquire the manufacturer name.

Usage example

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

3.3.1.2. @VERSION

Acquire the provider version in the character string.

Data type

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

Usage example

```
Variable ..'.. addition
Dim var As CaoVariable
Set var = ctrl.AddVariable("@VERSION")
Value ..'.. acquisition
Dim value As String
value = var.value
```

3.3.1.3. @MEASUREMENT

Acquire the measurement 【 item number: 1】. When the measuring data doesn't exist, it becomes VT_EMPTY. The type of measurements is different according to the measurement item number. Please refer to 6. Appendix B for the correspondence table and the judgment character string table of the measurement item number and the data type.

Data type

Type explanation
VT_ARRAY | VT_VARIANT

Type explanation		
0	VT_UI1	Device No. 1 - 31
1	VT_UI1	Condition number 1 ? 127
2	VT_DATE	Measurement date
4i - 1	VT_UI1	Measurement item code i($1 \leq i \leq N$)
4i + 0	VT_BSTR	Judgment i($1 \leq i \leq N$)
4i + 2	VT_VARIANT	Measurements i($1 \leq i \leq N$) When data doesn't exist, it becomes VT_EMPTY.
4i + 3	VT_BSTR	Unit i($1 \leq i \leq N$)

N:Five when 10 and not set when 6-10 set item items are set on display setting screen

Usage example

```
Variable ..'.. addition
Dim measurement As CaoVariable
Set measurement = ctrl.AddVariable("@MEASUREMENT")
..'.. acquire the value.
Dim measValues As Variant
measValues = measurement.value
..'.. device No
Dim machineNo As Long
machineNo = measValues(0)
Condition ..'.. number
Dim condition As Long
condition = measValues(1)
Measurement ..'.. date
Dim measDate As Date
measDate = measValues(2)
'Measurement item 1 Loop to - maximum measurement item
For i = 3 To UBound(measValues) Step 4
    ..'.. acquisition of measurement item code
    Dim term As Integer
    term = measValues(i)
    ..'.. acquisition of judgment code
    Dim result As String
    result = measValues(i + 1)
    ..'.. acquisition of measurements
    Dim value As Double
    value = measValues(i + 2)
    Acquisition of each '
    Dim unit As String
    unit = measValues(i + 3)
Next i
```

3.3.1.4. @WAVEFORM

Acquire wavy 【 item number: 2】. When waveform data doesn't exist, it becomes VT_EMPTY. Refer to "Manual" for the wavy item number list.

Data type

Type explanation				
VT_ARRAY | VT_VARIANT				
0	VT_UI1			Device No. 1 ? 31
1	VT_I4			Number of sampling
2	VT_UI1			Condition number 1 - 127
3	VT_UI1			Wavy item code 1(It means the item none in case of 255).
4	VT_UI1			Wavy item code 2(It means the item none in case of 255).
5	VT_UI1			Wavy item code 3(It means the item none in case of 255).
6	VT_UI1			Wavy item code 4(It means the item none in case of 255).
7	VT_VARIANT | VT_ARRAY			
	i	VT_VARIANT | VT_ARRAY		
		0	VT_R4	Sampling duration
		1	VT_BSTR	Sampling duration (unit)
		2	VT_R4	Measurements 1 VT_EMPTY in case of item none and non-display
		3	VT_BSTR	Unit 1 VT_EMPTY in case of item none and non-display
		4	VT_R4	Measurements 2 VT_EMPTY in case of item none and non-display
		5	VT_BSTR	Unit 2 VT_EMPTY in case of item none and non-display
		6	VT_R4	Measurements 3 VT_EMPTY in case of item none and non-display
		7	VT_BSTR	Unit 3 VT_EMPTY in case of item none and non-display
		8	VT_R4	Measurements 4 VT_EMPTY in case of item none and non-display

Type explanation				
		9	VT_BSTR	Unit 4 VT_EMPTY in case of item none and non-display

$0 \leq i <$ サンプリング数

Usage example

```
Dim waveform As CaoVariable
Set waveform = controller.AddVariable("@WAVEFORM")

Dim readValues As Variant
readValues = waveform.value

..'.. device No
Dim machineNo As Long
machineNo = readValues(0)

..'.. number of sampling
Dim numOfSumple As Long
numOfSumple = readValues(1)

Condition ..'.. number
Dim condition As Long
condition = readValues(2)

Wavy item number ..'.. acquisition
Dim terms(3) As Long
For i = 0 To 3
terms(i) = readValues(3 + i)
Next i

..'.. acquire waveform data.
Dim waveformCollection As Variant
waveformCollection = readValues(9)
For j = 0 To (numOfSumple - 1)
    ..'.. value of sampling duration
    Dim val1 As Single
    val1 = waveformCollection(j)(0)
    ..'.. unit of sampling duration
    Dim unit1 As String
    unit1 = waveformCollection(j)(1)

    ..'.. value of item 1
    Dim val1 As Single
    val1 = waveformCollection(j)(2)
    ..'.. unit of item 1
    Dim unit1 As String
```

```
        unit1 = waveformCollection(j)(3)

        ..'.. value of item 2
        Dim val2 As Single
        val2 = waveformCollection(j)(4)
        ..'.. unit of item 2
        Dim unit2 As String
        unit2 = waveformCollection(j)(5)

        ..'.. value of item 3
        Dim val3 As Single
        val3 = waveformCollection(j)(6)
        ..'.. unit of item 3
        Dim unit3 As String
        unit3 = waveformCollection(j)(7)

        ..'.. value of item 4
        Dim val4 As Single
        val4 = waveformCollection(j)(8)
        ..'.. unit of item 4
        Dim unit4 As String
        unit4 = waveformCollection(j)(9)
    Next j
```

3.3.1.5. @CURRENT_ALLCYCLE

Acquire current all cycles 【 item number: 3】. When current all cycles data doesn't exist, it becomes VT_EMPTY.

Data type

Type explanation			
VT_ARRAY | VT_VARIANT			
0	VT_UI1		Device No. 1 ? 31
1	VT_I4		Number of sampling
2	VT_UI1		Condition number 1 - 127
3	VT_VARIANT | VT_ARRAY		
	i	VT_VARIANT | VT_ARRAY	
		0 VT_R4	Sampling duration
		1 VT_BSTR	Sampling duration (unit)

Type explanation				
		2	VT_UI1	Time base range 1: Range of measurement 0: Outside measurement range
		3	VT_R4	Current
		4	VT_BSTR	Unit of current (kA)
		5	VT_R4	Voltage
		6	VT_BSTR	Unit of voltage (V)
		7	VT_UI1	Energizing corner 0 - 180 - This item might not exist.
		8	VT_BSTR	Unit of energizing corner (deg) - This item might not exist.

$0 \leq i <$ サンプリング数

Usage example

```
Dim currentAllcycle As CaoVariable
Set currentAllcycle = controller.AddVariable("@CURRENT_ALLCYCLE")

Dim readValues As Variant
readValues = currentAllcycle.value

..'.. device No
Dim machineNo As Long
machineNo = readValues(0)

..'.. number of sampling
Dim numOfSumple As Long
numOfSumple = readValues(1)

Condition ..'.. number
Dim condition As Long
condition = readValues(2)

..'.. acquire current all cycles.
Dim currentAllcycleCollection As Variant
currentAllcycleCollection = readValues(3)
For j = 0 To (numOfSumple - 1)
    ..'.. value of sampling duration
    Dim val1 As Single
    val1 = currentAllcycleCollection (j)(0)
    ..'.. unit of sampling duration
```

```
        Dim unit1 As String
        unit1 = currentAllcycleCollection (j)(1)

        ..'.. time base range
        Dim range As Byte
        range = currentAllcycleCollection(j)(2)

        if range = 1 Then
            ..'.. value of current
            Dim current As Single
            current = currentAllcycleCollection (j)(3)
            ..'.. unit of current
            Dim currentUnit As String
            currentUnit = currentAllcycleCollection (j)(4)

            ..'.. value of voltage
            Dim voltage As Single
            voltage = currentAllcycleCollection (j)(5)
            ..'.. unit of voltage
            Dim voltageUnit As String
            voltageUnit = currentAllcycleCollection (j)(6)

            If UBound(currentAllcycleCollection(j)) >= 7 Then
                ..'.. value of energizing corner
                Dim degree As Single
                degree = currentAllcycleCollection (j)(7)
                ..'.. unit of energizing corner
                Dim degreeUnit As String
                degreeUnit = currentAllcycleCollection (j)(8)
            End If
        End if
    Next j
```

3.3.1.6. @MEASUREMENT_HISTORY

Acquire the measurement history 【 item number: 6】.

Data type

Type explanation		
VT_ARRAY | VT_VARIANT		
0	VT_I4	
1	VT_ARRAY | VT_VARIANT	
	i	@MEASUREMENTRefer to [wo].

Usage example

```
    Dim history As CaoVariable
```

```
    Set history = controller.AddVariable("@MEASUREMENT_HISTORY")

    Dim readValues As Variant
    readValues = history.value

    ..'.. number of histories
    Dim numOfSumple As Long
    numOfSumple = readValues(0)

    ..'.. acquire the measurement history.
    Dim measurementCollection As Variant
    measurementCollection = readValues(1)
    For j = 0 To (numOfSumple - 1)
        ..'.. device No
        Dim machineNo As Long
        machineNo = measurementCollection(j)(0)

        Condition ..'.. number
        Dim condition As Long
        condition = measurementCollection(j)(1)

        Measurement ..'.. date
        Dim measDate As Date
        measDate = measurementCollection(j)(2)

        For i = 3 To UBound(measurementCollection(j)) Step 4
            Measurement item ..'.. code
            Dim term As Long
            term = measurementCollection(j)(i)

            Judgment ..'.. code
            Dim result As String
            result = measurementCollection(j)(i + 1)

            ..'.. measurements
            Dim value As Double
            value = measurementCollection(j)(i + 2)

            ..'.. unit
            Dim unit As String
            unit = measurementCollection(j)(i + 3)
        Next i
    Next j
```

3.3.1.7. @ALARM_HISTORY

Acquire an abnormal history 【 item number: 7】. Acquire only the measurement in which some abnormalities are found unlike the measurement history.

Data type

@MEASUREMENT_HISTORYRefer to [wo].

Usage example

@MEASUREMENT_HISTORYRefer to [wo].

3.3.1.8. @DISPLAY_SETTING

Acquisition/set the display setting 【 item number: 11】.

Data type

Type explanation	
VT_I4 | VT_ARRAY	
0	Measurements display 0: Five items 1: Ten items
1	Measurement item code 1
2	Measurement item code 2
3	Measurement item code 3
4	Measurement item code 4
5	Measurement item code 5
6	Measurement item code 6
7	Measurement item code 7
8	Measurement item code 8
9	Measurement item code 9
10	Measurement item code 10
11	Wavy item code 1
12	Wavy item code 2
13	Wavy item code 3
14	Wavy item code 4
15	Wavy display 1 0: OFF 1: ON
16	Wavy display 2 0: OFF 1: ON

Type explanation	
17	Wavy display 3 0: OFF 1: ON
18	Wavy display 4 0: OFF 1: ON

Usage example

```
Display setting ..'.. acquisition
Dim displaySetting As CaoVariable
Set displaySetting = controller.AddVariable("@DISPLAY_SETTING")

Dim values() As Long
values = displaySetting.value

..'.. set measurement 1 after the pulse of the displacement amount.
values(1) = 15
..'.. set shape of waves 4 to the display.
values(18) = 1

..'.. reflection
displaySetting = values
```

3.3.1.9. @SETTING_CONDITION

The condition setting Acquisition/set 【 item number: 14】.

Data type

Type explanation		
VT_ARRAY | VT_VARIANT		
0	VT_I4	Mode 0: Normality 1: Sime 2: Normal trace 3: Single trace

Type explanation		
1	VT_I4	Language 0: English 1: German 2: French 3: Spanish 4: Japanese 5: Korean 6: Chinese
2	VT_I4	Welding counter setting 0 ? 999999
4	VT_I4	Quality item counter setting 0 - 999999
5	VT_I4	Brightness 0 ? 10
6	VT_I4	Brightness 0: OFF 1: AUTO
7	VT_R4	Coil conversion coefficient 100 - 250
8	VT_BSTR	Unit of coil conversion coefficient (mV/kA)
9	VT_I4	Sampling interval 0: 100us 1: 200us 2: 500us

Usage example

```
..'.. acquire the condition setting.
Dim settingCondition As CaoVariable
Set settingCondition = controller.AddVariable("@SETTING_CONDITION")

Dim values As Variant
values = settingCondition.value

..'.. set the language to English.
values(1) = 0

..'.. reflection
settingCondition = values
```

3.3.1.10. @EXTERNAL_IO

Acquisition/set the external I/O 【 item number: 18】. Refer to "Manual" for the code.

Data type

Type explanation	
VT_I4 | VT_ARRAY	
0	Input 1 (1-6 external input code table)
1	Input 2 (1-6 external input code table)
2	Input 3 (1-6 external input code table)
3	Input 4 (1-6 external input code table)
4	Input 5 (1-6 external input code table)
5	Input 6 (1-6 external input code table)
6	Input 7 (7-8 external input code table)
7	Input 8 (7-8 external input code table)
8	Output 1-1 (1-12 external output code table)
9	Output 1-2 (1-12 external output code table)
10	Output 1-3 (1-12 external output code table)
11	Output 2-1 (1-12 external output code table)
12	Output 2-2 (1-12 external output code table)
13	Output 2-3 (1-12 external output code table)
14	Output 3-1 (1-12 external output code table)
15	Output 3-2 (1-12 external output code table)
16	Output 3-3 (1-12 external output code table)
17	Output 4-1 (1-12 external output code table)
18	Output 4-2 (1-12 external output code table)
19	Output 4-3 (1-12 external output code table)
20	Output 5-1 (1-12 external output code table)
21	Output 5-2 (1-12 external output code table)
22	Output 5-3 (1-12 external output code table)
23	Output 6-1 (1-12 external output code table)
24	Output 6-2 (1-12 external output code table)
25	Output 6-3 (1-12 external output code table)
26	Output 7-1 (1-12 external output code table)
27	Output 7-2 (1-12 external output code table)
28	Output 7-3 (1-12 external output code table)

Type explanation	
29	Output 8-1 (1-12 external output code table)
30	Output 8-2 (1-12 external output code table)
31	Output 8-3 (1-12 external output code table)
32	Output 9-1 (1-12 external output code table)
33	Output 9-2 (1-12 external output code table)
34	Output 9-3 (1-12 external output code table)
35	Output 10-1 (1-12 external output code table)
36	Output 10-2 (1-12 external output code table)
37	Output 10-3 (1-12 external output code table)
38	Output 11-1 (1-12 external output code table)
39	Output 11-2 (1-12 external output code table)
40	Output 11-3 (1-12 external output code table)
41	Output 12-1 (1-12 external output code table)
42	Output 12-2 (1-12 external output code table)
43	Output 12-3 (1-12 external output code table)
44	Parity 0:OFF 1:ON
45	While it stabilizes of input 0: 1ms 1: 10ms
46	Abnormal output setting 0: Normal close 1: Normal open
47	Output time 0: 10ms 1: 100ms 2: HOLD
48	Level output 0: Level 1: Pulse

Usage example

```
..'.. acquire the external I/O.
Dim externalIO As CaoVariable
```

```
    Set externalIO = controller.AddVariable("@EXTERNAL_IO")

    Dim values() As Long
    values = externalIO.value

    ..'.. set parity to input 1.
    values(0) = 0
    ..'.. set the displacement trigger to input 7.
    values(6) = 0

    ..'.. reflection
    externalIO = values
```

3.3.1.11. @PRINTING

Acquisition/set the print 【 item number: 21】.

Data type

Type explanation	
VT_I4 | VT_ARRAY	
0	Item 0: OFF 1: Measurements 2: Shape of waves 3: Current all cycles 4: Pressurizing all cycles 5: Measurements history 6: Abnormal history 7: Condition 8: Screen
1	Interval 1 - 1000
2	Operation outside judgment 0: OFF 1: ON

Usage example

```
    ..'.. acquire the print.
    Dim printing As CaoVariable
    Set printing = controller.AddVariable("@PRINTING")

    Dim values() As Long
```

```
    values = printing.value

    ..'.. set the print entry to the measurement.
    values(0) = 1

    ..'.. reflection
    printing = values
```

3.3.1.12. @COMMUNICATION

Acquisition/set the communication 【 item number: 22】.

Data type

Type explanation	
VT_I4 | VT_ARRAY	
0	Item 0: OFF 1: Measurements 2: Shape of waves 3: Current all cycles 4: Pressurizing all cycles 5: Measurements history 6: Abnormal history 7: Condition
1	Interval 1 ? 1000
2	Operation outside judgment 0: OFF 1: ON
3	Off between shapes of waves 0: 20us 1: 50us 2: 100us 3: 200us 4: 500us 5:1000us
4	Unit 0: OFF 1: ON

Type	explanation
5	Decimal point (* It is not possible to change in data). 0: Period (.) 1: Comma (,)
6	Method (* It is not possible to change in data). 0: OFF 1: RS232C 2: RS485 3: ETHERNET
7	Method (* It is not possible to change in data). 0: For everywhere 1: Interactive
8	Device number (* It is not possible to change in data). 1 ? 31
9	Speed (* It is not possible to change in data). 0: 9600 1:19200 2:38400
10	Internet Protocol address 1(* It is not possible to change in data). 0 ? 255
11	Internet Protocol address 2(* It is not possible to change in data). 0 ? 255
12	Internet Protocol address 3(* It is not possible to change in data). 0 ? 255
13	Internet Protocol address 4(* It is not possible to change in data). 0 ? 255
14	Subnet mask 1(* It is not possible to change in data). 0 ? 255
15	Subnet mask 2(* It is not possible to change in data). 0 ? 255
16	Subnet mask 3(* It is not possible to change in data). 0 ? 255
17	Subnet mask 4(* It is not possible to change in data). 0 ? 255
18	Default gateway 1(* It is not possible to change in data). 0 ? 255

Type explanation	
19	Default gateway 2(* It is not possible to change in data). 0 ? 255
20	Default gateway 3(* It is not possible to change in data). 0 ? 255
21	Default gateway 4(* It is not possible to change in data). 0 ? 255
22	Port number 1024 - 5000

Usage example

```
..'.. acquire the communication.
Dim comm As CaoVariable
Set comm = controller.AddVariable("@COMMUNICATION")

Dim values() As Long
values = comm.value

..'.. turn on the unit.
values(4) = 1
..'.. reflection
comm = values
```

3.3.1.13. @USB

Acquisition/set USB 【 item number: 23】.

Data type

Type explanation	
VT_I4 | VT_ARRAY	
0	Item 0: OFF 1: Measurements 2: Shape of waves 3: Current all cycles 4: Pressurizing all cycles 5: Measurements history 6: Abnormal history 7: Condition 8: Screen 9: Envelope

Type explanation	
1	Interval 1 ? 1000
2	Operation outside judgment 0: OFF 1: ON
3	Off between shapes of waves 0: 20us 1: 50us 2: 100us 3: 200us 4: 500us 5:1000us
4	Unit 0: OFF 1: ON
5	Decimal point 0: Period (.) 1: Comma (,)

Usage example

```
Acquire 'USB.
Dim usb As CaoVariable
Set usb = controller.AddVariable("@USB")

Dim values() As Long
values = usb.value

..'.. turn on the unit.
values(4) = 1
..'.. reflection
usb = values
```

3.3.1.14. @MEMORY

Acquisition/set an internal memory 【 item number: 24】.

Data type

Type explanation
VT_I4 | VT_ARRAY

Type explanation	
0	Item 0: OFF 1: Shape of waves 2: Current all cycles 3: Pressurizing all cycles
1	Interval 1 ? 1000
2	Operation outside judgment 0: OFF 1: ON
3	Off between shapes of waves 0: 20us 1: 50us 2: 100us 3: 200us 4: 500us 5:1000us

Usage example

```
..'.. acquire an internal memory.
Dim memory As CaoVariable
Set memory = controller.AddVariable("@MEMORY")

Dim values() As Long
values = memory.value

..'.. set the item to the shape of waves.
values(0) = 1
..'.. reflection
memory = values
```

3.3.1.15. BASIC_CONDITION<??>

Acquisition/set a basic condition 【 item number: 12】. Input an arbitrary character string after BASIC_CONDITION and make the variable.

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
Condition	-	Specify the condition number to be accessed. The data type changes besides in case of the case to specify 0.	0: Common denominator eyes 1 - 127: Condition specification	0

Condition = Data type at 0

Type explanation	
VT_I4 | VT_ARRAY	
0	Current trigger sensitivity 1 ? 99
1	Troidal coil 0: One time 1: Ten times
2	Operation 0: Original 1: ISO1767657
3	Current sensor 0: Troidal coil 1: [Janto] resistance
4	[Janto] resistance 0: 50mV/0.5kA 1: 50mV/1kA 2: 100mV/0.5kA 3: 100mV/1kA

Condition ≠Data type at 0

Type explanation		
VT_ARRAY | VT_VARIANT		
0	VT_BSTR	Condition name (A-Z, 0 ? 9)
1	VT_I4	Trigger 0:1 in current: Auto 2: Pressurizing power 3: External 4: Continuousness 5: Displacement magnitude (outside) 6:Welding force (outside) 7: External (outside)

Type explanation		
2	VT_I4	Time 0:CYC-AC 1:ms-DC 2:CYC***Hz-AC 3:CYC-D 4:ms-AC 5:SHORT ms-DC 6:LOG CYC-AC
3	VT_I4	Frequency 30:M050 31:M053 32:M056 33:M059 34:M063 35:M067 36:M071 37:M077 38:M083 39:M091 40:M100 41:M111 42:M125 43:M143 44:M167 45:M200 46:M250 47:M294 48:M417 49:M500 50 ? 250: 50Hz ? 250Hz
4	VT_I4	Current cooking stove One Troy [darukoiru] time time: 0:2.000kA 1:6.00kA 2:20.00kA 3: 60.0kA 4:200.0kA Ten Troy [darukoiru] time time: 0:0.2.00kA 1:0.600kA 2:2.000kA 3: 6.00kA 4:20.00kA
5	VT_I4	Voltage cooking stove 0: 6.00V 1: 20.0V
6	VT_R4	Beginning time
7	VT_BSTR	Every beginning time (CYC / ms)
8	VT_R4	End time
9	VT_BSTR	Every end time (CYC / ms)
10	VT_I4	Impulse 0: Specified pulse 1: There is all pulse setting. 2: There is no all pulse setting. 3: Coolly none
11	VT_I4	Impulse number 0 ? 20
12	VT_R4	Current value of two pulse beginning
13	VT_BSTR	Unit of current value of two pulse beginning (kA)
14	VT_R4	Cool time
15	VT_BSTR	Every cool time (CYC / ms)
16	VT_R4	Fall level 10 - 90
17	VT_BSTR	Unit of fall level (%)

Type explanation		
18	VT_R4	Compulsion measurement time
19	VT_BSTR	Every compulsion measurement time (CYC / ms)
20	VT_R4	Measurement rest time
21	VT_BSTR	Every measurement rest time (s)
22	VT_R4	End level 1.5 ? 15.0
23	VT_BSTR	Unit of end level (%)

Usage example

```
..'.. acquire the condition basic.
Dim var As CaoVariable
Set var = controller.AddVariable("BASIC_CONDITION_common")

Dim values() As Long
values = var.value

..'.. set the trigger sensitivity to 30.
values(0) = 30
..'.. reflection
var = values
```

3.3.1.16. EXT_CONDITION<??>

Acquisition/set the condition enhancing 【 item number: 13】. Input an arbitrary character string after EXT_CONDITION and make the variable.

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
Condition	-	Specify the condition number to be accessed. The data type changes besides in case of the case to specify 0.	0: Common denominator eyes 1 - 127: Condition specification	0

Condition = Data type at 0

Type explanation		
VT_ARRAY | VT_VARIANT		
0	VT_I4	Measurement before displacement amount is welded 0: Current initiation 1: External input
1	VT_I4	Measurement after pulse of displacement amount 0: Current initiation 1: DeLay time
2	VT_I4	Measurement after displacement amount is welded 0: DeLay time 1: External input
3	VT_I4	Two displacement amount pulse resets 0: OFF 1: ON
4	VT_I4	Displacement amount measurement method 0: Relative value 1: Absolute value 1 2: Absolute value 2
5	VT_I4	Displacement amount sensor 0: Mitsu Toyo 1: Ono Sokki 2: Keyence Corporation 3: Heidenhain
6	VT_R4	Step of displacement amount sensor 0.1 um - 10.0 um
7	VT_BSTR	Unit of step of displacement amount sensor (um)
8	VT_I4	Displacement amount polarity 0: Positive direction 1: The opposite direction
9	VT_I4	Unit of displacement amount 0: mm 1: inch
10	VT_I4	Displacement amount output cooking stove 0: 2.047 1: 9.191 2:32.767

Type explanation		
11	VT_I4	Pressurizing power sensor 0: MA-520 1: MA-521 2: MA-522 3: MA-770 4: MA-771 5: Ratings setting
12	VT_I4	Pressurizing power span 500 ? 1500
13	VT_R4	Pressurizing power ratings output 0.750 mV/V ? 2.000 mV/V
14	VT_BSTR	Unit of pressurizing power ratings output (mv/V)
15	VT_R4	Pressurizing power ratings
16	VT_BSTR	Unit of pressurizing power ratings
17	VT_I4	Pressurizing power decimal point 0: **** 1:***.* 2:**.**
18	VT_I4	Unit of pressurizing power 0: N 1: kgf 2: lbf
19	VT_R4	Pressurizing power trigger sensitivity 0.2% - 99.9%
20	VT_BSTR	Unit of pressurizing power trigger sensitivity (%)
21	VT_I4	Measurement before pressurizing power is welded 0: Current initiation 1: External input
22	VT_I4	External input 0: Voltage 1: Current
23	VT_R4	External ratings
24	VT_BSTR	Unit of external ratings

Type explanation		
25	VT_I4	External decimal point 0: **** 1:***.* 2:**.** 3:*.***
26	VT_I4	External unit 0: None 1: V 2: N 3: kgf 4: lbf 5: degC 6: degF 7: Mpa 8: bar 9: psi
27	VT_R4	External trigger sensitivity 2.0% - 99.9%
28	VT_BSTR	Unit of external trigger sensitivity
29	VT_I4	Measurement before it welds 0: Current initiation 1: External input
30	VT_R4	Pressurizing power offset
31	VT_BSTR	Unit of pressurizing power offset

Condition ≠Data type at 0

Type explanation		
VT_ARRAY | VT_VARIANT		
0	VT_R4	Displacement amount level output 1
1	VT_BSTR	One unit of displacement amount level output (mm / inch)
2	VT_R4	Displacement amount level output 2
3	VT_BSTR	Two units of displacement amount level output (mm / inch)
4	VT_R4	Displacement amount level output 3
5	VT_BSTR	Three units of displacement amount level output (mm / inch)

Type explanation		
6	VT_R4	The final DeLay time of displacement magnitude 0ms ? 10000ms
7	VT_BSTR	Every final DeLay time of the displacement magnitude (ms)
8	VT_R4	One in displacement amount pulse DeLay time 0ms ? 1000ms
9	VT_BSTR	One unit of displacement amount pulse DeLay time (ms)
10	VT_R4	Two in displacement amount pulse DeLay time 0ms ? 1000ms
11	VT_BSTR	Two units of displacement amount pulse DeLay time (ms)
12	VT_R4	Displacement amount reset DeLay time 0ms ? 1000ms
13	VT_BSTR	Every displacement amount reset DeLay time (ms)
14	VT_R4	Pressurizing power level output 1
15	VT_BSTR	One unit of pressurizing power level output (N / kgf / lbf)
16	VT_R4	Pressurizing power level output 2
17	VT_BSTR	Two units of pressurizing power level output (N / kgf / lbf)
18	VT_R4	Pressurizing power level output 3
19	VT_BSTR	Three units of pressurizing power level output (N / kgf / lbf)
20	VT_R4	Pressurizing power DeLay time 0ms ? 1000ms
21	VT_BSTR	Every pressurizing power DeLay time (ms)
22	VT_R4	One in pressurizing power beginning time 0ms ? 10000ms (10ms step)
23	VT_BSTR	One unit of pressurizing power beginning time (ms)
24	VT_R4	One in pressurizing power end time 0ms ? 10000ms (10ms step)
25	VT_BSTR	One unit of pressurizing power end time (ms)
26	VT_R4	Two in pressurizing power beginning time 0ms ? 10000ms (10ms step)
27	VT_BSTR	Two units of pressurizing power beginning time (ms)
28	VT_R4	Two in pressurizing power end time 0ms ? 10000ms (10ms step)
29	VT_BSTR	Two units of pressurizing power end time (ms)

Type explanation		
30	VT_R4	Pressurizing power [raizureberu] 10% ? 90%
31	VT_BSTR	Unit of pressurizing power [raizureberu] (%)
32	VT_R4	Pressurizing power fall level 10% ? 90%
33	VT_BSTR	Unit of pressurizing power fall level (%)
34	VT_R4	External level output 1
35	VT_BSTR	One unit of external level output (V / N /kgf / lbf / degC / degF / Mpa / bar / psi)
36	VT_R4	External level output 2
37	VT_BSTR	Two units of external level output (V / N /kgf / lbf / degC / degF / Mpa / bar / psi)
38	VT_R4	External level output 3
39	VT_BSTR	Three units of external level output (V / N /kgf / lbf / degC / degF / Mpa / bar / psi)
40	VT_R4	External DeLay time 0ms ? 1000ms
41	VT_BSTR	Every external DeLay time (ms)
42	VT_R4	One in external beginning time 0ms ? 10000ms (10ms step)
43	VT_BSTR	One unit of external beginning time (ms)
44	VT_R4	One in external end time 0ms ? 10000ms (10ms step)
45	VT_BSTR	One unit of external end time (ms)
46	VT_R4	Two in external beginning time 0ms ? 10000ms (10ms step)
47	VT_BSTR	Two units of external beginning time (ms)
48	VT_R4	Two in external end time 0ms ? 10000ms (10ms step)
49	VT_BSTR	Two units of external end time (ms)

Usage example

```
..'.. acquire the condition enhancing.
Dim var As CaoVariable
Set var = controller.AddVariable("EXT_CONDITION_common")
```

```
    Dim values() As Long
    values = var.value

    ..'.. set the measurement before the displacement amount is welded to an external input.
    values(0) = 1
    ..'.. set the measurement after the pulse of the displacement amount to the current
initiation.
    values(1) = 0
    ..'.. set the measurement after the displacement amount is welded at the DeLay time.
    values(2) = 0

    ..'.. reflection
    var = values
```

3.3.1.17. SEAM_CONDITION<??>

Acquisition/set condition Sime 【 item number: 15】. Input an arbitrary character string after SEAM_CONDITION and make the variable.

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
Condition	-	Specify the condition number to be accessed. The data type changes besides in case of the case to specify 0.	0: Common denominator eyes 1 - 127: Condition specification	0

Condition = Data type at 0

Type explanation		
VT_ARRAY | VT_VARIANT		
0	VT_I4	Trigger 0: Current 1: Voltage The condition that can be selected changes into "Time" by setting "Trigger". Trigger..current..time..selection..trigger..voltage..time..selection.

Type explanation		
1	VT_I4	Time 0:CYC-AC 1:ms-AC 2:ms-DC 3:CYC-DC 4:SHORT ms-DC
2	VT_I4	Operation 0: Peak value 1: Effective value 2: Aspect Canada average effect value
3	VT_I4	Current cooking stove One Troy [darukoiru] time time: 0:2.000kA 1:6.00kA 2:20.00kA 3: 60.0kA 4:200.0kA Ten Troy [darukoiru] time time: 0:0.2.00kA 1:0.600kA 2:2.000kA 3: 6.00kA 4:20.00kA
4	VT_I4	Voltage cooking stove 0: 6.00V 1: 20.0V
5	VT_I4	Current trigger sensitivity 1 ? 99
6	VT_I4	Voltage trigger sensitivity 1 - 99
7	VT_I4	Troidal coil 0: One time 1: Ten times
8	VT_R4	End level 1.5% - 15.0%
9	VT_BSTR	Unit of end level (%)

Condition ≠Data type at 0

Type explanation		
VT_ARRAY | VT_VARIANT		
0	VT_BSTR	Condition name (A-Z, 0 ? 9)
1	VT_R4	Measurement beginning
2	VT_BSTR	Unit of measurement beginning (ms / CYC)
3	VT_R4	Time base range
4	VT_BSTR	Unit of measurement range (ms / CYC)
5	VT_R4	Time between measurements

Type explanation		
6	VT_BSTR	Every time between measurements (ms / CYC)
7	VT_R4	One in beginning time
8	VT_BSTR	One unit of beginning time (ms / CYC)
9	VT_R4	One in end time
10	VT_BSTR	One unit of end time (ms / CYC)
11	VT_R4	Two in beginning time
12	VT_BSTR	Two units of beginning time (ms / CYC)
13	VT_R4	Two in end time
14	VT_BSTR	Two units of end time (ms / CYC)
15	VT_R4	Three in beginning time
16	VT_BSTR	Three units of beginning time (ms / CYC)
17	VT_R4	Three in end time
18	VT_BSTR	Three units of end time (ms / CYC)
19	VT_R4	Current upper bound 1
20	VT_BSTR	One unit of current upper bound (kA)
21	VT_R4	Current lower bound 1
22	VT_BSTR	One unit of current lower bound (kA)
23	VT_R4	Current upper bound 2
24	VT_BSTR	Two units of current upper bound (kA)
25	VT_R4	Current lower bound 2
26	VT_BSTR	Two units of current lower bound (kA)
27	VT_R4	Current upper bound 3
28	VT_BSTR	Three units of current upper bound (kA)
29	VT_R4	Current lower bound 3
30	VT_BSTR	Three units of current lower bound (kA)
31	VT_R4	Voltage upper bound 1
32	VT_BSTR	One unit of voltage upper bound (V)
33	VT_R4	Voltage lower bound 1
34	VT_BSTR	One unit of voltage lower bound (V)
35	VT_R4	Voltage upper bound 2
36	VT_BSTR	Two units of voltage upper bound (V)
37	VT_R4	Voltage lower bound 2
38	VT_BSTR	Two units of voltage lower bound (V)
39	VT_R4	Voltage upper bound 3

Type explanation		
40	VT_BSTR	Three units of voltage upper bound (V)
41	VT_R4	Voltage lower bound 3
42	VT_BSTR	Three units of voltage lower bound (V)

Usage example

```
..'.. acquire the condition enhancing.
Dim var As CaoVariable
Set var = controller.AddVariable("SEAM_CONDITION_common")

Dim values() As Long
values = var.value

..'.. set the trigger to the voltage.
values(0) = 1

..'.. reflection
var = values
```

3.3.1.18. RANGE_SETTING<??>

Acquisition/set the bound pair setting 【 item number: 16】. Input an arbitrary character string after RANGE_SETTING and make the variable. See "Manual" about the bound pair code.

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
Condition	-	Specify the condition number to be accessed.	1 - 127: Condition specification	1

Data type

Type explanation		
VT_ARRAY | VT_VARIANT		
0	VT_R4 or VT_EMPTY	Upper bound 1(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
1	VT_BSTR	Unit of upper bound 1(Refer to the bound pair code table).
2	VT_R4 or VT_EMPTY	Lower bound 1(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.

Type explanation		
3	VT_BSTR	Unit of lower bound 1(Refer to the bound pair code table).
4	VT_R4 or VT_EMPTY	Upper bound 2(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
5	VT_BSTR	Unit of upper bound 2(Refer to the bound pair code table).
6	VT_R4 or VT_EMPTY	Lower bound 2(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
7	VT_BSTR	Unit of lower bound 2(Refer to the bound pair code table).
8	VT_R4 or VT_EMPTY	Upper bound 3(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
9	VT_BSTR	Unit of upper bound 3(Refer to the bound pair code table).
10	VT_R4 or VT_EMPTY	Lower bound 3(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
11	VT_BSTR	Unit of lower bound 3(Refer to the bound pair code table).
12	VT_R4 or VT_EMPTY	Upper bound 4(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
13	VT_BSTR	Unit of upper bound 4(Refer to the bound pair code table).
14	VT_R4 or VT_EMPTY	Lower bound 4(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
15	VT_BSTR	Unit of lower bound 4(Refer to the bound pair code table).
16	VT_R4 or VT_EMPTY	Upper bound 5(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
17	VT_BSTR	Unit of upper bound 5(Refer to the bound pair code table).
18	VT_R4 or VT_EMPTY	Lower bound 5(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
19	VT_BSTR	Unit of lower bound 5(Refer to the bound pair code table).
20	VT_R4 or VT_EMPTY	Upper bound 6(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
21	VT_BSTR	Unit of upper bound 6(Refer to the bound pair code table).
22	VT_R4 or VT_EMPTY	Lower bound 6(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
23	VT_BSTR	Unit of lower bound 6(Refer to the bound pair code table).
24	VT_R4 or VT_EMPTY	Upper bound 7(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
25	VT_BSTR	Unit of upper bound 7(Refer to the bound pair code table).

Type explanation		
26	VT_R4 or VT_EMPTY	Lower bound 7(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
27	VT_BSTR	Unit of lower bound 7(Refer to the bound pair code table).
28	VT_R4 or VT_EMPTY	Upper bound 8(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
29	VT_BSTR	Unit of upper bound 8(Refer to the bound pair code table).
30	VT_R4 or VT_EMPTY	Lower bound 8(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
31	VT_BSTR	Unit of lower bound 8(Refer to the bound pair code table).
32	VT_R4 or VT_EMPTY	Upper bound 9(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
33	VT_BSTR	Unit of upper bound 9(Refer to the bound pair code table).
34	VT_R4 or VT_EMPTY	Lower bound 9(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
35	VT_BSTR	Unit of lower bound 9(Refer to the bound pair code table).
36	VT_R4 or VT_EMPTY	Upper bound 10(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
37	VT_BSTR	Unit of upper bound 10(Refer to the bound pair code table).
38	VT_R4 or VT_EMPTY	Lower bound 10(Refer to the bound pair code table). - When the value is not set, it becomes VT_EMPTY.
39	VT_BSTR	Unit of lower bound 10(Refer to the bound pair code table).

3.3.1.19. ENVELOPE<??>

Acquire the envelope 【 item number: 17】. Input an arbitrary character string after ENVELOPE and make the variable. See "Manual" about the envelope bound pair code.

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
Condition	-	Specify the condition number to be accessed.	1 - 20: Condition specification	1

Data type

Type explanation		
VT_ARRAY | VT_VARIANT		
0	VT_R4	OFFSET UPPER ENVE#1 SEGM#1
1	VT_BSTR	OFFSET UPPER Unit of ENVE#1 SEGM#1
2	VT_R4	OFFSET UPPER ENVE#1 SEGM#2
3	VT_BSTR	OFFSET UPPER Unit of ENVE#1 SEGM#2
4	VT_R4	OFFSET UPPER ENVE#1 SEGM#3
5	VT_BSTR	OFFSET UPPER Unit of ENVE#1 SEGM#3
6	VT_R4	OFFSET UPPER ENVE#2 SEGM#1
7	VT_BSTR	OFFSET UPPER Unit of ENVE#2 SEGM#1
8	VT_R4	OFFSET UPPER ENVE#2 SEGM#2
9	VT_BSTR	OFFSET UPPER Unit of ENVE#2 SEGM#2
10	VT_R4	OFFSET UPPER ENVE#2 SEGM#3
11	VT_BSTR	OFFSET UPPER Unit of ENVE#2 SEGM#3
12	VT_R4	OFFSET LOWER ENVE#1 SEGM#1
13	VT_BSTR	OFFSET LOWER Unit of ENVE#1 SEGM#1
14	VT_R4	OFFSET LOWER ENVE#1 SEGM#2
15	VT_BSTR	OFFSET LOWER Unit of ENVE#1 SEGM#2

Type explanation		
16	VT_R4	OFFSET LOWER ENVE#1 SEGM#3
17	VT_BSTR	OFFSET LOWER Unit of ENVE#1 SEGM#3
18	VT_R4	OFFSET LOWER ENVE#2 SEGM#1
19	VT_BSTR	OFFSET LOWER Unit of ENVE#2 SEGM#1
20	VT_R4	OFFSET LOWER ENVE#2 SEGM#2
21	VT_BSTR	OFFSET LOWER Unit of ENVE#2 SEGM#2
22	VT_R4	OFFSET LOWER ENVE#2 SEGM#3
23	VT_BSTR	OFFSET LOWER Unit of ENVE#2 SEGM#3
24	VT_R4	START TIME UPPER ENVE#1 SEGM#1
25	VT_BSTR	START TIME UPPER Unit of ENVE#1 SEGM#1
26	VT_R4	START TIME UPPER ENVE#1 SEGM#2
27	VT_BSTR	START TIME UPPER Unit of ENVE#1 SEGM#2
28	VT_R4	START TIME UPPER ENVE#1 SEGM#3
29	VT_BSTR	START TIME UPPER Unit of ENVE#1 SEGM#3
30	VT_R4	START TIME UPPER ENVE#2 SEGM#1
31	VT_BSTR	START TIME UPPER Unit of ENVE#2 SEGM#1
32	VT_R4	START TIME UPPER ENVE#2 SEGM#2

Type explanation		
33	VT_BSTR	START TIME UPPER Unit of ENVE#2 SEGM#2
34	VT_R4	START TIME UPPER ENVE#2 SEGM#3
35	VT_BSTR	START TIME UPPER Unit of ENVE#2 SEGM#3
36	VT_R4	START TIME LOWER ENVE#1 SEGM#1
37	VT_BSTR	START TIME LOWER Unit of ENVE#1 SEGM#1
38	VT_R4	START TIME LOWER ENVE#1 SEGM#2
39	VT_BSTR	START TIME LOWER Unit of ENVE#1 SEGM#2
40	VT_R4	START TIME LOWER ENVE#1 SEGM#3
41	VT_BSTR	START TIME LOWER Unit of ENVE#1 SEGM#3
42	VT_R4	START TIME LOWER ENVE#2 SEGM#1
43	VT_BSTR	START TIME LOWER Unit of ENVE#2 SEGM#1
44	VT_R4	START TIME LOWER ENVE#2 SEGM#2
45	VT_BSTR	START TIME LOWER Unit of ENVE#2 SEGM#2
46	VT_R4	START TIME LOWER ENVE#2 SEGM#3
47	VT_BSTR	START TIME LOWER Unit of ENVE#2 SEGM#3
48	VT_R4	END TIME UPPER ENVE#1 SEGM#1
49	VT_BSTR	END TIME UPPER Unit of ENVE#1 SEGM#1

Type explanation		
50	VT_R4	END TIME UPPER ENVE#1 SEGM#2
51	VT_BSTR	END TIME UPPER Unit of ENVE#1 SEGM#2
52	VT_R4	END TIME UPPER ENVE#1 SEGM#3
53	VT_BSTR	END TIME UPPER Unit of ENVE#1 SEGM#3
54	VT_R4	END TIME UPPER ENVE#2 SEGM#1
55	VT_BSTR	END TIME UPPER Unit of ENVE#2 SEGM#1
56	VT_R4	END TIME UPPER ENVE#2 SEGM#2
57	VT_BSTR	END TIME UPPER Unit of ENVE#2 SEGM#2
58	VT_R4	END TIME UPPER ENVE#2 SEGM#3
59	VT_BSTR	END TIME UPPER Unit of ENVE#2 SEGM#3
60	VT_R4	END TIME LOWER ENVE#1 SEGM#1
61	VT_BSTR	END TIME LOWER Unit of ENVE#1 SEGM#1
62	VT_R4	END TIME LOWER ENVE#1 SEGM#2
63	VT_BSTR	END TIME LOWER Unit of ENVE#1 SEGM#2
64	VT_R4	END TIME LOWER ENVE#1 SEGM#3
65	VT_BSTR	END TIME LOWER Unit of ENVE#1 SEGM#3
66	VT_R4	END TIME LOWER ENVE#2 SEGM#1

Type explanation		
67	VT_BSTR	END TIME LOWER Unit of ENVE#2 SEGM#1
68	VT_R4	END TIME LOWER ENVE#2 SEGM#2
69	VT_BSTR	END TIME LOWER Unit of ENVE#2 SEGM#2
70	VT_R4	END TIME LOWER ENVE#2 SEGM#3
71	VT_BSTR	END TIME LOWER Unit of ENVE#2 SEGM#3

3.4. Message list

Controller's error notification and the change in the state can be received as OnMessage event.

Number	Explanation
0	The error occurred when receiving it. Maintain the error code as data.
1	The measurement was received. About the data type3.3.1.3Refer to [wo].
2	The shape of waves was received. About the data type3.3.1.4Refer to [wo].
3	Current all cycles were received. About the data type3.3.1.5Refer to [wo].
6	The measurement history was received. About the data type3.3.1.6Refer to [wo].
7	An abnormal history was received. About the data type3.3.1.7Refer to [wo].

4. Programming by MM400 provider

In the MM400 provider, client PC and the Weld checker can be connected according to the following procedures.

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

After it connects it with the Weld checker, it can access measurements and the set up information in the Weld checker by using the OnMessage event of CaoController or generating the CaoVariabe object.

4.1. Sample programming that receives measurement automatically

The sample program that receives the measurement of the Weld checker by the automatic operation as an example is shown here. Table4-AThe requirement for [ni] sample programFigure4-1The flow of [ni] sample program is described respectively.

Table4-ARequirement for sample program

Requirement	Explanation
Connection destination	Connect it by TCP/IP.
	Connection destination Internet Protocol address is 192.168.1.10.
	The connection destination port number is 1024.
	The communication method is a single direction.
	The communication item is a result of a measurement.
	The decimal point method is a period (.).
Content of processing	Receive the result of a measurement from the Weld checker with OnMessage.

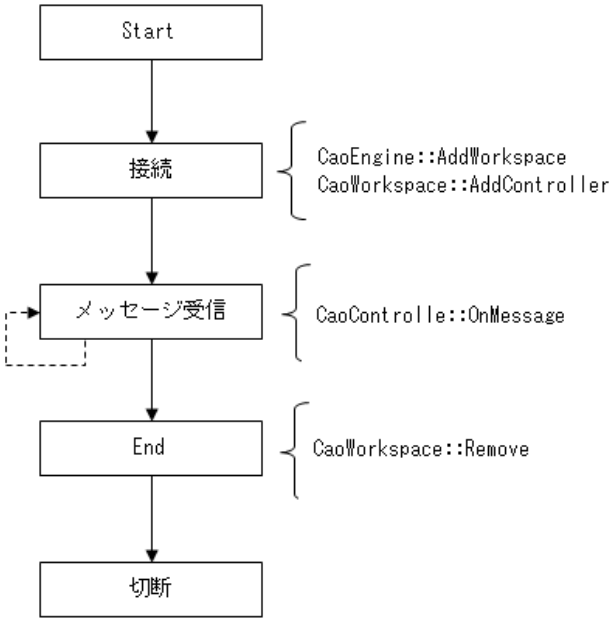


Figure4-1Flow of measurement result reception

A concrete code is shown from the following paragraphs.

4.1.1. Sample program

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

Sample WeldCheckerFeature.vb

```
Variable ..'.. declaration
Private engine As CaoEngine
Private workspace As CaoWorkspace
Private WithEvents controller As CaoController

Connection ..'.. method
Sub Connect()
     ..'.. making of CaoEngine object
    Set engine = New CaoEngine
     ..'.. acquisition of CaoWorkspace object
    Set workspace = engine.Workspaces.Item(0)

    A single direction and the reception ..'.. .... ..(.. item of making of the CaoController
object are specified for measurements. )
    Set controller = workspace.AddController("AMADA", _
                                    "CaoProv.AMADA.MM400", _
                                    "", _
                                    "conn=tcp:192.168.1.10:1024, Mode=1")
End Sub

Cutting ..'.. method
Sub Disconnect()
    workspace.Controllers.Remove (controller.Index)
```

```
    Set controller = Nothing
    Call engine.Workspaces.Remove(workspace.Index)
     ..'.. deletion of CaoWorkspace
    Set workspace = Nothing
     ..'.. deletion of CaoEngine
    Set engine = Nothing
End Sub

..'.. method of receiving message
Private Sub controller_OnMessage(ByVal pICaoMess As CAOLib.ICaoMessage)
    If pICaoMess.Number = 1 Then
        ..'.. acquire the value if the reception message number is measurements.
        Dim measValues As Variant
        measValues = pICaoMess.Value

        ..'.. device No
        Dim machineNo As Long
        machineNo = measValues(0)
        Condition ..'.. number
        Dim condition As Long
        condition = measValues(1)
        Measurement ..'.. date
        Dim measDate As Date
        measDate = measValues(2)
        'Measurement item 1 Loop to - maximum measurement item
        For i = 3 To UBound(measValues) Step 4
            ..'.. acquisition of measurement item code
            Dim term As Integer
            term = measValues(i)
            ..'.. acquisition of judgment code
            Dim result As String
            result = measValues(i + 1)
            ..'.. acquisition of measurements
            Dim value As Double
            value = measValues(i + 2)
            Acquisition of each '
            Dim unit As String
            unit = measValues(i + 3)
        Next i
    End If
End Sub
```

4.1.1.1. Connection

Take the following procedures to connect it with the Weld checker.

(1) Prepare the variable to maintain the object. The object necessary for the controller connection is CaoEngine object, CaoWorkspace object, and CaoController object. It is

necessary to declare the CaoController type variable with "WithEvents" in VB6 to do the event of CaoController in the steering wheel.

```
 ..'.. variable for CaoEngine object
Private engine As CaoEngine
 ..'.. variable for CaoWorkspace object
Private workspace As CaoWorkspace
 ..'.. variable for CaoController object
Private WithEvents controller As CaoController
```

(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 and CaoWorkspace of default are shown as follows.

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

Acquisition of 'CaoWorkspace of default object
Set workspace = engine.Workspaces.Item(0)
```

(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 MM400 provider, specify connection destination information and the communication method (single direction/interactive) in the option. CaoController is made specifying the following content in the sample.

- TCP/IP connection
- Connection destination IP: 192.168.1.10 and connection destination port: 1024
- The communication method is a single direction.
- The reception item is measurements.

```
A single direction and the reception ..'.. .... ..(.. item of making of the CaoController object are specified for measurements. )
Set controller = workspace.AddController("AMADA", _
                                         "CaoProv.AMADA.MM400", _
                                         "", _
                                         "conn=tcp:192.168.1.10:1024, Mode=1")
```

4.1.1.2. Message reception

When CaoController of the MM400 provider is made by the single direction method, information on MM400 becomes possible to acquire by doing the CaoController::OnMessage event in the steering wheel it. In the sample program, the controller_OnMessage event handler is prepared and the steering wheel does the CaoController::OnMessage event. Please refer to chapter 3.4 for the specification of each message.

```
    If pICaoMess.Number = 1 Then
        ..'.. acquire the value if the reception message number is measurements.
        Dim measValues As Variant
        measValues = measurement.value

        Device No ..'.. acquisition
        Dim machineNo As Long
        machineNo = measValues(0)
        ..'.. acquisition of condition number
        Dim condition As Long
        condition = measValues(1)
        ..'.. acquisition at measurement date
        Dim measDate As Date
        measDate = measValues(2)
        'Measurement item 1 Loop to - maximum measurement item
        For i = 3 To UBound(measValues) Step 4
            ..'.. acquisition of measurement item code
            Dim term As Integer
            term = measValues(i)

            ..'.. acquisition of judgment code
            Dim result As String
            result = measValues(i + 1)

            ..'.. acquisition of measurements
            Dim value As Double
            value = measValues(i + 2)

            Acquisition of each '
            Dim unit As String
            unit = measValues(i + 3)
        Next i
    End If
```

4.1.1.3. 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 CaoController from CaoWorkspace.
```

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

4.2. Sample programming to acquire measurement

It differs from Chapter 4.1 and the example of acquiring the measurement in an interactive mode is presented in this sample program.

Table4-2 Requirement for sample program

Requirement	Explanation
Connection destination	Connect it by TCP/IP.
	Connection destination Internet Protocol address is 192.168.1.10.
	The connection destination port number is 1024.
	The communication method is interactive.
	The decimal point method is a period (.).
Content of processing	Make the measurement result acquisition variable.
	Acquire the value from the measurement result acquisition variable.

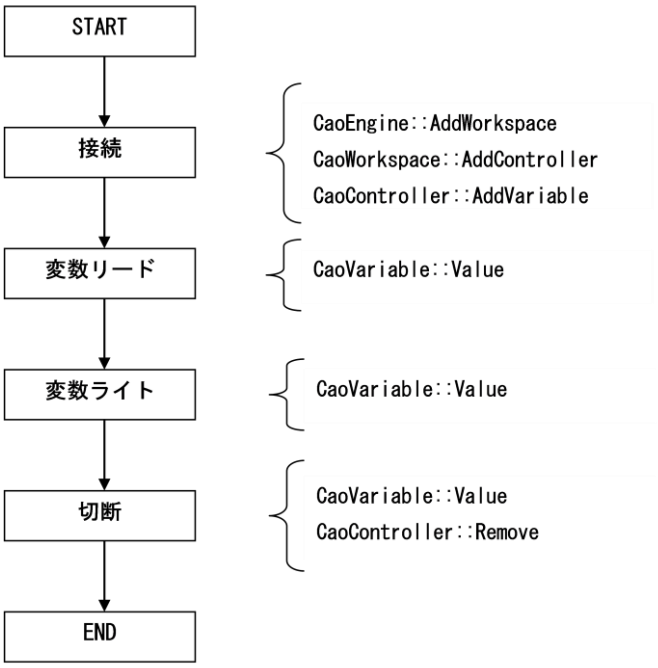


Figure4-2Flow of measurement result acquisition

4.2.1. Sample program

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

Sample GetMeasurement.vb

```
Variable ..'.. declaration
Private engine As CaoEngine
Private workspace As CaoWorkspace
Private controller As CaoController
Private measurement As CaoVariable

Sub Main()
     ..'.. making of CaoEngine object
    Set engine = New CaoEngine
     ..'.. acquisition of CaoWorkspace object
    Set workspace = engine.Workspaces.Item(0)

     ..'.. making of CaoController object (interactive)
    Set controller = workspace.AddController("AMADA", _
                                              "CaoProv.AMADA.MM400", _
                                              "", _
                                              "conn=tcp:192.168.1.10:1024, Mode=2")

    Measurement variable ..'.. addition
    Set measurement = controller.AddVariable("@MEASUREMENT")
```

```
    ..'.. acquire the value if the reception message number is measurements.
    Dim measValues As Variant
    measValues = measurement.value

    ..'.. device No
    Dim machineNo As Long
    machineNo = measValues(0)
    Condition ..'.. number
    Dim condition As Long
    condition = measValues(1)
    Measurement ..'.. date
    Dim measDate As Date
    measDate = measValues(2)
    'Measurement item 1 Loop to - maximum measurement item
    For i = 3 To UBound(measValues) Step 4
        ..'.. acquisition of measurement item code
        Dim term As Integer
        term = measValues(i)
        ..'.. acquisition of judgment code
        Dim result As String
        result = measValues(i + 1)
        ..'.. acquisition of measurements
        Dim value As Double
        value = measValues(i + 2)
        Acquisition of each '
        Dim unit As String
        unit = measValues(i + 3)
    Next i

    controller.Variables.Remove(measurement.Index)
    Set measurement = Nothing

    workspace.Controllers.Remove (controller.Index)
    Set controller = Nothing
    Call engine.Workspaces.Remove(workspace.Index)
     ..'.. deletion of CaoWorkspace
    Set workspace = Nothing
     ..'.. deletion of CaoEngine
    Set engine = Nothing
End Sub
```

4.2.1.1. Connection

Take the following procedures to connect it with the Weld checker.

(1) Prepare the variable to maintain the object. The object necessary for the controller connection is CaoEngine object, CaoWorkspace object, and CaoController object. Moreover,

it is necessary to prepare the CaoVariable object to acquire information on the Weld checker when connecting it by an interactive method.

```
Private engine As CaoEngine           ..'.. variable for CaoEngine object
Private workspace As CaoWorkspace     ..'.. variable for CaoWorkspace object
Private controller As CaoController   ..'.. variable for CaoController object
Private measurement 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 and CaoWorkspace of default are shown as follows.

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

Acquisition of 'CaoWorkspace of default object
Set workspace = engine.Workspaces.Item(0)
```

(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 MM400 provider, specify connection destination information and the communication method (single direction/interactive) in the option. CaoController is made specifying the following content in the sample.

- TCP/IP connection
- Connection destination IP: 192.168.1.10 and connection destination port: 1024
- The communication method is interactive.

```
 A single direction and the reception ..'.. .... ..(.. item of making of the CaoController
object are specified for measurements. )
 Set controller = workspace.AddController("AMADA", _
                                          "CaoProv.AMADA.MM400", _
                                          "", _
                                          "conn=tcp:192.168.1.10:1024, Mode=2")
```

(5) It is necessary to add the CaoVariable object to the CaoController object for an interactive method acquisition/to set information on the Weld checker. Variable @MEASUREMENT to acquire the measurement is added in the sample program.

```
 Measurement variable ..'.. addition
 Set measurement = controller.AddVariable("@MEASUREMENT")
```

4.2.1.2. Acquisition of measurement

Use the Value property of the added CaoVariable variable to acquire the value. The Value property of the @MEASUREMENT variable is VT_VARIANT | VT_ARRAY. Please refer to chapter 3.3 for details.

```
    ..'.. acquire the value.
    Dim measValues As Variant
    measValues = measurement.value
    ..'.. device No
    Dim machineNo As Long
    machineNo = measValues(0)
    Condition ..'.. number
    Dim condition As Long
    condition = measValues(1)
    Measurement ..'.. date
    Dim measDate As Date
    measDate = measValues(2)
    'Measurement item 1 Loop to - maximum measurement item
    For i = 3 To UBound(measValues) Step 4
        ..'.. acquisition of measurement item code
        Dim term As Integer
        term = measValues(i)
        ..'.. acquisition of judgment code
        Dim result As String
        result = measValues(i + 1)
        ..'.. acquisition of measurements
        Dim value As Double
        value = measValues(i + 2)
        Acquisition of each '
        Dim unit As String
        unit = measValues(i + 3)
    Next i
```

4.2.1.3. 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 CaoVaraible from CaoController.
    Call controller.Variables.Remove(measurement.Index)
    Set measurement = Nothing
     ..'.. delete CaoController from CaoWorkspace.
    Call workspace.Controllers.Remove(controller.Index)
     ..'.. deletion of CaoController
    Set ctrl = Nothing
     ..'.. delete CaoWorkspace from CaoEngine.
    Call engine.Workspaces.Remove(workspace.Index)
     ..'.. deletion of CaoWorkspace
```

```
    Set workspace = Nothing
     ..'.. deletion of CaoEngine
    Set engine = Nothing
```

5. MM400 provider error code

In the MM400 provider, the following original error codes in which the mask is done with 0x8011**** exist. (Table5-AReference)

About a common error of ORiN2, "ORiN2 プログラミングガイド Refer to the chapter of the error code of".

Table5-AOriginal error code table

Error number	Explanation
0x80110001	It is not specified that indispensability is optional. The option described 0 in an indispensable row is indispensable and optional. Specify it.
0x80110002	The communication type is different. Specify either of Com/Eth/Tcp.
0x80110003	The specified value is outside the range. Specify the value within the range described in each item.
0x80110005	Header ""doesn't exist in receive data. There is a possibility that is not the corresponding model. Inquire of the manufacturer.
0x80110006	It failed in the analysis of the measuring data. There is a possibility that the decimal point method on the Weld checker side and the decimal point method of the provider are different. Confirm whether the optional DecimalPoint of CaoWorkspace::AddController specification is corresponding to the setting of the Weld checker side.
0x80110007	Item data different from the specified transmission item was received. There is a possibility that the transmission item of the Weld checker and the reception item of the provider are different.
0x80110008	The data of a demanded condition number and a different condition number was received. There is a possibility of the condition number that doesn't correspond on the Weld checker side. Review the specified value optional Condition of CaoController::AddVariabl it.
0x80110009	It received the data from a transmitted machine number and a different machine number. There is a possibility that the machine number of the Weld checker and the machine number of the provider are different. Confirm whether the optional ID of CaoWorkspace::AddController specification is corresponding to the setting of the Weld checker side.

6. Appendix

Appendix A. Table for communication protocol

Enumerate the correspondence table with the communication item described in each variable and the manual here.

Variable	Communication item
@MEASUREMENT	Measurement【 item number: 1】
@WAVEFORM	Shape of waves【 item number: 2】
@CURRENT_ALLCYCLE	Current all cycles【 item number: 3】
@MEASUREMENT_HISTORY	Measurement history【 item number: 6】
@ALARM_HISTORY	Abnormal history【 item number: 7】
@DISPLAY_SETTING	Display setting【 item number: 11】
@SETTING_CONDITION	Condition setting【 item number: 14】
@EXTERNAL_IO	External I/O【 item number: 18】
@PRINTING	Print【 item number: 21】
@COMMUNICATION	Communication【 item number: 22】
@USB	USB【 item number: 23】
@MEMORY	Internal memory【 item number: 24】
BASIC_CONDITION	The condition is basic. 【 item number: 12】
EXT_CONDITION	Condition enhancing【 item number: 13】
SEAM_CONDITION	Condition Sime【 item number: 15】
RANGE_SETTING	Bound pair setting【 item number: 16】
ENVELOPE	Envelope【 item number: 17】

Appendix B. Correspondence table of measurement item code and data type

Measurement item		Measurements	
Code	Item name	Type	Unit
0	Current peak value	VT_R8	kA
1	Current effect value		
2	Average of current [soukanada] effect value		
3	Voltage peak value	VT_R8	V
4	Voltage effect value		
5	Average of voltage [soukanada] effect value		
6	Energizing corner	VT_I4	deg
7	Electric power mean value	VT_R8	kW
8	Resistance mean value	VT_R8	mOhm
9	Energizing time	VT_R8	CYC

Measurement item		Measurements	
Code	Item name	Type	Unit
			ms
10	Energizing time TP	VT_I4	ms
11	Energizing time TH	VT_I4	
12	Flow time	VT_I4	ms
13	Before welding the displacement amount	VT_R8	mm inch
14	After one the displacement amount pulse	VT_R8	
15	After two the displacement amount pulse	VT_R8	
16	After welding the displacement amount	VT_R8	
17	The displacement magnitude is continuous.	VT_EMPTY	
18	Pressurizing power peak value	VT_R8	N kgf lbf
19	Pressurizing power mean value 1	VT_R8	
20	Pressurizing power mean value 2	VT_R8	
21	Before welding the pressurizing power	VT_R8	
22	After welding the pressurizing power	VT_R8	
23	The welding force is continuous.	VT_EMPTY	
24	Pressurizing power time	VT_I4	ms
25	External peak value	VT_R8	V N kgf lbf degC degF Mpa Bar Psi
26	External mean value 1	VT_R8	
27	External mean value 2	VT_R8	
28	Before welding the external	VT_R8	
29	After welding the external	VT_R8	
30	The external is continuous.	VT_EMPTY	
31	Extrinsic time	VT_I4	ms
32	Welding counter	VT_I4	
33	Quality item counter	VT_I4	
34	There is no setting.	VT_EMPTY	

Appendix C. Correspondence table of bound pair code and

data type

Measurement item		Measurements	
Code	Item name	Type	Unit
0	Current peak value	VT_R8	kA
1	Current effect value		
2	Average of current [soukanada] effect value		
3	Voltage peak value	VT_R8	V
4	Voltage effect value		
5	Average of voltage [soukanada] effect value		
6	Energizing corner	VT_EMPTY	deg
7	Electric power mean value	VT_R8	kW
8	Resistance mean value	VT_R8	mOhm
9	Energizing time	VT_R8	CYC ms
10	Energizing time TP	VT_I4	ms
11	Energizing time TH	VT_I4	
12	Flow time	VT_I4	ms
13	Before welding the displacement amount	VT_R8	mm inch
14	After one the displacement amount pulse	VT_R8	
15	After two the displacement amount pulse	VT_R8	
16	After welding the displacement amount	VT_R8	
17	The displacement magnitude is continuous.	VT_EMPTY	
18	Pressurizing power peak value	VT_R8	N kgf lbf
19	Pressurizing power mean value 1	VT_R8	
20	Pressurizing power mean value 2	VT_R8	
21	Before welding the pressurizing power	VT_R8	
22	After welding the pressurizing power	VT_R8	
23	The welding force is continuous.	VT_EMPTY	
24	Pressurizing power time	VT_EMPTY	ms
25	External peak value	VT_R8	V N kgf
26	External mean value 1	VT_R8	
27	External mean value 2	VT_R8	

Measurement item		Measurements	
Code	Item name	Type	Unit
28	Before welding the external	VT_R8	lbf degC degF Mpa Bar Psi
29	After welding the external	VT_R8	
30	The external is continuous.	VT_EMPTY	
31	Extrinsic time	VT_EMPTY	ms
32	Welding counter	VT_EMPTY	
33	Quality item counter	VT_EMPTY	
34	There is no setting.	VT_EMPTY	