

RobCom provider for Matrox-based vision systems

Version 1.0.1

User's guide

November 12, 2014

[Remarks]

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1.0.0	2014-09-09	First edition.
1.0.1	2014-11-12	Add commands. SendCommand, ReceiveCommand, SendPositionRequest, WaitPositionReply

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1. Introduction

This is a users guide for RobCom provider that is one of the CAO provider. RobCom provider is designed to communicate with vision systems, including smart cameras, configured using the Matrox Design Assistant vision software.

RobCom provider sends/receives commands from/to a Matrox Design Assistant project using Communication: Robot steps (Figure 1-1) through EtherNet(TCP/IP) connection. Figure 1-2 shows the communication overview with a Matrox Design Assistant project (running for example on a Matrox Iris GT smart camera).

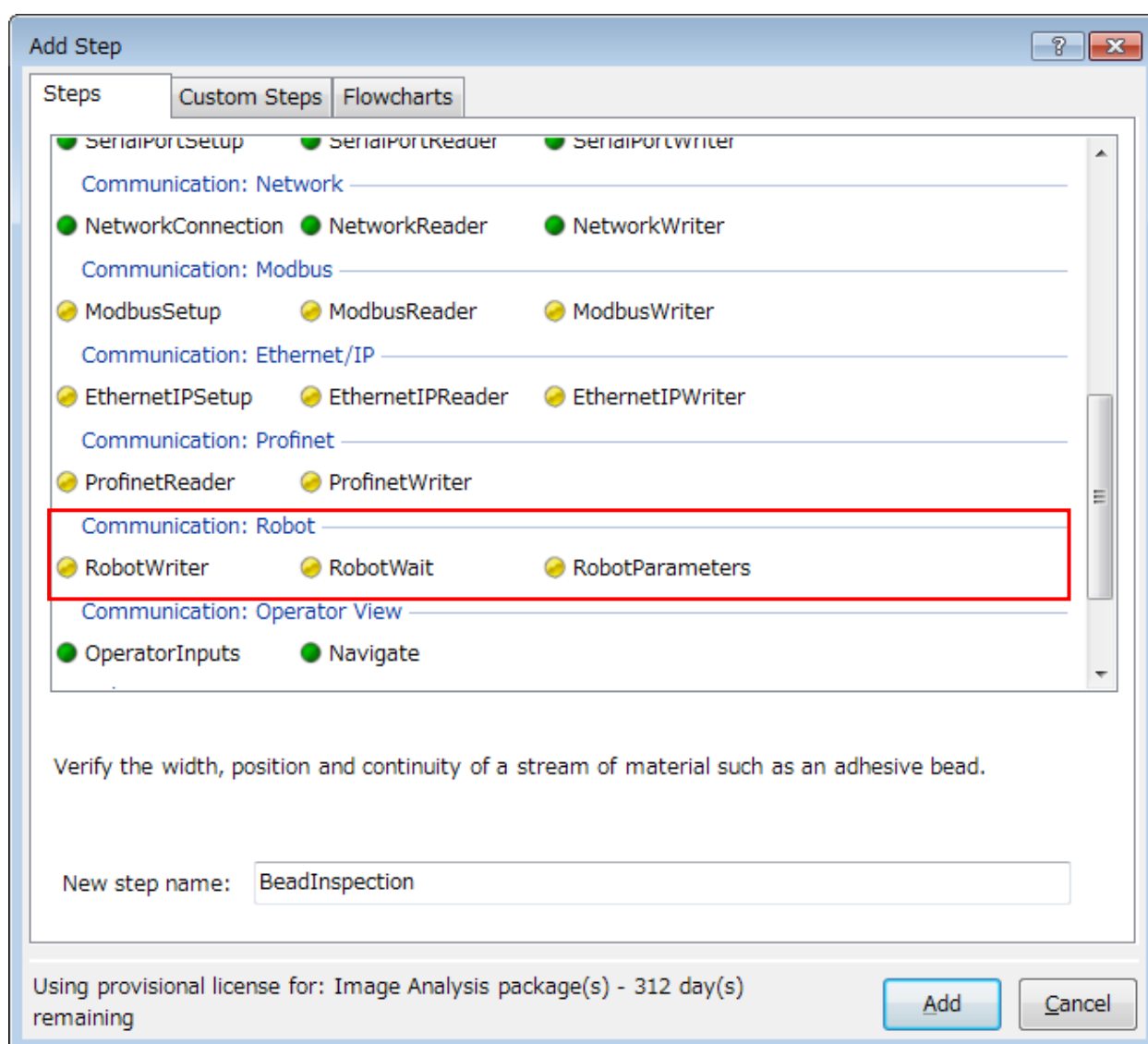


Figure 1-1 Communication: Robot

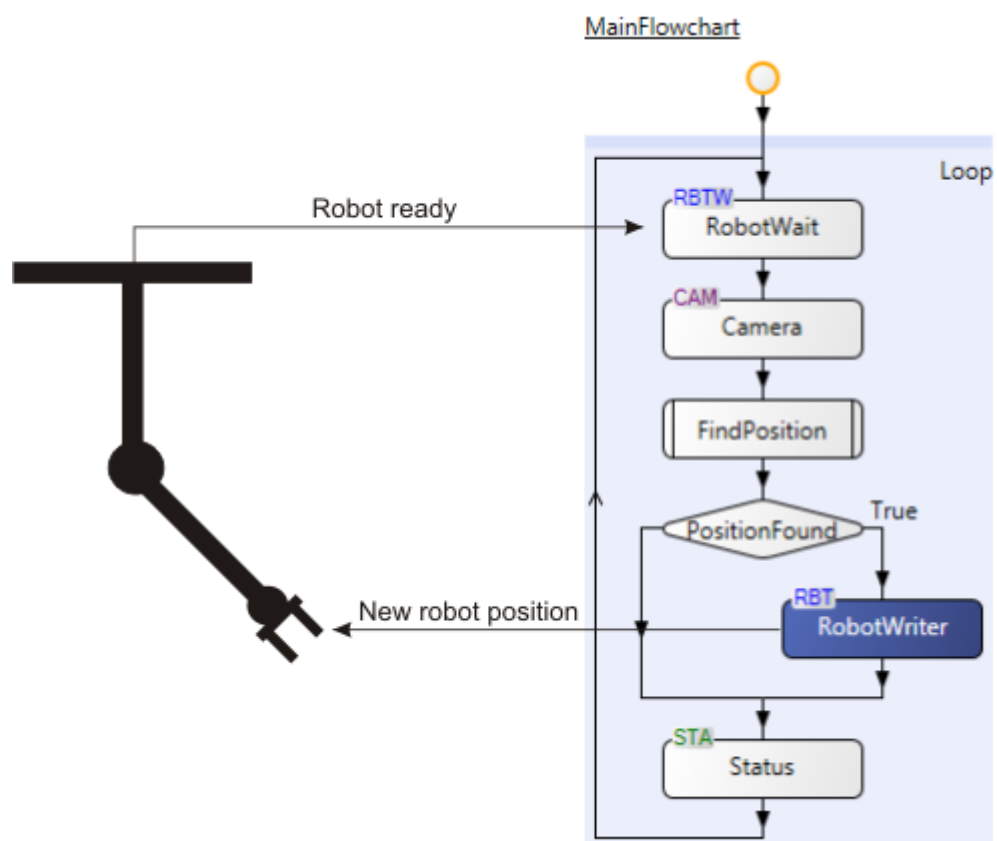


Figure 1-2 Communication overview

2. Outline of provider

2.1. Outline

RobCom provider activates its server at AddController execution. On the Matrox Design Assistant project side, you need to establish a connection with a port number that has been specified by AddController (see Figure 2-1). CaoController::Execute is provided as a way of command execution. For details about each command, refer to Section 2.5.

2.2. Method and property

2.2.1. CaoWorkspace::AddController method

RobCom provider establishes communication connection with communication connection parameters at AddController execution. Specify the timeout period and listening port in option character string. On the Matrox Design Assistant project side, specify a controller port number that is specified by “ConfigureRobots”(see Figure 2-1).

Syntax AddController(<bstrCtrlName:VT_BSTR>,<bstrProvName:VT_BSTR>,
 <bstrPcName:VT_BSTR > [,<bstrOption:VT_BSTR>])

bstrCtrlName : [in] Controller name (given name)

bstrProvName : [in] Provider name. Fixed value =”CaoProv.Matrox.Robcom”

bstrPcName : [in] Machine name where provider operates

bstrOption : [in] Option character string

Table 2-1 shows items specified in option character string

Table 2-1 Option character string of CaoWorkspace::AddController

Option	Description
Timeout[=<Timeout period>]	Specify the timeout period by milliseconds at sending and receiving. (Default: 500)
Port[=<Port number>]	Open a TCP port specified for listening

Example

```
Dim caoCtrl as Object
caoCtrl = cao.AddController("RobCom". "caoProv.Matrox.RobCom". ""'. "timeout=1000. port=2001")
```

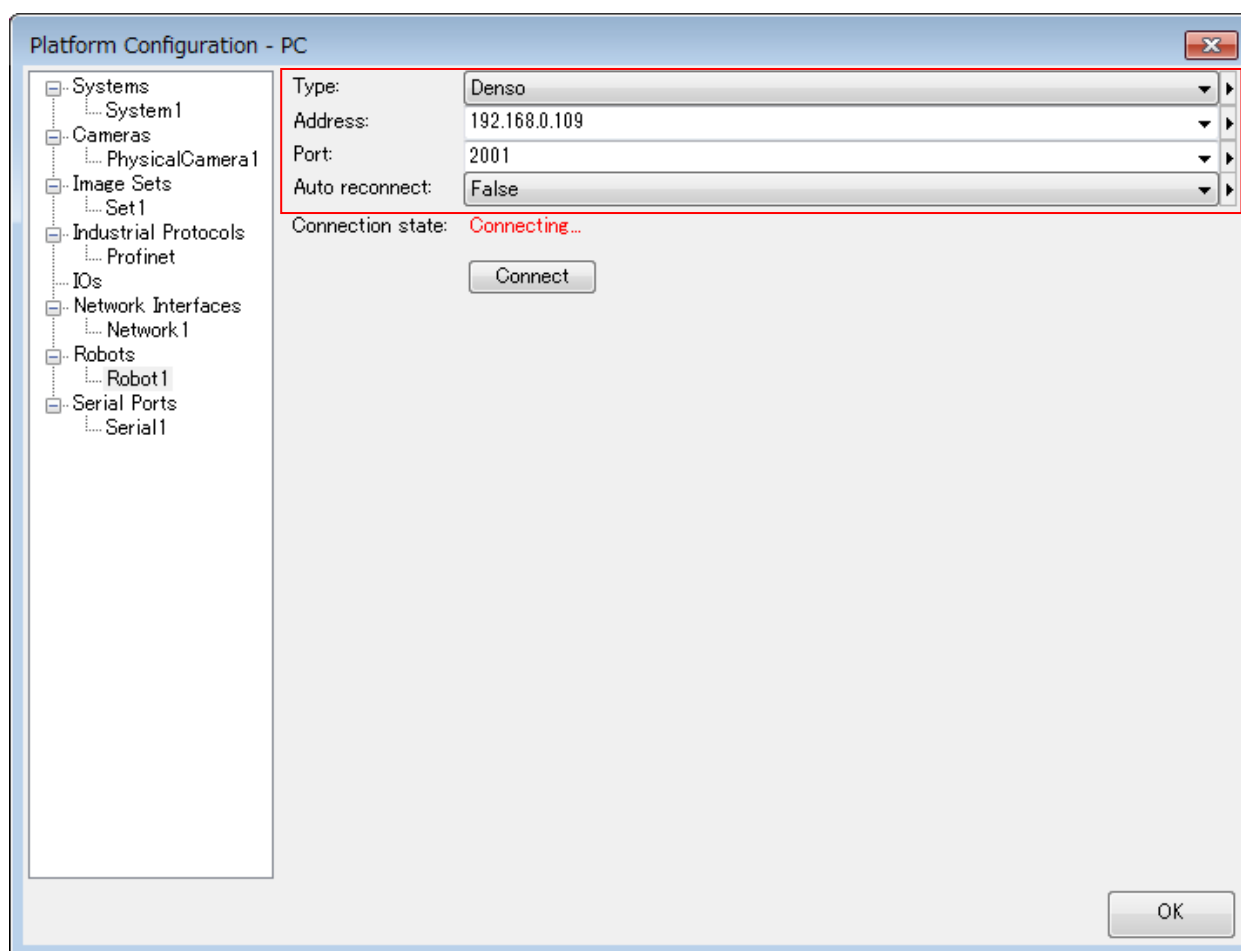


Figure 2-1 Setting window in Matrox Design Assistant

2.2.2. CaoController::Execute method

Send and receive commands from vision system. Specify a command name and command parameter for the first argument and the second argument, respectively. For detail about each command, refer to capture 2.5

Syntax Execute (<bstrCommandName:VT_BSTR>,[<vntParam : VT_VARIANT>])
 bstrCommandName: [in] Command name
 vntParam : [in] Parameter

2.2.3. CaoController::AddVariable method

Create variables to obtain system information. For about available variables, refer to Table 2-2.

Syntax AddVariable(<bstrVariableName:VT_BSTR>,[< bstrOption: VT_BSTR >])

bstrVariableName : [in] Variable name
 bstrOption : [in] Option character string (unused)

Example

```
Dim bstrVal as String
bstrVal = caoCtrl.AddVariable("@VERSION", "")

bstrVal : "1.0.1"
```

2.2.4. CaoVariable::put_value property

At present, variable class does not support put_value property.

2.2.5. CaoVariable::get_value property

You can obtain properties with the format of Table 2-2 Controller class System variable list.

2.3. Variable list

2.3.1. Controller class

Table 2-2 Controller class System variable list

Variable name	Data type	Description	Attribute	
			get	put
@MAKER_NAME	VT_BSTR	Obtain a manufacturer name that have created provider	○	-
@VERSION	VT_BSTR	Obtain version information of provider	○	-
@STATUS	VT_BOOL	Obtain the connection status to vision system. True : Connection is confirmed False: Connection is not confirmed	○	-

2.4. Error Code

In RobCom provider, specific error codes written in Table 2-3 are defined. For about ORiN2 common errors, refer to the error code section on “ORiN2 Programming Guide.”

Table 2-3 Specific error code list

Error name	Error number	Description
------------	--------------	-------------

E_NOCLIENT	0x80100001	Not connected to vision system.
E_CONECTED	0x80100002	Connected to vision system.
E_ROBCOMSTATUS	0x80100003	Vision system returns an error.
E_WINDOWS_MASK	0x8091xxxx	Store an Winsock error code (16bits) in the XXXX part (lower two bites). Example) 10053 (WSAECONNABORTED) Software caused connection abort → 0x80912745

2.5. Command Reference

This section describes each command of CaoController::Execute method.

Table 2-4 CaoController::Execute Command list

RobCom command	Command	Description	
Communication command			
—	SendPos	Send ID and position data to vision system and request it to proceed.	P9
	ReceivePos	Receive position data from vision system.	P10
	SendPositionRequest	Send status, ID and position data to vision system and request it to proceed.	P11
	WaitPositionReply	Receive status, ID and position data from vision system.	P11
	SendCommand	Send communication command data to vision system.	P12
	ReceiveCommand	Receive communication command data from vision system.	P13
Supplemental command			
	DisconnectClient	Disconnect from currently connected vision system.	P14
	IsConnected	Check the connection status to vision system.	P14
	Clear	Clear data that have been received	P14
	SetTimeout	Set timeout period at data reception	P15

2.5.1. Communication command

2.5.1.1. CaoController::Execute(“SendPos”) command

Send position data to vision system and request it to proceed. To receive data from the vision system, use a

ReceivePos command.

Syntax SendPos(<ID >, <Position>)

 <ID > : [in] ID (VT_I4)

 <Position> : [in] Position data (VT_R4 | VT_ARRAY)

 X, Y, Z, Rx, Ry, Rz

 Return value : [out] None

If the connection is not established, E_NOCLIENT will be returned.

Example

```
Dim IID as Long
Dim vntPos as Variant

IID = 1
vntPos = Array(100, 100, 200, 10, 10, 10)
caoCtrl.Execute "SendPos", Array(IID, vntPos)
```

2.5.1.2. CaoController::Execute ("ReceivePos") command

Receive Position data from vision system.

Syntax ReceivePos ()

 Argument : None

 Return value : [out] Position data (VT_R4 | VT_ARRAY)

 X, Y, Z, Rx, Ry, Rz

When the elapsed time passes the value specified by the timeout period, 0x80000900 will be returned. When the Status of RobotWriter is Error, E_ROBCOMSTATUS will be returned.

Example

```
Dim vntPos as Variant

vntPos = caoCtrl.Execute("ReceivePos")
```

2.5.1.3. CaoController::Execute(“SendPositionRequest”) command

This command sends ID, Position data, and Status to the vision system to go on the next step. To receive data from the vision system, use a WaitPositionReply command.

Syntax SendPositionRequest (<Status>, <ID >, <Position>)

 <Status> : [in] Status code (VT_I4)
 0 : M_COM_SUCCESS
 1 : M_COM_ERROR

 <ID > : [in] Object ID (VT_I4)

 <Position> : [in] Position data (VT_R4 | VT_ARRAY)
 X, Y, Z, Rx, Ry, Rz

 Return value : [out] None

If the connection is not established, E_NOCLIENT will be returned.

Example

```

Dim lStatus as Long
Dim lID as Long
Dim vntPos as Variant

lStatus = 0
lID = 1
vntPos = Array(100, 100, 200, 10, 10, 10)
caoCtrl.Execute "SendPositionRequest", Array(lStatus , lID, vntPos)

```

2.5.1.4. CaoController::Execute (“WaitPositionReply”) command

Receive data sent from the vision system

Syntax WaitPositionReply ()

 Argument : None

 Return value : [out] <Status>, <ID>, <Position> (VT_ARRAY | VT_VARIANT)
 <Status> : Status (VT_I4)
 <ID> : Object ID (VT_I4)
 <Position> : Position data (VT_R4 | VT_ARRAY)
 X, Y, Z, Rx, Ry, Rz

When the elapsed time passes the value specified by the timeout period, 0x80000900 will be returned.

Example

```

Dim vntRet as Variant
Dim lStatus as Long
Dim IID as Long
Dim vntPos as Variant

```

```

vntRet = caoCtrl.Execute("WaitPositionReply")
lStatus = vntRet(0)
IID = vntRet(1)
vntPos = vntRet(2)

```

2.5.1.5. CaoController::Execute("SendCommand") command

Send a command to the vision system.

Syntax SendCommand (< OperaCode>, <Status>, <ID>, <Position>)

< OperaCode>	:	[in] Operation code(VT_I4)
		1 : M_COM_ROBOT_FIND_POSITION
< Status>	:	[in] Status(VT_I4)
		0 : M_COM_SUCCESS
		1 : M_COM_ERROR
<ID>	:	[in] ID (VT_I4)
<Position>	:	[in] Position data (VT_R4 VT_ARRAY)
		X, Y, Z, Rx, Ry, Rz
Return value	:	[out] none

Create a command data and then send it to the vision system. To receive the response, use a ReceiveCommand command.

If the connection is not established, E_NOCLIENT will be returned.

Example

```

Dim lOpCode as Long
Dim lStatus as Long
Dim IID as Long
Dim vntPos as Variant

```

```

lOpCode = 1

```

```
lStatus = 0
IID = 1
vntPos = Array(100, 100, 200, 10, 10, 10)
caoCtrl.Execute "SendCommand", Array(lOpCode, lStatus, IID, vntPos)
```

2.5.1.6. CaoController::Execute (“ReceiveCommand”) command

Receive a command response from the vision system.

Syntax ReceiveCommand ()

Argument	: None
Return value	: [out] <OperaCode>, <Status>, <ID>, <Position> (VT_ARRAY VT_VARIANT) <OperaCode> : Operation code (VT_I4) 2 : M_COM_ROBOT_FIND_POSITION_RESULT <Status> : Status (VT_I4) 0 : M_COM_SUCCESS 1 : M_COM_ERROR <ID> : Object ID (VT_I4) <Position> : Position data (VT_R4 VT_ARRAY) X, Y, Z, Rx, Ry, Rz

When the elapsed time passes the value specified by the timeout period, 0x80000900 will be returned.

Example

```
Dim vntRet as Variant
Dim lOperaCode as Long
Dim lStatus as Long
Dim IID as Long
Dim vntPos as Variant

vntRet = caoCtrl.Execute("ReceiveCommand")
lOperaCode = vntRet(0)
lStatus = vntRet(1)
IID = vntRet(2)
vntPos = vntRet(3)
```

2.5.2. Supplemental command

2.5.2.1. CaoController::Execute ("DisconnectClient") command

Disconnect from currently connected vision system.

Syntax DisconnectClient()

Argument : none

Return value : none

Example

```
caoCtrl.Execute "DisconnectClient"
```

2.5.2.2. CaoController::Execute ("IsConnected") command

Check the connection status to vision system.

Syntax IsConnected ()

Argument : none

Return value : [out] Connection status (VT_BOOL)
TRUE : Connection is confirmed
FALSE : Connection is not confirmed

Example

```
Dim lVal as Long  
lVal = caoCtrl.Execute("IsConnected")
```

2.5.2.3. CaoController::Execute ("Clear") command

Clear data that have been received

Syntax Clear

Argument : none

Return value : none

Example

```
Call caoCtrl.Execute("Clear")
```

2.5.2.4. CaoController::Execute ("SetTimeout") command

Change the timeout period

Syntax SetTimeout (<Timeout>)

Timeout : [in] Timeout period msec (VT_I4)

Return value : none

Example

Call caoCtrl.Execute("SetTimeout", 1000)

3. Sample program

The following shows a sample program written with RC8 Pacscript..

```
'!TITLE "MatroxRobComSample"

#include <Variant.h>

Sub Main
  Dim caoCtrl as Object

  ' socket bind (Port=PortNumber)
  caoCtrl = cao.AddController("RobCom", "CaoProv.Matrox.RobCom", "", "Port=2001,
timeout=6000")

  Do
    ' Wait for Connection
    if caoCtrl.IsConnected Then
      Exit Do
    End if
    delay 100
  Loop

  ' Send Position and Request
  caoCtrl.SendPos 1, VarChangeType(CurPos, VT_R8 + VT_ARRAY)

  ' Get Position
  P11 = caoCtrl.ReceivePos

  ' Disconnect Client
  caoCtrl.DisconnectClient

  ' Close
  cao.Controllers.Remove caoCtrl.Index
  caoCtrl = Nothing
End Sub
```

4. Tips

4.1. About Communication Command

RobCom provider equips three types of communication commands designed to communicate with vision system's project created by DA.

4.1.1. SendPos and ReceivePos

This program will obtain a workpiece's position data that has been found by the vision system. If you set the Status of the RobotWriter becoming "Error" when a workpiece is not found, the ReceivePos will return "E_ROBCOMSTATUS". In that case, do the error processing with an OnError statement or others.

```
'!TITLE "MatroxRobComSample"

#include <Variant.h>

Sub Main
    On Error Goto ErrorProc
    Dim caoCtrl as Object

    ' socket bind (Port=PortNumber)
    caoCtrl = cao.AddController("RobCom", "CaoProv.Matrox.RobCom", "", "Port=2001,
timeout=6000")

Connect:
    Do
        ' Wait for Connection
        if caoCtrl.IsConnected Then
            Exit Do
        End if
        delay 100
    Loop

SendAndRecieve:
    Do
        ' Send Position and Request
        caoCtrl.SendPos 1, VarChangeType(CurPos, VT_R8 + VT_ARRAY)
    Recieve:
        ' Get Position
        P11 = caoCtrl.ReceivePos
    Loop
    Exit Sub

ErrorProc:
    On Error Goto ErrorProc
    PrintDbg "Error:" & HEX(Err.OriginalNumber)

    ' Work not found
    If (Err.OriginalNumber = &H80100003) Then
        Goto SendAndRecieve
    ' Timeout
    ElseIf (Err.OriginalNumber = &H80000900) Then
        Goto Recieve
    ' Error
    Else
        caoCtrl.DisconnectClient
        Goto Connect
    End If
```

End Sub

4.1.2. SendPositionRequest and WaitPositionReply

This program will obtain not only the position data but also ID and Status of a workpiece that have been found by the vision system at the same time. Status provided by DA's RobotWriter will be stored in the return values of WaitPositionReply. Therefore, E_ROBCOMSTATUS will not be returned at an error occurrence.

```

' !TITLE "MatroxRobComSample"

#include < Variant.h >

Sub Main
    On Error GoTo ErrorProc
    Dim caoCtrl As Object
    Dim vntRet as Variant

    ' socket bind (Port=PortNumber)
    caoCtrl = Cao.AddController( "RobCom", "CaoProv.Matrox.RobCom", "", "Port=2001,
timeout=6000" )

    Connect:
    Do
        ' Wait for Connection
        If caoCtrl.IsConnected Then
            Exit Do
        End If
        Delay 100
    Loop

    SendAndRecieve:
    Do
        ' Send Position and Request
        caoCtrl.SendPositionRequest 0, 1, VarChangeType( CurPos, VT_R8 + VT_ARRAY )

    Recieve:
        ' Get Position
        vntRet = caoCtrl.WaitPositionReply
        I11 = vntRet(0)    ' Status
        I12 = vntRet(1)    ' ID
        P11 = vntRet(2)    ' Position

    Loop
    Exit Sub

    ErrorProc:
    On Error GoTo ErrorProc
    PrintDbg "Error:" & Hex( Err.OriginalNumber )

    ' Work not found
    If ( Err.OriginalNumber = &H80000900 ) Then
        GoTo Recieve
    ' Error
    Else
        caoCtrl.DisconnectClient
        GoTo Connect
    End If

End Sub

```

4.1.3. SendCommand and ReceiveCommand

This program enables to send a given command to the vision system. Use this program when a new command is specified in DA.

```

' !TITLE "MatroxRobComSample"

#include < Variant.h >

Sub Main
    On Error GoTo ErrorProc
    Dim caoCtrl As Object
    Dim vntRet as Variant

    ' socket bind (Port=PortNumber)
    caoCtrl = Cao.AddController( "RobCom", "CaoProv.Matrox.RobCom", "", "Port=2001,
timeout=6000" )

Connect:
    Do
        ' Wait for Connection
        If caoCtrl.IsConnected Then
            Exit Do
        End If
        Delay 100
    Loop

SendAndRecieve:
    Do
        ' Send Command
        caoCtrl.SendCommand 1, 0, 1, VarChangeType( CurPos, VT_R8 + VT_ARRAY )

Recieve:
        ' Get Command reply
        vntRet = caoCtrl.ReceiveCommand
        I10 = vntRet(0) ' OperaCode
        I11 = vntRet(1) ' Status
        I12 = vntRet(2) ' ID
        P11 = vntRet(3) ' Position

    Loop
    Exit Sub

ErrorProc:
    On Error GoTo ErrorProc
    PrintDbg "Error:" & Hex( Err.OriginalNumber )

    ' Work not found
    If ( Err.OriginalNumber = &H80000900 ) Then
        GoTo Recieve
    ' Error
    Else
        caoCtrl.DisconnectClient
        GoTo Connect
    End If

End Sub

```
