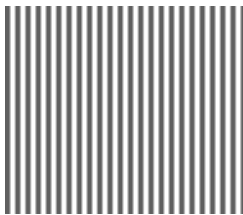


CHINO

AL 3000/AH 3000
BR 1000 SERIES

**ETHERNET
COMMUNICATION
INTERFACE**

 **INSTRUCTIONS**

CHINO

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Preface

This instruction manual explains the specifications and instructions of the Ethernet communications interface for AL3000 series hybrid recorders, AH3000 hybrid recorders, BR1000 series graphic recorders.
For using this interface safely and preventing any troubles, make sure to read this instruction manual before operation.

1. Referred to other manual

This instruction manual only explains the Ethernet communications interface. For the operations of the instruments to be networked and MODBUS communications, refer to the following separate manuals.

AL3000/AH3000



- 1) AL3000/AH3000 SERIES (PEN TYPE) HYBRID RECORDER (INST.No.INE-308B)
- 2) AL3000/AH3000 SERIES (MULTI-POINT TYPE) HYBRID RECORDER COMMUNICATIONS INTERFACES (INST.No.INE-272)

BR1000 SERIES

- 1) BR1000 SERIES GRAPHIC RECORDER (INST.No.INE-273)
- 2) BR1000 SERIES GRAPHIC RECORDER COMMUNICATION INTERFACES (INST.No.INE-300)

2. Symbols in This Manual

The cautions to be observed for preventing the damage and unexpected accidents of this interface are sorted by the following symbols according to their importance degrees for enabling operators to use this interface safely.

 Remarks	This symbol shows a caution when the instrument does not function as specified or when such a possibility exists.
 Reference	This reference serves as a supplement for handling and operation, and it may be convenient for the user.

Windows is a registered trademark of Microsoft Corporation, USA.
Other brands and product names are trademarks or registered trademarks of their respective holders.

1 Outline

By connecting the Ethernet communications interface (Ethernet IF) for AL3000 series hybrid recorders, AH3000 series hybrid recorders, BR1000 series graphic recorders with Local Area Network (LAN) configured by Ethernet (10BASE-T), you can browse real time data of the networked instruments and set up their parameters (partly) by using the WWW browser on your personal computer (PC) connected with the LAN. Also, you can execute data acquisition by using our software package KIDS or parameter settings by PASS.

Note: Any clients whose network is different cannot access to this network.

2 Function

2.1 Protocol configuration

The protocols of MODBUS, HTTP, TCP, and IP are available in this Ethernet software. These protocols have the relation shown in the right figure. In these protocols, you can exactly use the protocols of MODBUS and HTTP that have the following functions.

MODBUS	HTTP
TCP	
IP	
Ethernet 10BASE-T	

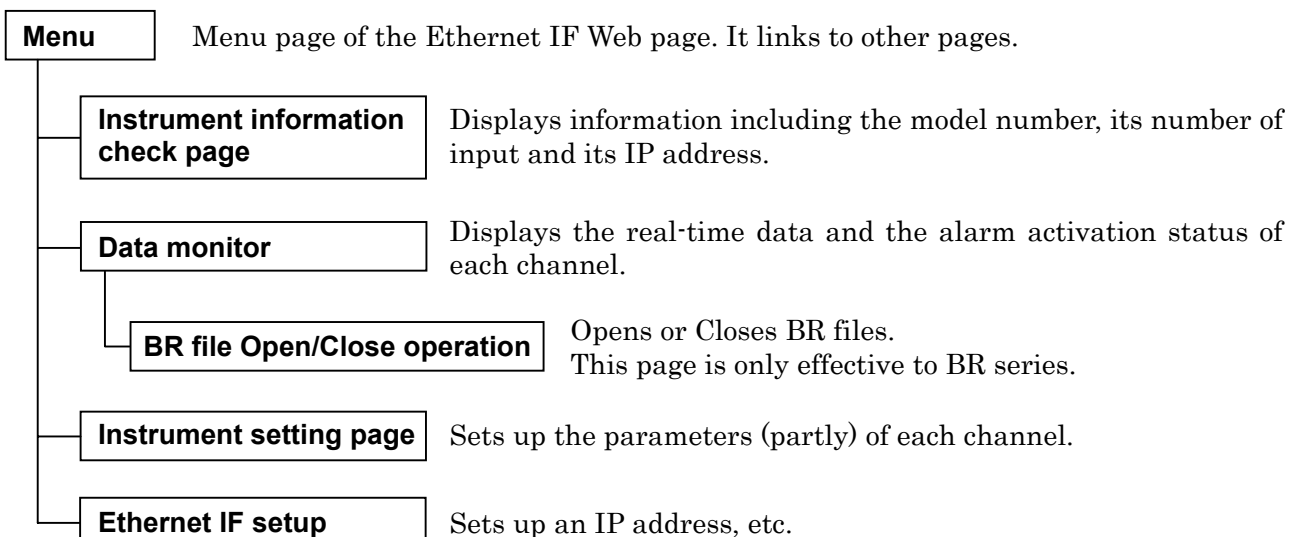
1) MODBUS(one client)

For data acquisition of the networked instruments by our software package KIDS, setting up of their parameters by PASS, and communications with the networked instruments by custom-made application software.

2) HTTP (five clients)

For browsing of the Ethernet IF Web pages by WWW browsers (Internet Explorer, etc.)

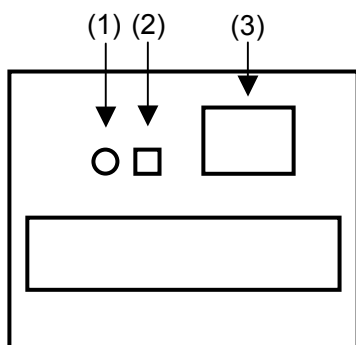
2.2 Ethernet IF Web page



3 Explanation of each part

Ethernet IF consists of one connector, one LED, and one push button switch.

BR/AL/AH



The following functions are commonly available in the Ethernet IFs for BR1000/AL3000/AH3000.

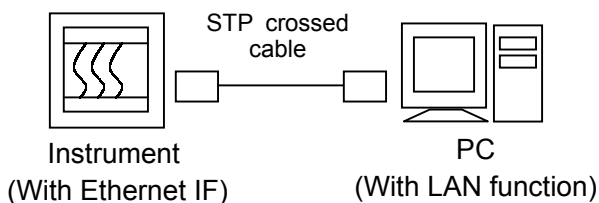
- (1) LINK lamp: Lights when the Ethernet IF is electrically connected with your PC or a hub.
- (2) RST switch: Reset switch for restarting the Ethernet IF (Re-connection takes 1 or 2 minutes.)
- (3) RJ-45 connector: For connection to a LAN cable (Be sure to use a shielded twisted-pair cable (STP).)

4 Wirings

4.1 Wirings

4.1.1 Connection with PC by 1 to 1

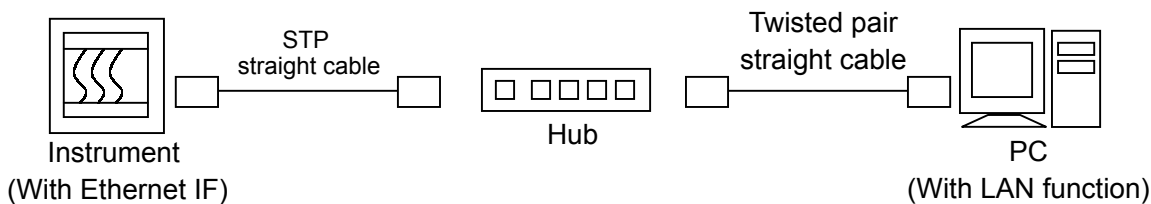
For the connection of the Ethernet IF with a PC by 1 to 1, a crossed STP is to be used.



4.1.2 Connection with PC by N to N

(For connection with multiple units or with an existing LAN)

For the connection of multiple PCs or Ethernet IFs, use a hub and a straight STP to connect the hub to the Ethernet IF.

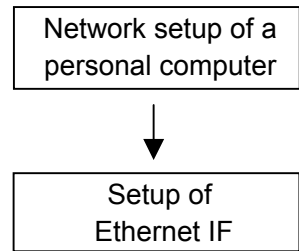


Remarks

Be sure to use a shielded twisted-pair cable (STP) for connection.

5 Initial settings

For the Ethernet IF, assign suitable IP addresses for the both the PC and the Ethernet IF. Change the IP address of the Ethernet IF in the Web page by the PC with the LAN function and with WWW browser preinstalled.



5.1 Checking the LAN function of your PC

The following procedure is for checking if the LAN board (card) attached to your PC is correctly installed and also for checking if the communications by using TCP/IP enables.

5.1.1 Procedure for checking if the LAN board (card) is correctly installed in your PC

The setting items and method are slightly different depending on your OS. The following example is the procedure based on Windows 98.

- (1) Click the [Start] button, point to [Settings], and then click [Control Panel].
- (2) Double-click [System].
- (3) Click the "Device Manager" tab in the System Properties dialog box, click "View devices by type", and then double-click "Network adapters" of the tree view.
- (4) Check the network adapter list if the LAN board (card) that you want to use is listed. If not listed, install the LAN board (card) by referring its instruction manual.
If it is listed but the mark "x" or "!" is added to its icon, the LAN board (card) is abnormally working. Take necessary measures for the correct working by referring the instruction manual for the LAN board (card).

5.1.2 Procedure of checking if TCP/IP is enabled

- (1) Click the [Start] button, point to [Settings], and then click [Control Panel]
- (2) Double-click [Network].
- (3) Check that the "TCP/IP-> (the network adapter name to use)" is listed in the list of "The following components are installed" in the "Configuration" tab. If not listed, click [Add], select "Microsoft" as "Manufacturers", select "TCP/IP" as "Network protocol", and then click [OK].
- (4) When the CD-ROM of Windows is requested, follow the instructions on your screen.
The dialog box for requesting re-starting will appear. Re-start your PC by clicking OK.

5.2 Network settings of your PC

The default IP address and subnet mask of the Ethernet IF are:

IP address: 192.168.254.254

Subnet mask: 255.255.255.0

For the communications with the Ethernet IF, set up the IP address and the subnet mask of your PC as follows: (Communications beyond a router not possible)

IP address: One address in the range from 192.168.254.1 to 192.168.254.253

Subnet mask: 255.255.255.0

Remarks

If your PC has been networked with the existing LAN and its network settings should be changed for the settings of the Ethernet IF, contact your network administrator for preventing any trouble by the change of the network settings.

The following procedures are for setting up the network of your PC.

- (1) Click the [Start] button, point to [Settings], and then click [Control Panel].
- (2) Double-click [Network].
- (3) Click the "Configuration" tab, click "TCP/IP-> (the network adapter name to use)" in "The following components are installed", and then click [Property].
- (4) Click "IP Address" tab in the TCP/IP Properties dialog box, click [Specify an IP address], and then type an IP Address and a Subnet Mask.
- (5) Click OK in the TCP/IP Properties dialog box, and then click OK in "Network".

When the CD-ROM of Windows is requested, follow the instructions on your screen.

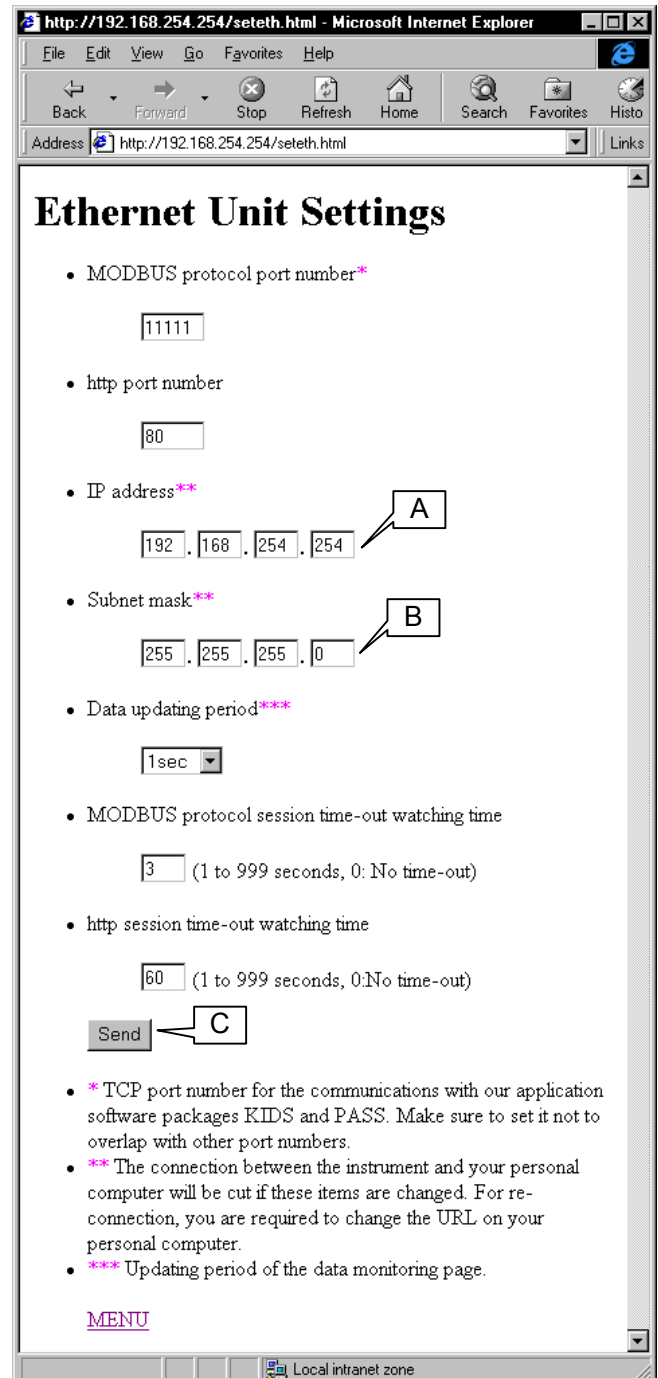
The dialog box for requesting re-starting will appear. Re-start your PC by clicking OK.

5.3 Settings of Ethernet IF

Set up the Ethernet IF, with the following procedures, by using your PC of which settings have been changed in the paragraph 5.2.

- (1) Connect the Ethernet IF and your PC as shown in the paragraph 4.1.
- (2) Turn on the power supply of the networked instruments. (It takes 1 to 2 minutes for communications. Communications with networked instruments having many channels require longer time.)
- (3) Open a Web browser (Internet Explorer, etc.) installed in your PC, type http://192.168.254.254/ in the Address, and press [Enter] key.
- (4) Click [Ethernet Unit Settings] in the Menu.
- (5) "Ethernet Unit Settings" page (right figure) appears.
- (6) In this page, set up an IP address (A in the figure) and a subnet mask (B in the figure) of the Ethernet IF, and then click [Send] (C in the figure).
- (7) When the settings are correct, "Accepted" will appear. It takes 1 to 2 minutes for communications after the settings.
If the settings are not correct, "Error" or "Invalid data" will appear. Correct the settings.

Set up an IP address and a Subnet mask corresponding to the network with which the Ethernet IF is connected. If you connect the Ethernet IF with the existing network, contact your network administrator for setting up an appropriate IP address and a subnet mask.



6 Operation

The Ethernet IF has the functions of MODBUS (one client) and HTTP (five clients). You can use both simultaneously if the number of the client is within the specified ones.

6.1 MODBUS

This protocol is for the communications with our software packages KIDS and PASS. It communicates with the networked instruments by transmitting the MODBUS commands as data of TCP. By creating application software newly, the parameters of the networked instruments can be changed or data can also be acquired. Refer to the sample program shown in Appendix 2.

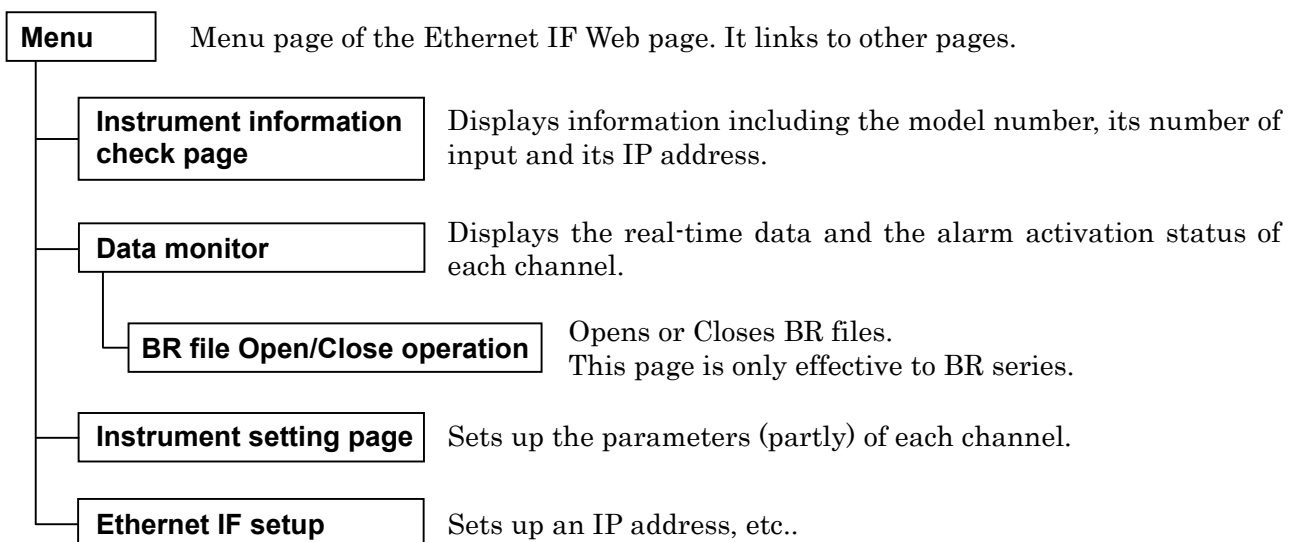
For the specifications of the MODBUS commands used in our products, refer to the separate instruction manual for the communications interface of the instruments networked.

6.2 HTTP

This protocol is for browsing real time data and setting up parameters (partly) of the networked instruments by accessing to the Ethernet IF Web page with a WWW browser (Internet Explorer, etc.).

6.2.1 Configuration of Ethernet IF Web page

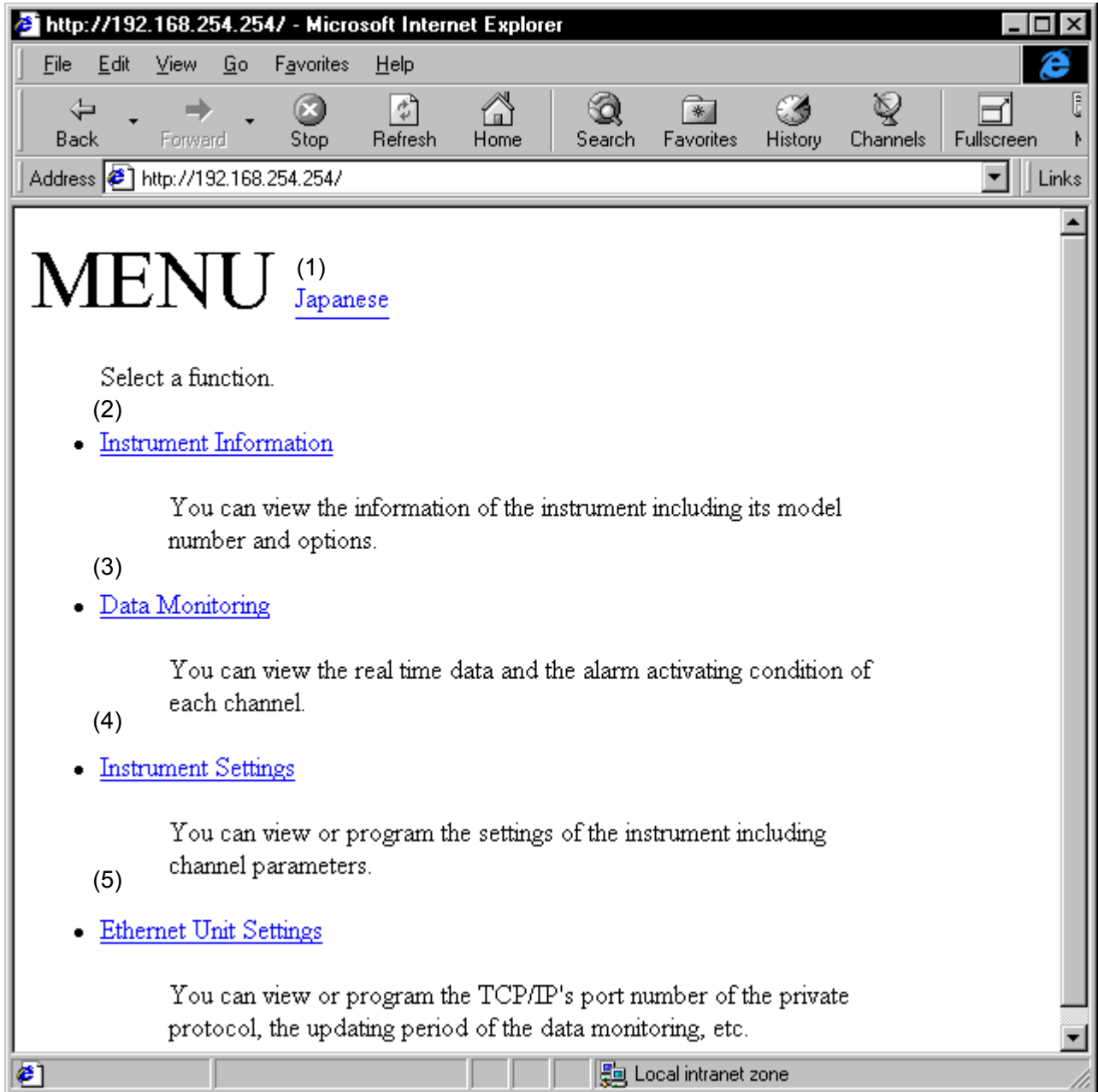
The configuration of the Ethernet IF Web page is as follows.



* Each page has an English page and a Japanese page.

6.2.2 MENU page

Page configuration:



Instructions:

	Name	Function
(1)	Japanese	Jumps to the Japanese "MENU" page.
(2)	Instrument Information	Jumps to the English "Instrument information" page.
(3)	Data Monitoring	Jumps to the English "Data Monitoring" page.
(4)	Instrument Settings	Jumps to the English "Instrument Settings" page.
(5)	Ethernet Unit Settings	Jumps to the English "Ethernet Unit Settings" (Ethernet IF setting) page.

6.2.3 Instrument Information page

Page configuration: The following is for BR series graphic recorders. Items may be different depending on models.

Item	Value
(1) Model	BR17A2
(2) ROM version	V201
(3) Number of input point	6
(4) Number of alarm output point	6
(5) Remote contact	None
(6) Communications 1	Ethernet
(7) Communications 2	RS485
(8) Option 1	NO
(9) Option 2	YES
(10) Option 3	NO
(11) IP address	192.168.254.254
(12) Subnet mask	255.255.255.0
(13) MAC address	00.04.99.00.00.03
(14) MODBUS protocol port number	11111
(15) http port number	80
(16) Data updating period	1sec

[MENU \(17\)](#)

Instructions:

	Name	Function
(1)	Model	Model number of instrument (networked)
(2)	ROM version	ROM version number of instrument (networked)
(3)	Number of input point	Number of input point of instrument (networked)
(4)	Number of alarm output point	Number of alarm output of instrument (networked)
(5)	Remote contact	Displays the remote contact (option) is added (Available) or not (None) to instrument (networked).
(6)	Communications 1	Communications type as slave (Ethernet fixed)
(7)	Communications 2	Communications type as master (BR series only)
(8)-(10)	Option 1 to 3	Displays an option is added (YES) or not (NO) to instrument (networked). (These contents differ depending on models.)
(11)	IP address	IP address of Ethernet IF. Change the settings in the "Ethernet Unit Settings" (Ethernet IF settings) page.
(12)	Subnet mask	Subnet mask of Ethernet Change the settings in the "Ethernet Unit Settings" (Ethernet IF settings) page.
(13)	MAC address	MAC address of Ethernet IF Setting change is disabled.
(14)	MODBUS protocol port number	Number for communications using MODBUS Change the settings in the "Ethernet Unit Settings" (Ethernet IF settings) page.
(15)	http port number	Number for using http (usually 80.) Change the settings in the "Ethernet Unit Settings" (Ethernet IF settings) page.
(16)	Data updating period	Data updating period in the "Data Monitoring" page Change the settings in the "Ethernet Unit Settings" (Ethernet IF settings) page.
(17)	Menu	Jumps to the "MENU" page.

6.2.4 Data Monitoring page

Page configuration:

(1)
Model: BR17A2

(2) (3) (4)

CH No.	Data	Alarm	CH No.	Data	Alarm	CH No.	Data	Alarm
Ch1	28.5	----	Ch13	0	----	Ch25	0	----
Ch2	28.6	----	Ch14	0	----	Ch26	0	----
Ch3	28.7	----	Ch15	0	----	Ch27	0	----
Ch4	28.8	----	Ch16	0	----	Ch28	0	----
Ch5	28.8	----	Ch17	0	----	Ch29	0	----
Ch6	28.7	----	Ch18	0	----	Ch30	0	----
Ch7	0	----	Ch19	0	----			
Ch8	0	----	Ch20	0	----			
Ch9	0	----	Ch21	0	----			
Ch10	0	----	Ch22	0	----			
Ch11	0	----	Ch23	0	----			
Ch12	0	----	Ch24	0	----			

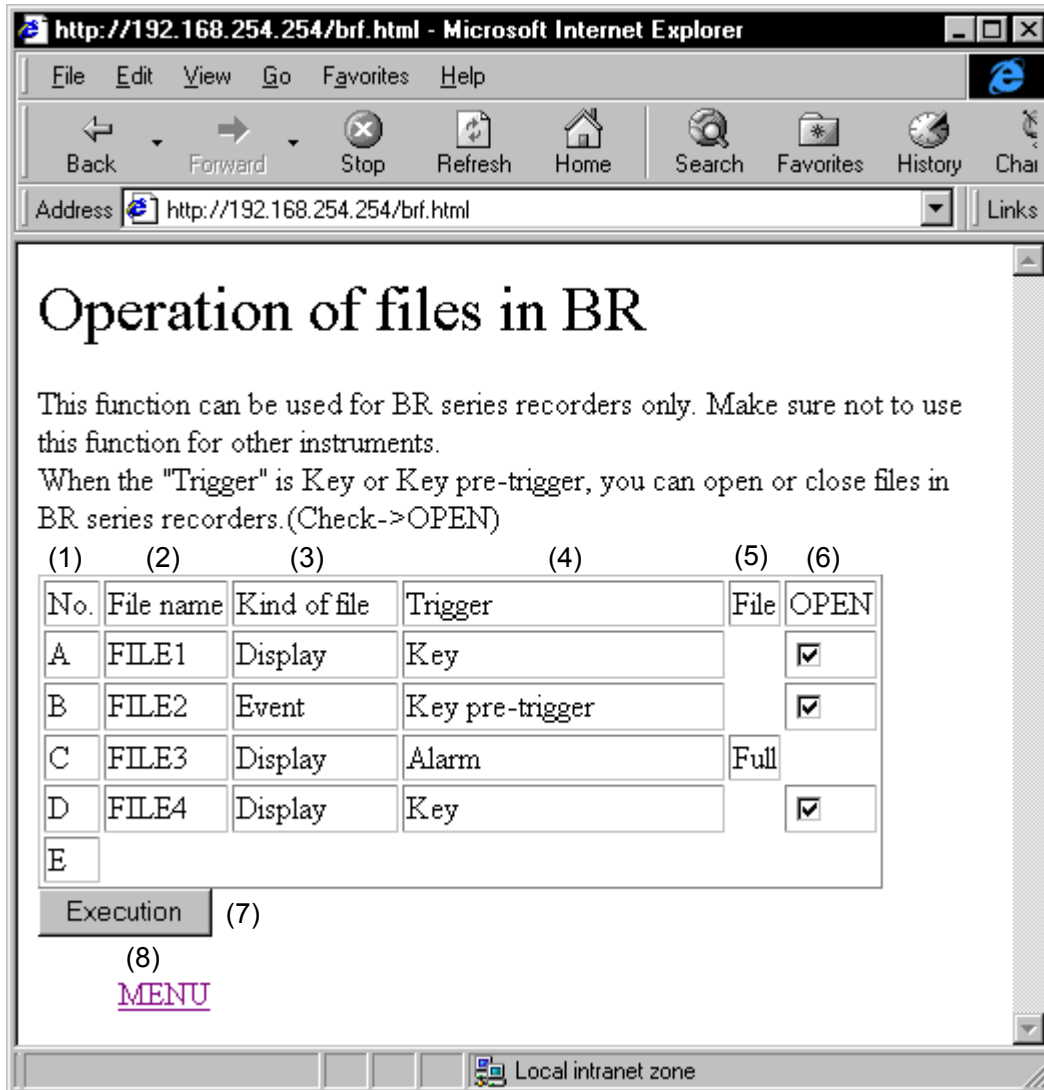
(5) (6)
[MENU](#) | [BR file open](#)

Instructions:

	Name	Function
(1)	Model	Model number of instrument (networked)
(2)	CH No.	Channel number Number of channels differs depending on specifications of instrument (networked).
(3)	Data	Real-time data Change the data updating period in the “Ethernet Unit Settings” (Ethernet IF settings) page.
(4)	Alarm	Alarm activating status
(5)	Menu	Jumps to the MENU page.
(6)	BR file open	Jumps to the “Operation of files in BR” page (Open/Close operation of BR files). (BR series only)

6.2.5 Operation of files in BR page

Page configuration: This page is available for BR series only.



Instructions:

	Name	Function
(1)	No.	File number
(2)	File name	File name
(3)	Kind of file	Kind of file
(4)	Trigger	Starting trigger type of file
(5)	File	Displays the file operation is enabled or disabled. If enabled, nothing appears. If disabled, "Full" appears. Operation is disabled when a starting trigger is other than "Key" or "Key pre-trigger" or when the memory allocated to the file is full (100% used).
(6)	OPEN	Displays open or close status of a file Box checked -- Open (storing) Box unchecked -- Close (standing by for storage) In addition, by clicking Execution button after you check or uncheck the box, the file open/close operation can be executed.
(7)	Execution	Execution of the file operation in (6)
(8)	Menu	Jumps to the MENU page.

6.2.6 Instrument Settings page

Page configuration:

Instrument Settings

(1) [MENU](#)

Channel settings Choose a channel for setting

(2) No.	(3) Input	(4) Input range		(5) Scale		(6) Alarm 1				(7) Alarm 2		
		Min. value	Max. value	Min. value	Max. value	Type	Alarm point	Ref. CH	Sample count	Type	Alarm point	Ref. CE
CH01	K	-200.0	300.0	-200.0	300.0	None				None		
CH02	K	-200.0	300.0	-200.0	300.0	None				None		
CH03	K	-200.0	300.0	-200.0	300.0	None				None		
CH04	K	-200.0	300.0	-200.0	300.0	None				None		
CH05	K	-200.0	300.0	-200.0	300.0	None				None		

(12) No.	(13) Input	(14) Input range		(15) Scale		(16) Alarm 1				(17)	(18)	(19)	(20)	(21)
		Min. value	Max. value	Min. value	Max. value	Type	Alarm point	Ref. CH	Sample count					
CH1	K	-200.0	300.	-200.0	300.0	None		None						

Send (22)

Local intranet zone

Instructions:

This page is vertically separated by a frame. The upper side of the frame is for selecting a channel that you want to view or change its parameters, but you cannot change the parameters here. Use the lower side of the frame for changing the parameters and transmitting the changed parameters.

	Name	Function
(1)	Menu	Jumps to the MENU page.
(2)	No.	Channel number By clicking a channel number button, the lower side of the frame displays its parameters for changing.
(3)	Input	Input type (range number) of channel
(4)(5)	Input range-Min.(Max.) value	Minimum (maximum) value of range
(6)(7)	Scale- Min.(Max.) value	Minimum (maximum) value of scale
(8)	Alarm 1 - Type	Alarm type
(9)	Alarm 1 - Alarm point	Alarm setpoint
(10)	Alarm 1 - Ref. CH	Reference channel for differential alarm
(11)	Alarm 1 - Sample count	Number of samples for rate-of-change alarm
(12)-(21)	No. to Alarm 1 - Sample count	Parameters of the channel selected in the upper side of the frame are displayed for changing.
(22)	Send	Transmits the changed parameters to instrument (networked). When the correct parameters are transmitted, "Accepted" will appear. For continuous settings, click "Return" button to return to the "Instrument Settings" page. When incorrect parameters are transmitted, "Error" will appear displayed. Correct and retransmit the parameters.

4 sets of alarm [1 set is consisted of 4 items from (8) to (11)] can be displayed and set up.

The setting ranges of the above parameters are different depending on models. Refer to the separate instruction manual for each model.

Rough indication of setting ranges

	Setting item	Setting range
(14)(15)	Input range-Min.(Max.) value	Setting range: -9999 to 30000
(16)(17)	Scale- Min.(Max.) value	Setting range: -9999 to 30000
(18)	Alarm1-Type	None: No setting, H: High alarm, L: Low alarm, U: Increase rate-of change alarm, D: Decrease rate-of-change alarm, B: Differential high alarm, S: Differential low alarm
(19)	Alarm1-Alarm point	Setting range: -9999 to 30000 Its decimal point position can be arranged to the decimal point position of scale.

6.2.7 Ethernet Unit Settings page

Page configuration:

Ethernet Unit Settings

- MODBUS protocol port number*
(1)
- http port number
(2)
- IP address**
(3) . . .
- Subnet mask**
(4) . . .
- Data updating period***
(5)
- MODBUS protocol session time-out watching time
(6) (1 to 999 seconds, 0: No time-out)
- http session time-out watching time
(7) (1 to 999 seconds, 0: No time-out)

(8)

- * TCP port number for the communications with our application software packages KIDS and PASS. Make sure to set it not to overlap with other port numbers.
- ** The connection between the instrument and your personal computer will be cut if these items are changed. For re-connection, you are required to change the URL on your personal computer.
- *** Updating period of the data monitoring page.

(9)
[MENU](#)

Local intranet zone

Each part explanation:

	Name	Function
(1)	MODBUS protocol port number	Setting of MODBUS protocol port number This number is for communication with KIDS and PASS via Ethernet. The default value is "11111." Set up it not to overlap an application using other Ethernet. Contact your network administrator.
(2)	http port number	Setting of http port number As the port number "80" is used worldwide for http used to display a Web page, you do not need to change it usually.
(3)	IP address	Setting of IP address of Ethernet IF Set up it not to overlap other units (PC, etc.). If you connect the Ethernet IF with the existing network, contact your network administrator
(4)	Subnet mask	Setting of subnet mask of Ethernet IF If you connect the Ethernet IF with the existing network, contact your network administrator.
(5)	Data updating period	Selection of data updating period in the "Data Monitoring" page
(6)	MODBUS protocol session time-out watching time	Time setting of MODBUS communications time-out If MODBUS communications is not executed within this time, the session of MODBUS will be closed automatically. Even if the session is not closed by abnormal shutdown of your PC during MODBUS communications or other reasons, the session will be closed after its time.
(7)	http protocol session time-out watching time	Time setting of http time-out If http communications is not executed within this time, the session of http will be closed automatically. Even if the session is not closed by abnormal shutdown of your PC during http communications or other reasons, the session will be closed after its time.
(8)	Send	Transmits the changed parameters to Ethernet IF. When the correct parameters are transmitted, "Accepted" will appear. It takes 1 to 2 minutes for communications after the settings. If the incorrect settings are transmitted, "Error" or "Invalid data" will appear. Correct and retransmit the settings.
(9)	Menu	Jumps to the MENU page.

You do not need to set up (6) and (7) usually. If communications error happens frequently, adjust these values.

Appendix 1 Glossary

10BASE-T

One of several physical media for Ethernet LANs
Unshielded twisted pair cables are used.

WWW browser

Software program for viewing files in HTML or other formats as Web pages and doing Internet related tasks

Web page

Files in HTML or other formats being viewed in the WWW browser

HTTP (Hypertext Transfer Protocol)

Protocol for transmitting the data of WWW

TCP (Transmission Control Protocol)

IP (Internet Protocol)

Protocol

Rules that computers use to communicate with each other
In other words, it is a language used by computers to communicate with other computers.

Client

Computer or software program receiving services on a network
The contrary is a server.

Custom-made application software

Application software programs created independently

Link

Text or image within a Web page that points to another Web page

Frame

Frame for dividing the WWW browser window
Each divided frame independently views a different Web page.

Appendix 2 Sample program

The following is a sample program by using MODBUS communications. This program is for reading and displaying data from networked instruments at a specified interval.

Development environment

Visual Basic 6.0

Function

[Start] button – For reading data from networked instruments at the interval set by the timer

[Stop] button – For stopping communications

Close “x” button in the upper-right – For quitting the software

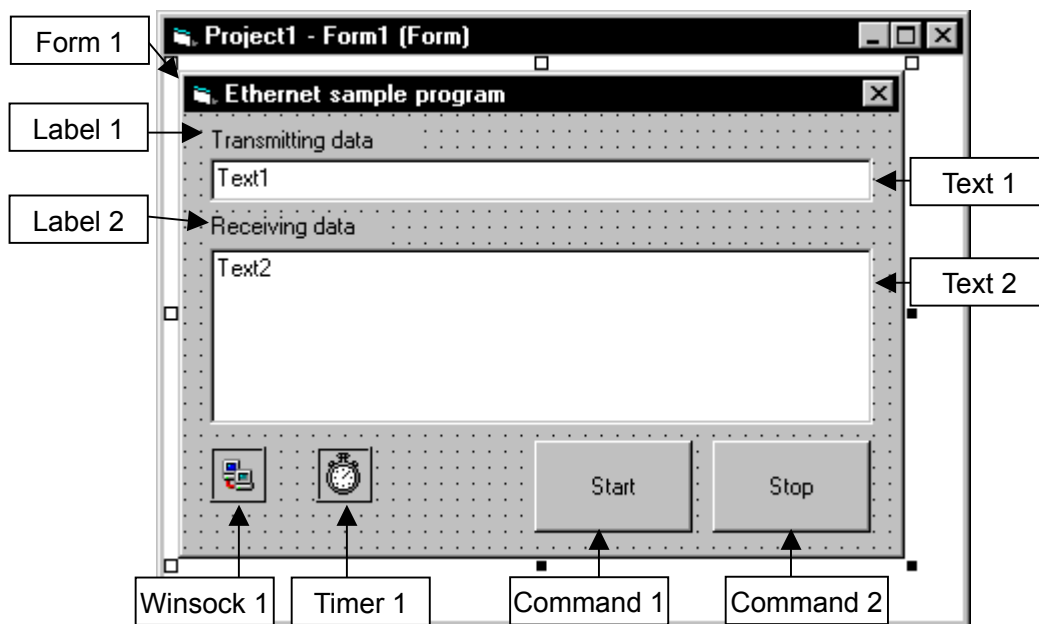
Cautions: Any countermeasures against errors, which may be generated during operation, are not described here. When any countermeasure is required, refer to Help of Visual Basic 6.0 or books commercially available.

Control used

Command Button x 2
Text x 2

Form x 1
Timer x 1

Label x 2
Winsock x 1



Creation procedure

- (1) Start up Visual Basic6.0 (VB) and create a new project (standard EXE).
- (2) Arrange each control in a form as shown in the above figure. Winsock has not been installed as standard. Add it by the following procedures.
Click [Project] of the menu bar of VB, and then click [Components]. The Components dialog box will appear. Click the “Controls” tab, check "Microsoft Winsock Control 6.0" box in the list, and then click [OK]. Winsock will be added to the toolbox of VB.

(3) Property of each control

Change the property of each control arranged into the definitions shown below.

Control	Property	Value
Command 1	Caption	Start
Command 2	Caption	Stop
	Enabled	False
Form 1	BorderStyle	1-Fixed (solid line)
	Caption	Ethernet sample program
Label 1	Caption	Transmitting data
Label 2	Caption	Receiving data
Text 1	*	*
Text 2	MultiLine	True
Timer 1	Enabled	False
	Interval	5000
Winsock 1	RemoteHost	192.168.254.254
	RemotePort	11111

* No property to change is available in Text 1.


```

'////////////////////
'/Task when the connection of TCP was completed
'////////////////////
Private Sub Winsock1_Connect ( )

    Dim bSndData(7) As Byte          'Declares the array for transmitting commands.
    Dim i As Integer

    Dim sData As String              'Variables for displaying characters

    Text1.Text = ""                 'Clears contents of Text 1.
    Text2.Text = ""                 'Clears contents of Text 2.

    'Creates the transmitting commands.
    bSndData(0) = &H1
    bSndData(1) = &H4
    bSndData(2) = &H0
    bSndData(3) = &H64
    bSndData(4) = &H0
    bSndData(5) = &HC

    Make_CRC bSndData                'Calls the CRC-16 computation procedure.

    'Creates the displaying characters.
    For i = 0 To 7
        sData = sData + "," + Right$("0" + Hex$(bSndData(i)), 2)
    Next i

    Text1.Text = Mid$(sData, 2)      'Displays the transmitting commands.

    Winsock1.SendData bSndData       'Transmits the transmitting commands.

    Timer1.Enabled = True            'Starts the timer.
End Sub
'////////////////////
'/Task when TCP data (instrument's responding commands) were stored into the buffer memory.
'/ Arguments : bytesTotal Type Long
'/            The number of bytes of received data was stored.
'////////////////////
Private Sub Winsock1_DataArrival (ByVal bytesTotal As Long)

    Dim bRcvData() As Byte           'Declares the array for receiving commands storage.
    Dim sData As String              'Variables for displaying characters
    Dim i As Integer

    ReDim bRcvData(bytesTotal)       'Defines the size of the array for receiving commands
                                     storage.

    'Receives the data, of which size is the "bytesTotal" bytes, as a byte type arrangement from
    the buffer memory and stores them into the "bRcvData".
    Winsock1.GetData bRcvData, vbByte, bytesTotal

    'Creates the displaying characters.
    For i = 0 To bytesTotal - 1
        sData = sData + "," + Right$("00" + Hex$(bRcvData(i)), 2)
    Next i

    Text2.Text = Mid$(sData, 2)      'Displays the receiving commands.
End Sub

```

```

'////////////////////
'/Procedure for creating MODBUS commands CRC (Newly added procedure)
'/Arguments : bData() Byte type arrangement
'/          Set up the byte array storing MODBUS commands for computing CRC-16.
'/*The CRC-16 computed will be stored into the last (2 bytes) of the array.
'////////////////////////////////////
Private Sub Make_CRC(ByRef bData() As Byte)

    Dim iData() As Integer          ' Declares the array for CRC-16 computation.
    Dim iCRC As Integer             ' Declares the variable for CRC-16 computation.
    Dim iCY As Integer              ' Declares the variable for CRC-16 computation.
    Dim iP As Integer               ' Declares the variable for CRC-16 computation.
    Dim iC1 As Integer              ' Declares the variable for CRC-16 computation.
    Dim iC2 As Integer              ' Declares the variable for CRC-16 computation.

    Dim i As Integer
    Dim j As Integer

    ReDim iData(UBound(bData))      ' Declares the size of the array for CRC-16 computation.

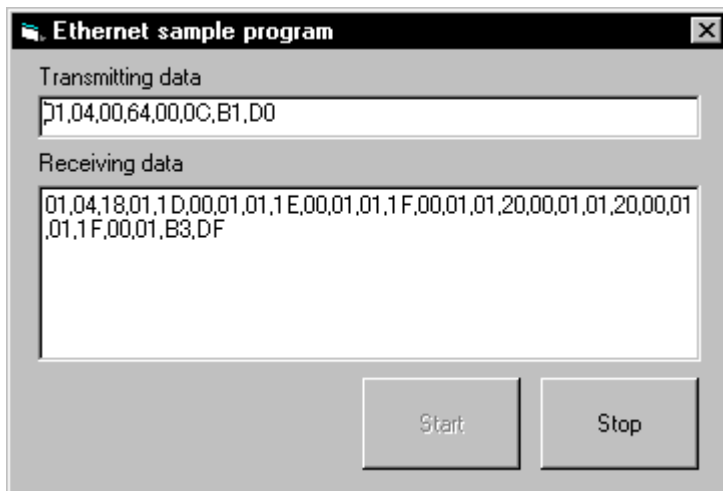
' ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ Start of CRC-16 computation ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
    iCRC = &HFFFF
    For i = 0 To UBound(bData) - 2
        iData(i) = bData(i)
        iCRC = iCRC Xor iData(i)
        For j = 1 To 8
            iCY = iCRC And &H1
            If iCRC < 0 Then
                iP = &H4000
                iCRC = iCRC And &H7FFF
            Else
                iP = 0
            End If
            iCRC = iCRC ¥ 2
            iCRC = iCRC Or iP
            If iCY = 1 Then iCRC = iCRC Xor &HA001
        Next j
    Next i
    If iCRC < 0 Then
        iP = &H80
        iCRC = iCRC And &H7FFF
    Else
        iP = 0
    End If
    iC1 = iCRC And &HFF
    iC2 = (iCRC And &H7F00) ¥ 256
    iC2 = iC2 Or iP
' ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ End of CRC-16 computation ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑

    bData(UBound(bData) - 1) = iC1 ' CRC-H
    bData(UBound(bData)) = iC2    ' CRC-L
End Sub

```


(5) Execution

The executed result will be as follows.



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