

**ZS-6180AF**

**LAN / GP-IB Converter**

**User's Manual**



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## Introduction

ZS-6180AF is LAN/GP-IB converter. In order to make more effective use of ZS-6180AF, please use this product after understanding the contents of this manual sufficiently.

In order to use this product, general knowledge about PC/AT compatible machine and Windows(R) is necessary. If you have any questions about PC/AT compatible machine or Windows(R), please refer to those instructions or related books etc.

- The appearance and specifications of this product and items described in the instruction manual are subject to change without notice.
- Reproduction and reprinting of all matters stated by the instruction manual are prohibited.
- Company names and product names described in this instruction manual are trademarks and registered trademarks of each company.
- Please absolutely stop handling this product without fully understanding the contents of the instruction manual.

## Warranty

The warranty period of this product is the period stated in the “Letter of warranty” attached to the product.

For defective products during the warranty period, Zenisu Keisoku, Inc repairs or replaces defective parts for no charge. However, the product that caused a problem due to the items listed below will be out of warranty.

- Failure or damage due to inadvertent handling, accident, product misuse or abuse.
- Failure or damage due to falling etc.
- Failure or damage due to use of parts manufactured or sold by other than us.
- Modification of product, improper repair or malfunction or damage found to be attributable to the user’s responsibility.
- Failure or damage due to other equipment connected to this product or other external factors.
- Failure or damage due to fire, earthquake, other natural disasters, pollution etc.
- Replacement of consumable parts.
- Adjustment, maintenance and repair in non-company designated by us.
- There is no letter of warranty attached to this product.

Note) We are not responsible for any defects and damages or losses caused by disasters or third part’s actions or carelessness after the product is shipped, regardless of any circumstances.

Note) This product can not be used as parts or equipment throughout facilities such as nuclear power plants, medical equipment, railroad transportation, building management, or anything related to human lives. If it is used for these, we are not responsible for any defects and damage or loss.

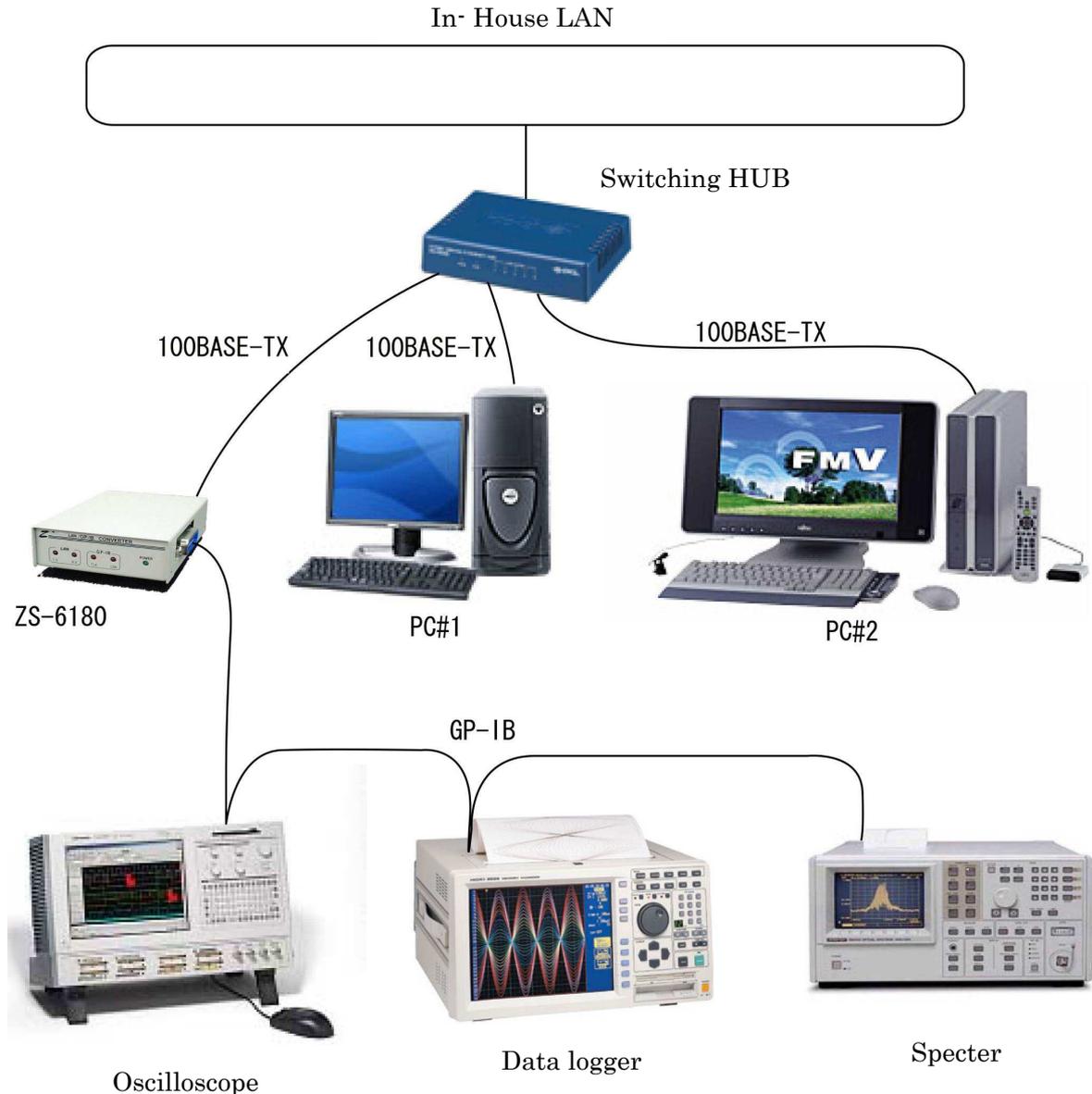
Note) we are not responsible for any damage, directly or indirectly, caused by the failure of this product or its use.

Repair request

If you are requesting repair, please contact to your agency or us. We will repair or replace defective product and return it. In requesting repair, please attach a letter of warranty to the product and send it with safe transportation method at your own risk.

Outline

ZS-6180AF is an interface converter that mediates communication between LAN and GP-IB. This device functions as a GP-IB controller by a command from a computer equipped with a LAN adapter.



[ System configuration example ]

In the above example, PC#1 and PC#2 can be GP-IB controller via ZS-6180AF respectively. The cable length restriction of GP-IB cable is improved by using LAN cable and hub. It is also possible to perform external control by using the VPN function. We do not support implementation of VPN function.

To use this product safely



## Warning!



### Caution

- Do not use the included CD-ROM absolutely except for CD-ROM compatible players. Damage to ear may be caused by loud volume, or the speaker may be damaged.



### Fire hazard

- Do not disassemble / remodel this product. It may cause fire, electric shock, or malfunction.

- If it is used in an abnormal state such as smoke, odd smell or sound, it may cause fire or electric hazard. Immediately turn off the power switch of the main unit and connected equipment and unplug their power plug from the outlet.



### Electric hazard

- Do not use or leave in place where water and oil are scattered, in damp or dusty places or outdoors. It may cause fire, electric hazard or failure.

- Do not handle equipment with wet hands. You may get an electric shock.

- If a foreign substance enters the inside of the device, turn off the computer and the device immediately.

- Do not use in places exposed to direct sunshine, extremely high temperature, low temperature, high humidity, strong magnetized place etc. It may cause equipment malfunction.

- If it used with dew condensation, the equipment may malfunction or break down.

- Be sure to turn off the power of the computer and connected equipment when detached the cable. If the cable is detached while turning on the power, the device may be destroyed by overvoltage or overcurrent.

- To protect the equipment against electrostatic breakdown, please do not touch the contact part of IC or connector on board. It may be destroyed equipment by static electricity charged on your body.

- Do not adhere liquid such as water may cause electric shock or fire.

**Please check the contents of the packing box**

When opening the packing box, please check first that main unit and accessories are included. If there is missing or damaged, please contact your agency immediately.

- ZS-6180AF
- DC input cable (Attach it as a service only if you do not purchase an optional AC adapter)
- Letter of warranty

**Contents of download utility**

- ¥ ..... Readme.txt file is included. When there are incompleteness in the instruction manual etc., and important contents such as specification change are included, please read first.
- ¥MANUAL ..... Folder containing this instruction manual.
- ¥LANTRONIX ..... Folder containing COM Port Redirector.
- ¥SAMPLE¥LANTRONIX¥VB6 ..... Use the Telnet emulator with ComPort Redirector to place a folder containing VB6 samples.
- ¥SAMPLE¥LANTRONIX¥VBNET ..... Use the Telnet emulator with ComPort Redirector to place a folder containing VB.NET samples.
- ¥SAMPLE¥LANTRONIX¥VC6 ..... Use the Telnet emulator with ComPort Redirector to place a folder containing VC++6 samples.
- ¥SAMPLE¥LANTRONIX¥VCNET ..... Use the Telnet emulator with ComPort Redirector to place a folder containing VC++.NET samples.
- ¥SAMPLE¥TCPIP¥VB6 ..... Use the Telnet emulator with TCP/IP to place a folder containing VB6 samples.
- ¥SAMPLE¥TCPIP¥VBNET ..... Use the Telnet emulator with TCP/IP to place a folder containing VB.NET samples.
- ¥SAMPLE¥TCPIP¥VC6 ..... Use the Telnet emulator with TCP/IP to place a folder containing VC++ samples.
- ¥SAMPLE¥TCPIP¥VCNET ..... Use the Telnet emulator with TCP/IP to place a folder containing VC++.NET samples.
- ¥SAMPLE¥TCPIP¥LINUX ..... Use the Telnet emulator with TCP/IP to place a folder containing samples for LINUX.

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# 1. Specifications

## (1) LAN

Standard: IEEE802.3

Type: 10BASE-T or 100BASE-TX (Automatic switching)

Access control: CSMA/CD

Modulation/Coding scheme: baseband/Manchester encoding 4B5B,NRZ

Transmission speed: 10BASE-T→10Mbps, 100BASE-TX→100Mbps

Transmission cable: Two pairs twist cable UTP category 5

Impedance: 100Ω

Connector: RJ45-8pin modular connector (ISO8877 Std)

PIN#	SIGNAL	PIN#	SIGNAL
1	TX+	2	TX-
3	RX+	4	N.C.
5	N.C.	6	RX-
7	N.C.	8	N.C.

Maximum segment length: 100m

Wiring form: Star

Supported protocol: ARP, TCP/IP,UDP/IP,Telnet,ICMP,SNMP,DHCP,BOOTP,TFTP,AutoIP,HTTP

## (2)GP-IB

Standard: IEEE 488.1-1987

Interface function:

SH1	All functions of handshake are available
AH1	All functions of acceptor handshake are available
T5	All functions of talker are available
L3	All functions of listener are available
SR1	All functions of serial poll are available
RL1	All functions of remote/local are available
PP0	No parallel poll function
DC1	All functions of device clear are available
DT1	All functions of device trigger are available
C1	System controller function is available
C2	IFC transmission function is available
C3	REN transmission function is available
C4	SRQ response function is available
C27	Interface message sending function is available Function of control in synchronization with handshake is available

Type: piggyback amphenol 24pin cable, maximum cable length 20m, each cable length is 4m or less.

Buffer memory:

Transmission: 16 KByte

Reception: 16 KByte

Dimensions: 82mm(w) x 30mm(h) x 126mm(d)

Weight: 360g

Power supply voltage: +5VDC

Current consumption: 500mA or less

Operation temperature: 0°C to +85°C

Humidity: 5% to 95% (No condensation)

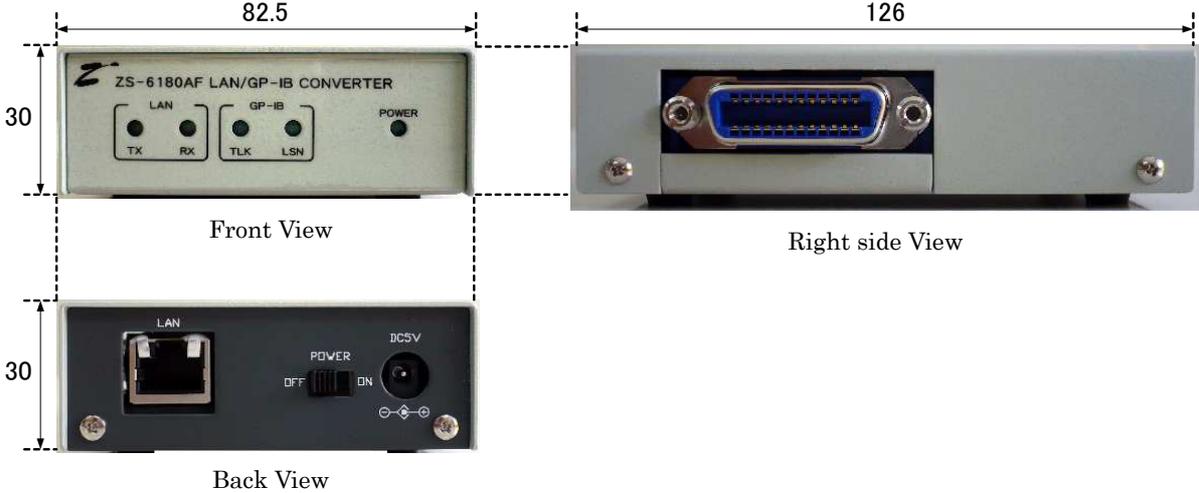
Accessories: DC input cable (AC adapter is optional, letter of warranty)

Compatible models: A computer that can access 10BASE-T or 100BASE-TX Ethernet.

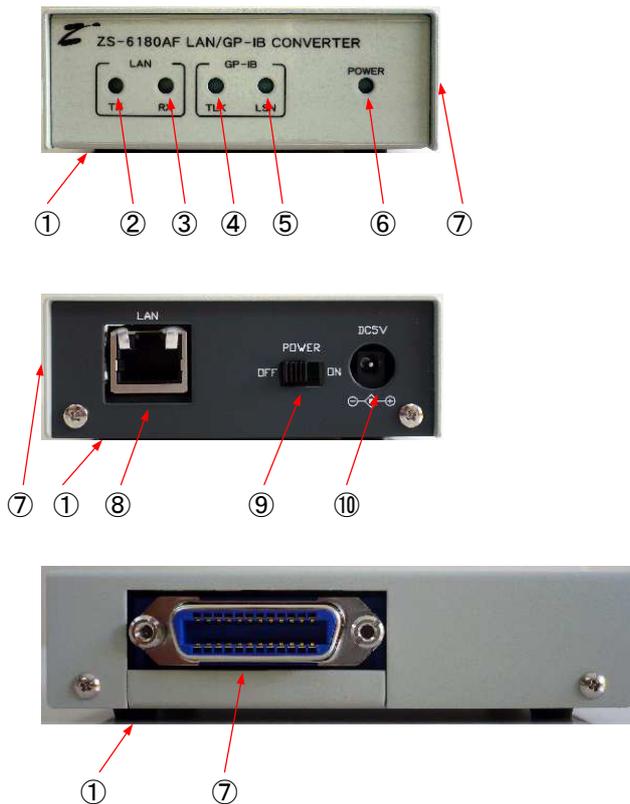
OS: All OSs that can use TCP/IP or UDP/IP.

2. Appearance

2-1. Dimensional drawing



## 2-2. Name of each parts



**① Rubber foot**

It is attached as standard.

**② Data transmission indicator light**

It lights up when this product transmits data to the host computer.

**③ Data reception indicator light**

It lights up when this product receives data from the host computer.

**④ Talker indicator light**

It lights up when this product is in talker mode of GP-IB device.

**⑤ Listener indicator light**

It lights up when this product is in listener mode of GP-IB device.

**⑥ Power light**

It lights up when +5VDC is supplied to the power supply connector and the power switch is turned on.

**⑦ GP-IB connector**

This is for connecting the GP-IB cable.

**⑧ LAN connector**

Connector of RJ-45 to connect the LAN cable for linking with the host computer. Be sure to connect with a cross-cable if not via the hub, straight-cable if via the hub.

**⑨ Power switch**

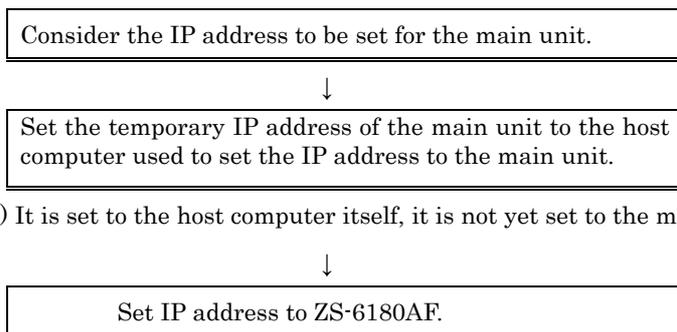
It is a slide switch that puts the power supply into the circuit.

**⑩ Power supply connector**

For +5VDC AC adapter.

### 3. Setting

Set the IP address as follow.



#### 3-1. Consider the IP address to be set for the main unit.

- ① Run the command prompt(MSDOS prompt) on the host computer and execute the ipconfig command.

Example) `ipconfig`



- ② As a result of the ipconfig command, you can see the value of your network part.

IP Address	192. 168. 1. 14	11000000. 10101000. 00000001.	00001110
Subnet Mask	255. 255. 255. 0	11111111. 11111111. 11111111.	00000000
	192. 168. 1. X	AND 11000000. 10101000. 00000001.	XXXXXXXX
		Network part	Host part

In this example, the network part is 192.168.1. The host part numbers unused numbers. To determine the IP address of the ZS-6180AF, the network part of the IP address is determined as above. For the host part, please ask the network administrator to allocate the empty number of the host part. The combined network part and host part is the IP address of ZS-6180AF.

### 3-2. Set the temporary IP address of the main unit to the host computer.

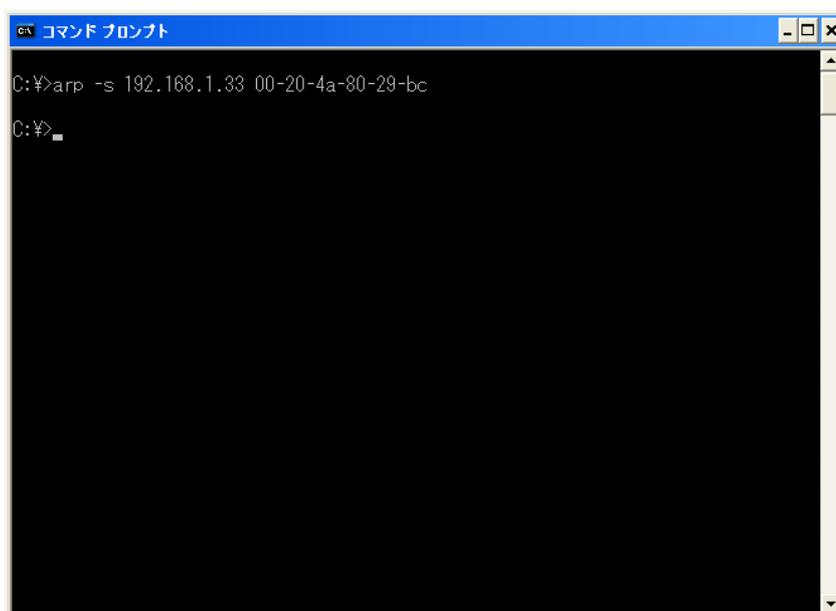
1. Prepare the warranty certificate of the ZS-6180AF, refer to the MAC address affixed to the letter of warranty.
2. Connect the ZS-6180 to the LAN.
3. Connect the Ac adapter to a 100V outlet and connect the AC adapter to the ZS-6180AF. Then turn on the power switch of ZS-6180AF.

Note) In order to be following explanation, the IP address determined above will be “192.168.1.33” and the MAC address written in the letter of warranty will be “00-20-4A-80-29-BC”. However, be sure to change the IP address and MAC address to the value you set yourself.

Run the command prompt (MSDOS prompt) on the host computer and set the temporary IP address of ZS-6180AF. The temporary address is set to the host computer, but not set to the ZS-6180AF.

At the command prompt, enter the following command and execute it.

Example) `arp -s 192.168.1.33 00-20-4a-80-29-bc` 



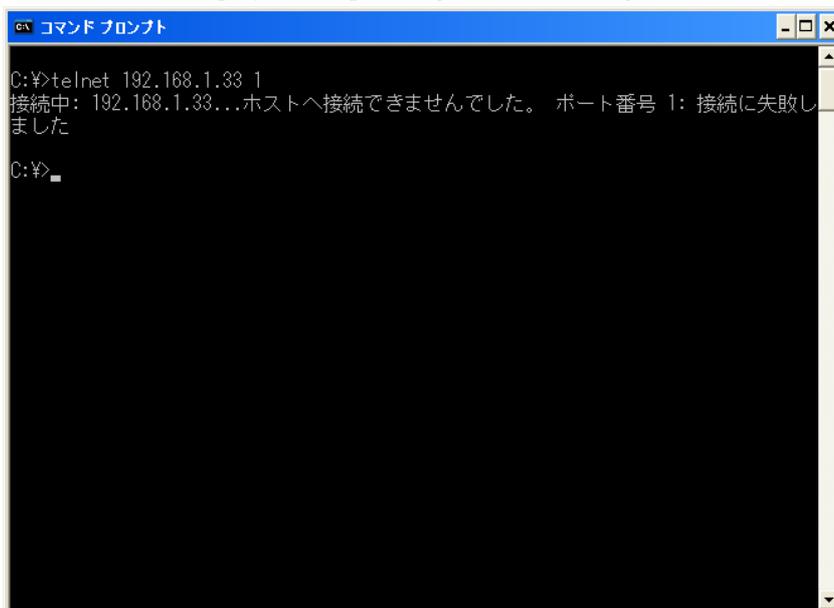
```
コマンドプロンプト
C:\>arp -s 192.168.1.33 00-20-4a-80-29-bc
C:\>
```

### 3-3. Set IP address to ZS-6180AF

- ① At the command prompt, enter the following command and execute it.

Example) `telnet 192.168.1.33 1` 

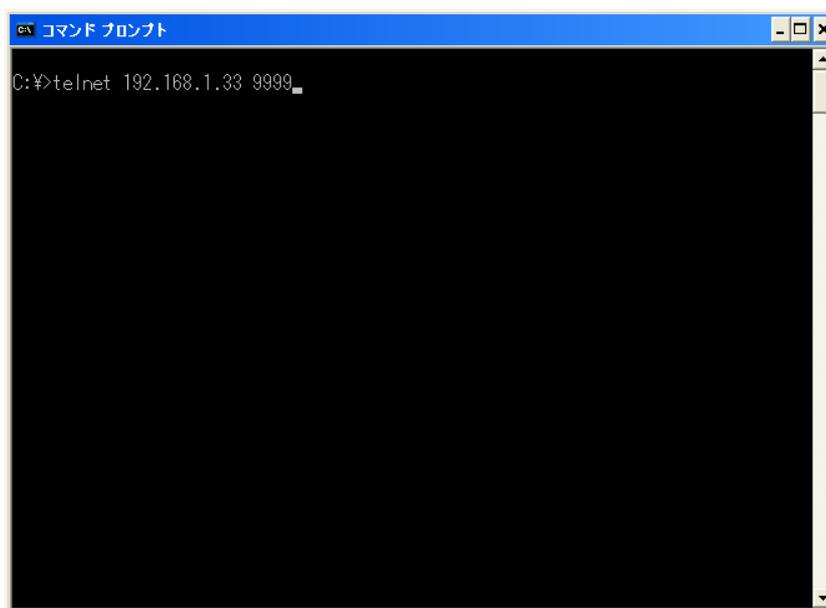
An error will be displayed, but please ignore this message.



```
コマンド プロンプト
C:\>telnet 192.168.1.33 1
接続中: 192.168.1.33...ホストへ接続できませんでした。 ポート番号 1: 接続に失敗しました
C:\>_
```

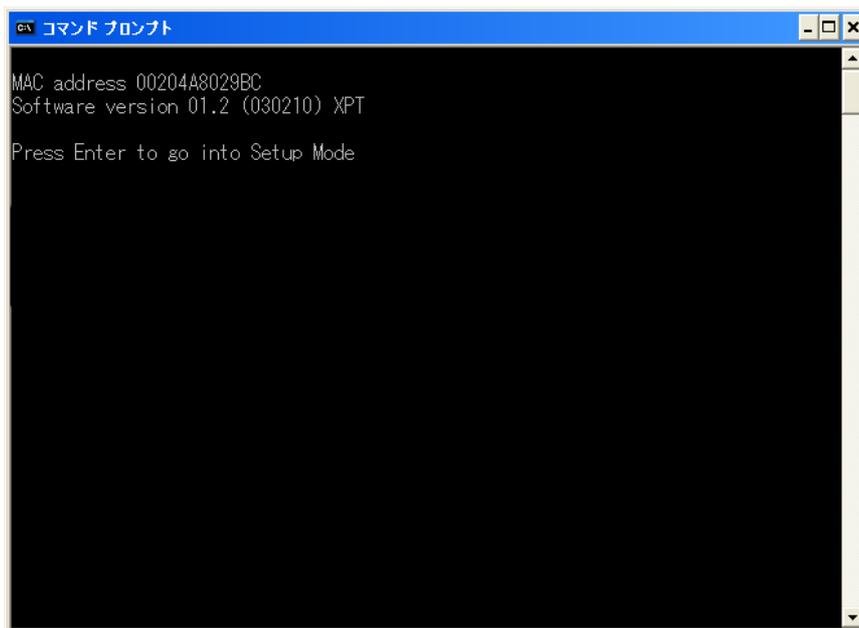
- ② At the command prompt, enter the following command prompt and execute it.

Example) `telnet 192.168.1.33 9999` 



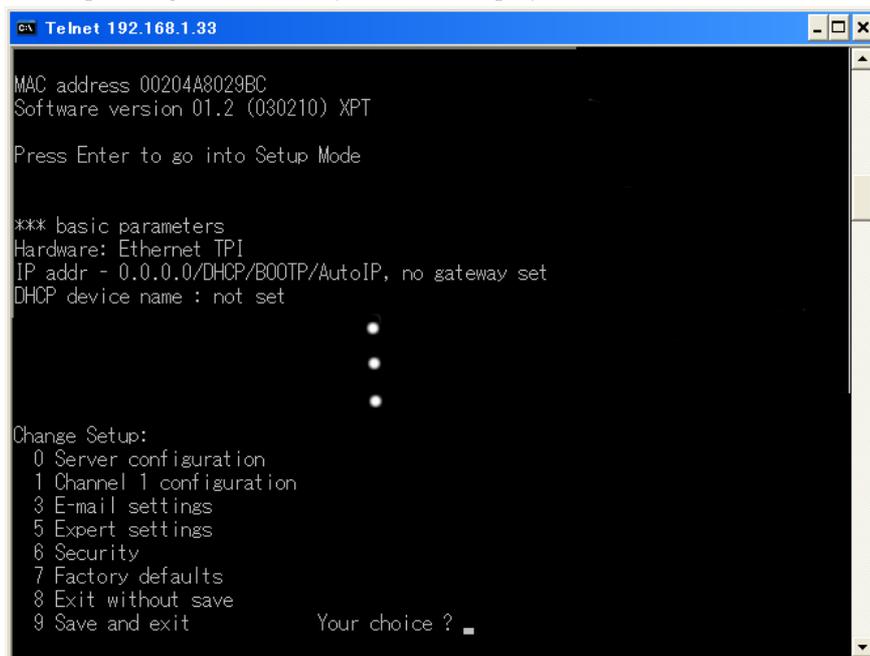
```
コマンド プロンプト
C:\>telnet 192.168.1.33 9999_
```

The screen will be erased and the following screen will appear.



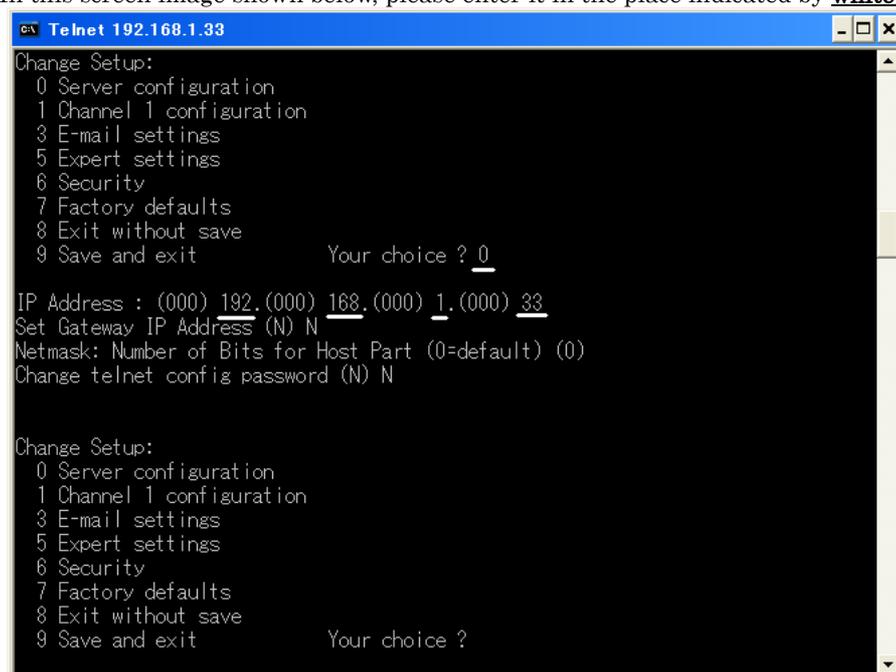
Please press the enter key. If you leave it without pressing the return key, a message such as a “The connection with the host has been disconnected” is displayed, and telnet will end.

- ③ After pressing the return key, it will be displayed as follows.



- ④ As you are being asked “Your choice?”, please enter “0”. Then you will be prompted to enter the IP address, so enter the IP address of ZS-6180AF which was decided by “3-1. Consider IP address to be set for the main unit”.

In this screen image shown below, please enter it in the place indicated by **white underline**.

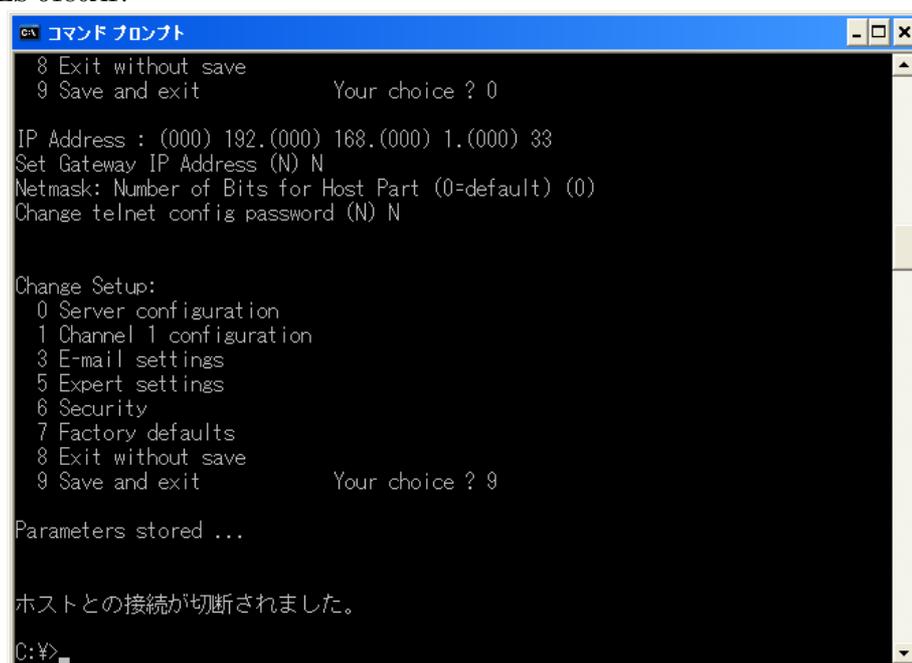


```
ca Telnet 192.168.1.33
Change Setup:
0 Server configuration
1 Channel 1 configuration
3 E-mail settings
5 Expert settings
6 Security
7 Factory defaults
8 Exit without save
9 Save and exit      Your choice ? 0

IP Address : (000) 192.(000) 168.(000) 1.(000) 33
Set Gateway IP Address (N) N
Netmask: Number of Bits for Host Part (0=default) (0)
Change telnet config password (N) N

Change Setup:
0 Server configuration
1 Channel 1 configuration
3 E-mail settings
5 Expert settings
6 Security
7 Factory defaults
8 Exit without save
9 Save and exit      Your choice ?
```

- ⑤ As you are asked “Your choice?” again, please enter “9” at this time and save the setting value to the ZS-6180AF.



```
ca コマンドプロンプト
8 Exit without save
9 Save and exit      Your choice ? 0

IP Address : (000) 192.(000) 168.(000) 1.(000) 33
Set Gateway IP Address (N) N
Netmask: Number of Bits for Host Part (0=default) (0)
Change telnet config password (N) N

Change Setup:
0 Server configuration
1 Channel 1 configuration
3 E-mail settings
5 Expert settings
6 Security
7 Factory defaults
8 Exit without save
9 Save and exit      Your choice ? 9

Parameters stored ...

ホストとの接続が切断されました。
C:¥>
```

Completes the setting of the IP address to the ZS-6180AF.

## 4. How to install “COM Port Redirector”

This section explains how to install “COM Port Redirector” made by Rantronix.Inc, which can be used without being conscious of TCP/IP or UDP/IP.

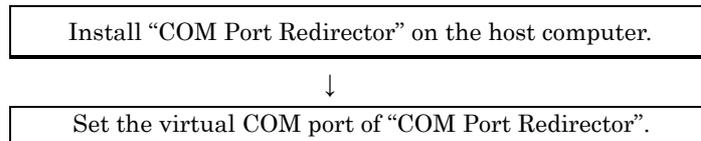
This “COM Port Redirector” provides a virtual COM port for user application programs. By performing serial communication with this virtual COM port, the user application program can communicate with other devices connected via Ethernet by “COM Port Redirector” operates on Windows@XP or later.

For details, please see the explanation of “COM Port Redirector” as below. You can also download from the following website. There are Network installation version and Standalone version, so please choose according to your operating environment.

<http://www.lantronix.com/device-networking/utilities-tools/com-port-redirector.html>

**Note) If you are writing TCP/IP or UDP/IP user application program, skip this section.**

The procedure is as follows.



### 4-1. Install “Com Port Redirector” on the host computer.

An example with Windows 7 64bit version as below. The details may be different depending on the environment.

- ① Execute the download setup\_cpr\_x86x64cd\_4.3.0.3.exe (standalone version). When executed, the following screen will appear. It is also abbreviated as CPR.



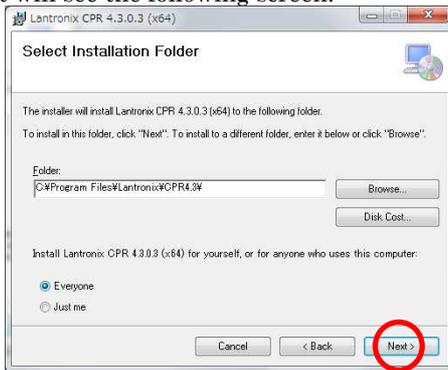
Click “Install” button.

- ② It will see the following screen.



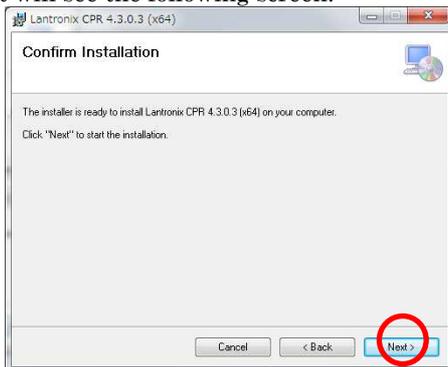
Click “NEXT” button.

③ It will see the following screen.



Click "NEXT" button.

④ It will see the following screen.



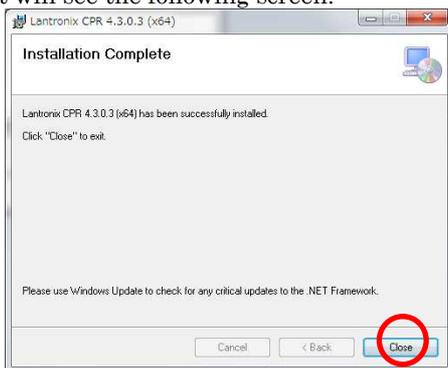
Click "NEXT" button.

⑤ After the file is copied, it will see the following screen.



Click "Install" button.

⑥ It will see the following screen.



Click "Close" button.

⑦ It will see the following screen.

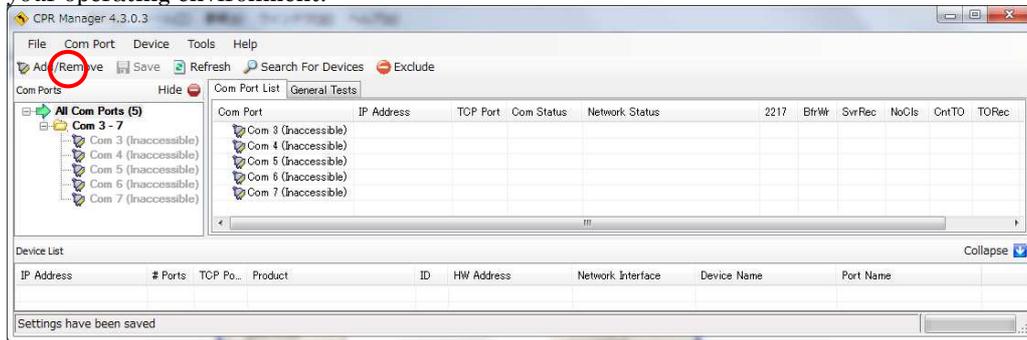


Click "OK" button.

The installation of this program has been completed.

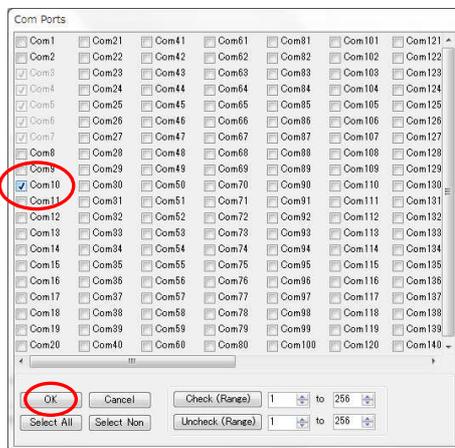
## 4-2. Set the virtual COM port of “COM Port Redirector”.

- ① From the start menu, select [Program]>>[Lantronix]>>[CPR X.X]>>[CPR Manager] and start it. Then the following “CPR Manager” screen will be displayed. The state of the COM port depends on your operating environment.



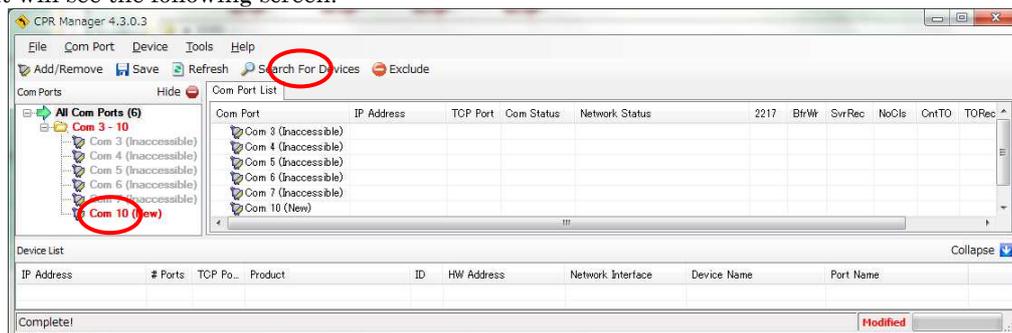
Click “Add/Remove” on the left side of the screen to display the “Com Ports” screen.

- ② It will see the following screen.

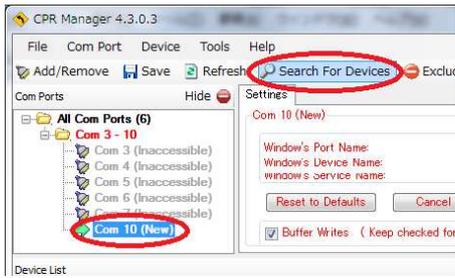


On the “Com Ports” screen on the left, check the COM port number to be set as the virtual COM port. An example of setting to “Com 10” is explained as here. Click the “OK” button to return to the “CPR Manager” screen.

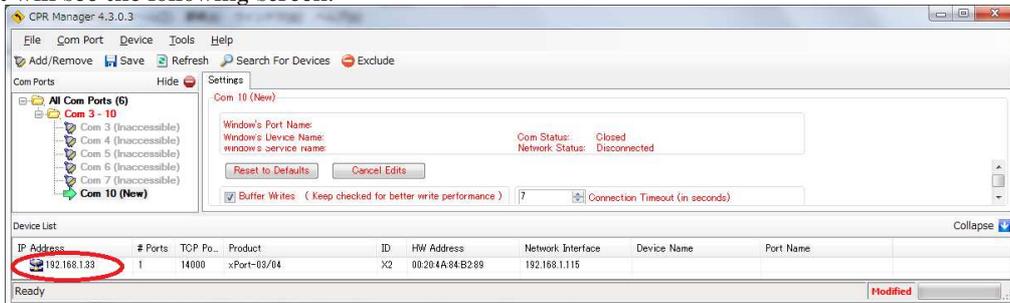
- ③ It will see the following screen.



Select the port set in ② in “COM Ports” on the left side of the screen and click “Search For Devices”.

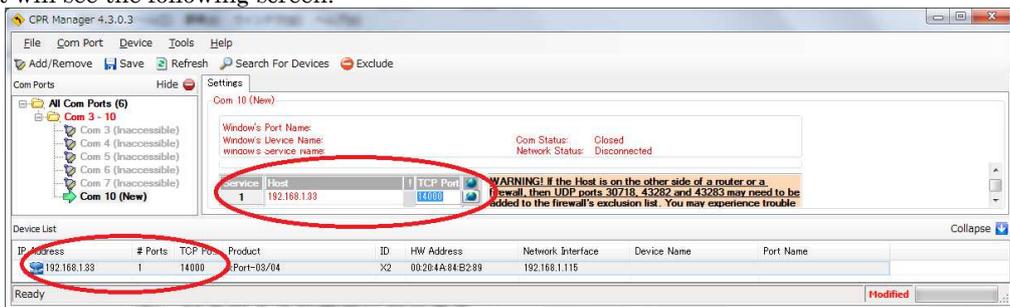


④ It will see the following screen.



Select the item displayed in the “Device List” at the bottom left of the screen and double click it.

⑤ It will see the following screen.



Items displayed in the “Device List” at the bottom left of the screen are reflected in the Com setting in the center of the screen. Click “Save” at the top of the screen, and click “OK” on the displayed confirmation screen. This setting is completed, please exit “CPR Manager”.

Note) The virtual COM port can be used with the above operation. The display of the button may change depending on the OS and version, but in that case please operate according to the displayed message.

## 5. Consider the program

The communication program with ZS-6180AF is a program in which the host computer is the client and the ZS-6180AF is the server. At this time, the client side program consists of three blocks that are “Establish link with ZS-6180AF”, “Communicate for ZS-6180AF and GP-IB control” and “Cancel link with ZS-6180AF”.

Note) The flow chart on the session is shown on the right side.

### ① Establish link with ZS-6180AF.

1. Initialize Winsock.
2. Create socket.
3. Specify the IP address and port number of ZS-6180AF and perform connection processing with ZS-6180AF.

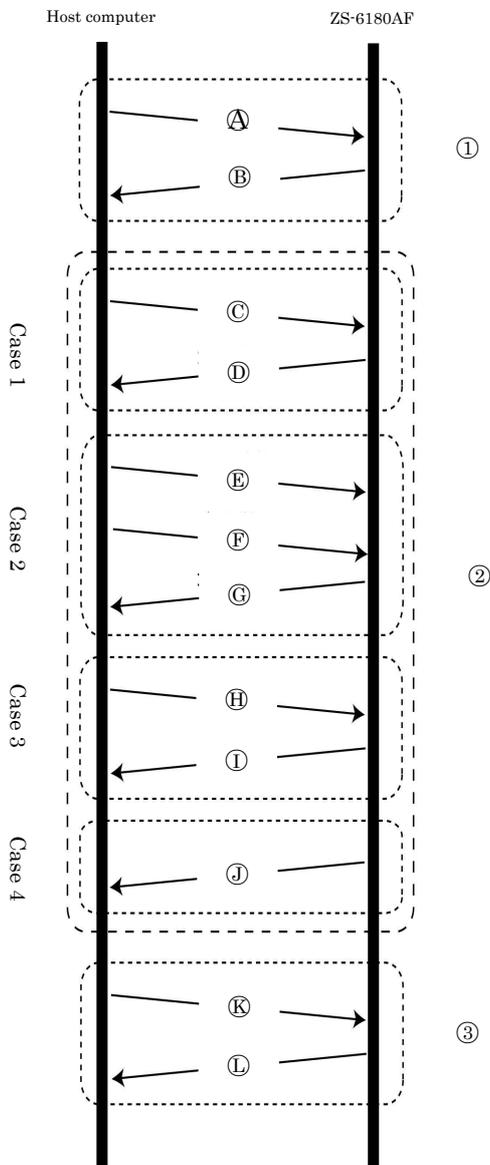
### ② Communicate for ZS-6180AF and GP-IB control.

Control the external GP-IB device using the GP-IB command of ZS-6180AF. At this time, there are four type of access procedures by the GP-IB command, which are described as Case 1 to Case 4. It will be described in detail later.

### ③ Cancel link with ZS-6180AF.

Discard the socket and end the communication.

- Ⓐ: Connect request
- Ⓑ: Connect response
- Ⓒ: Command transmission
- Ⓓ: Command response
- Ⓔ: Command transmission
- Ⓕ: Data transmission
- Ⓖ: Command response
- Ⓗ: Command transmission
- Ⓘ: Data reception
- Ⓙ: SRQ reception
- Ⓚ: Cancel request
- Ⓛ: Cancel response



## Access details of GP-IB communication control

The command to ZS-6180AF consists of 3 to 4 characters command name using ASCII code followed by parameter (character string). Command include control commands, data output command, and data request commands. Upon receipt of a command from the host computer, the ZS-6180AF performs control corresponding to that command and sends a response message corresponding to the command to the host computer. The host computer sends the command to the ZS-6180AF, and receiving the response message from the ZS-6180AF, send the next command.

There are the following types of response messages after command execution.

- 1.END  CR  LF A control command without data to be returned to the host computer or a data output command. (case1, 2)
2. XXX··XX  CR  LF Data request command etc. that returns data to the host computer. (case 3).
3. F-ERR  CR  LF When there is a format error (case 1, 2, 3).
- 4.G-ERR  CR  LF When there is a timeout error (case 1, 2, 3).
- 5.O-ERR  CR  LF When there is a overflow error (case 1, 2, 3).
- 6.P-ERR  CR  LF When there is a parameter error (case 1, 2, 3).
- 7.R-ERR  CR  LF When there is a internal error (case1, 2, 3).
8. SRQ  CR  LF When SRQ occurs, SRQ it is sent from the ZS-6180AF without sending a command from the host computer (case 4).

## When a person making TCP/IP programming wants to change the port number.

A person who creates TCP/IP applications without using COM Port Redirector will indicate how to change the port number of ZS-6180AF.

- ① Please start the web browser (Internet Explorer, Netscape Navigator, etc.). Then enter the IP address of ZS-6180AF set in the URL address.

Example) <http://192.168.1.33>  The menu opens as shown on the right.

- ② Make sure that “Port Properties” indicated as A is selected. Please select if not selected. If it is selected, the color of button will turn to orange.
- ③ The value of “Local Port” indicated as B is the port number. The initial setting is 14000. Please set the port number you want to change. To restore the value, set it to 14000 again.
- ④ The setting is completed by clicking “Update Setting” indicated as C.

**Note) Since it may not operate properly, please do not change other items.**



The screenshot shows the web interface for the ZS-6180AF. The main title is "Selected Channel : 1". On the left is a "Menu" with several options: "Unit Configuration", "Server Properties", "Port Properties" (highlighted in orange), "Factory Settings1", "Update Settings", "Select Channel", and "Channel1". On the right, the "Serial Port Settings" section includes fields for "Serial Protocol" (RS232), "Baud Rate" (19200), "Character Size" (8), "Parity" (None), and "Stop Bit" (1). Below this is the "Connect Mode Settings" section with "UDP Datagram Mode" set to "Disable" and "UDP Datagram Type" set to "Change Address Table". The "Incoming Connection" section has "Accept unconditional", "Response" set to "Nothing (quiet)", and "Startup" set to "No Active Connection Startup". The "Dedicated Connection" section has "Remote IP Address" and "Remote Port" empty, and "Local Port" set to "14000". The "Flush Mode Input Buffer (Line to Network)" and "Flush Mode Input Buffer (Network to Line)" sections both have "On Active Connection", "On Passive Connection", and "At Time To Disconnect" set to "Disable". The "Packing Algorithm" section has "Packing Algorithm" set to "Disable", "Idle Time" set to "Force Transmit 12ms", "Trailing Characters" set to "None", "Send Immediate After Sendchars" set to "Disable", "Sendchar Define 2-Byte Sequence" set to "Disable", "Send Character 01" set to "00", and "Send Character 02" set to "00". The "Additional Settings" section has "Disconnect Mode" set to "Ignore DTR", "Check for CTRL-D To Disconnect" set to "Disable", "Port Password" set to "Disable", "Telnet Mode" set to "Disable", "Inactivity Timeout" set to "Enable", "Inactivity Timer" set to "00", and "Port Password" empty.

## 6. Command description

### How to send commands

Commands from the host PC are sent in the order of "command", "CR", "LF", "CR" is 0x0d, "LF" is 0x0a. Commands can be sent consecutively, separated by ":" colon.

[command] : [command] : [command] ..... [command] : [command] [CR] [LF]

This is called multi-command. The multi-command function is performed with commands MCE and MDC. Upon receiving the multi-command, ZS-6180AF sequentially executes the command, and after completing execution of all commands, sends a response message to the host computer.

This response message belongs to the latest command executed. Therefore, when using any of the seven commands (INP, INPB, IND, INDB, INC, INCB, RDS) that return data in response message as multi-command, be sure to put it at the end of the command sequence.

If an error occurs during multi-command execution, the command execution is terminated at that point, and an error response message is returned to the host computer.

### Command format

Command format is as bellow.

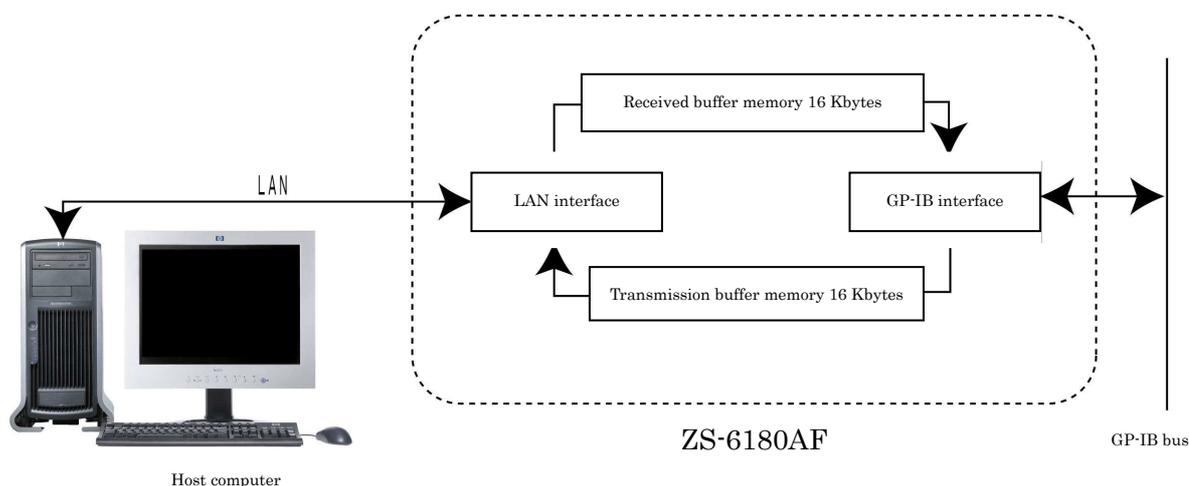
[ Command code ] \_ [ Address or Parameter ] ; [ (Data) ]  
(Space) (Semicolon)

If there are multiple address or parameters, separate them with a comma (,). The address is a decimal two digits code, the parameter and the data have two decimal digits and two hexadecimal digits. Some commands do not require semicolon (;) afterwards.

### Internal buffer memory

The ZS-6180AF executes the command after storing the command, data and delimiter sent from the host computer in the internal receive buffer memory. The size of the internal receive buffer memory, including the delimiter, is 16 Kbytes. ZS-6180AF returns O-ERR to the host computer if amount of data sent from the host computer 16 Kbytes or more.

When data is received from the GP-IB device, the data is stored in the internal transmission buffer memory. The size of internal transmission buffer memory is 16 Kbytes. If the data received from the GP-IB device exceeds 16 Kbytes, GP-IB data is received but discarded without being stored in the internal transmission buffer memory.



## **GP-IB address**

Execute GP-IB address setting command of ZS-6180AF. This command name is SGA. For details, refer to the SGA in the command table.

## **SRQ**

ZS-6180AF has SRQE mode and SRQD Mode. In the SRQE mode, the host computer is notified of the occurrence of the GP-IB SRQ. SRQD mode does not notify the occurrence of SRQ.

① SRQE mode

This command enables the interrupt processing function. When SRQ occurs, SRQ message is sent to the host computer. However, if SRQ occurs during command execution, ZS-6180AF sends SRQ message to the host computer after sending a response message

② SRQD mode

This command disables the interrupt processing function. Even if SRQ occurs, it will not be notified to the host computer. After turning on the power switch, this mode is set.

## **Error message**

Error code	Contents
F-ERR (Format Error)	There is an error in command format. The number of specified address exceeds 31. Amount of received commands and transmitted data is 16 Kbytes or more. The number of data exceeds 5000 with some commands. The command does not put at the end of transmission data when using multi-command.
G-ERR (Timeout Error)	Amount time of the GP-IB handshake exceed the value set with the TOE command. When ZS-6180AF is in talker mode, it tried to send a message to the device even though no listener device exists.
O-ERR (Overflow Error)	There are more than 16 Kbytes of command or multi-command including the delimiter send from the host computer.
P-ERR (Parameter Error)	The address or parameter value of each command is out of range. Binary data is a value other than 0 to F.
R-ERR (Internal Error)	Internal error occurred with ZS-6180AF.

ZS-6180AF sends UNT(0x5f) and UNL(0x3f) to the GP-IB bus when G-ERR occurs, and stops communication. Please re-set the talker and listener.

ZS-6180AF will not accept any subsequent commands when R-ERR occurs. Please turn off the power, then turn it on again and restart.

Command processing is suspended when an error occurs other than R-ERR.

## **Initial setting**

1. GP-IB address: 0
2. Delimiter of GP-IB device message: CR, LF, EOI
3. GP-IB timeout function: 25.5 seconds
4. SRQ mode setting: SRQD mode
5. Multi-command mode: Invalid

After turning on the power, ZS-6180AF automatically executes IFC and makes REN true and put it in remote state. Then, it waits for a command from the host computer.

## Command table

Command	Function
REM	Set the REN signal to TRUE and put all devices in remote state.
IFC	Initialize interface function of all devices.
DCL	Initialize all devices.
SDC	Initialize specified equipment.
GTL	Set the REN signal to false and put all the devices in local state. Make the specified device in local state.
LLO	Set all devices to local state prohibited.
GET	Send a trigger to a specified device.
CMD	Send an interface message.
TAD	Set a specified device as a talker.
LAD	Set a specified device as a listener.
DAT	Send a device message as ASCII character string data.
DATB	Send a device message as a binary data.
OUT	Send a device message with listener device specification.
OUTB	DATB command with listener device specification.
IND	Receive a device message as ASCII character string data.
INDB	Receive a device message as a binary data.
INP	IND command with talker device specification.
INPB	INDB command with talker device specification.
INC	INP command with received byte count setting function.
INCB	INPB command with received byte count setting function.
RDS	Execute a serial poll.
DLM	Set a delimiter of device message.
TOE	Set a timeout of GP-IB handshake.
SRQE	Enable SRQ mode.
SRQD	Disable SRQ mode.
SGA	Set a GP-IP address of ZS-6180AF.
MCE	Enable multi-command.
MCD	Disable multi-command.
RST	Reset ZS-6180AF.

## Description of each commands

### REM

#### Set REM signal to TRUE

##### Format

##### REM

---

Set REN signal to true on the GP-IB bus.

**【Argument】**

None

**【Note】**

After turning on the power, ZS-6180AF executes IFC and set the REN signal to true.

### IFC

#### Initialize interface function of all devices

##### Format

##### IFC

---

It outputs a true pulse to the IFC signal on the GP-IB bus and initializes the GP-IB interface function of all the devices. The pulse width is about 100  $\mu$ s.

**【Argument】**

None

**【Note】**

After turning power on, ZS-6180AF executes IFC.

### DCL

#### Initialize all devices

##### Format

##### DCL

---

Send the DCL message to all devices on the GP-IB bus. Request initialization for all devices with DC function.

**【Argument】**

None

# SDC

## Initialize specified equipment

### Format

#### SDC [addresses]

SDC message is sent to a specified device on the GP-IB bus. SDC message is used to the device specified as a listener.

#### 【Argument】

Addresses: It is a device address of two decimal digits separated by 1 to 31 commas. Device address range is 00 to 30.

#### 【Example】

SDC 00,01,30
--------------

Initialize the device with device address 0, 1, 30.

# GTL

## Set the device to the local state

### Format 1

#### GTL

Set the REN signal to false and put all devices in local state. Request the transition to the local state for all devices with RL function.

#### 【Argument】

None

### Format 2

#### GTL [addresses]

GTL message is sent to a specified device on the GP-IB bus. Request the transition to the local state to specified device with RL function. GTL message is used to the device specified as a listener.

#### 【Argument】

Addresses: It is a device address of two decimal digits separated by 1 to 31 commas. Device address range is 00 to 30.

#### 【Note】

If GP-IB address of ZS-6180AF is specified as GTL address, operation can not be guaranteed.

#### 【Example】

GTL 00,01,30
--------------

Set the device with device address 0, 1, 30 to local state.

# LLO

## Set a device to local state prohibited

### Format

#### LLO

---

Send an LLO message to all the devices on the GP-IB bus. The LLO message requests that all device with RL function be prohibited from transitioning to the local state.

#### 【Argument】

None

# GET

## Send a trigger to a specified device

### Format

#### GET [addresses]

---

Send a GET message that issues a trigger to a specified device on the GP-IB bus. GET message is used to the device specified as a listener.

#### 【Argument】

Addresses: It is a device address of two decimal digits separated by 1 to 31 commas. Device address range is 00 to 30.

#### 【Example】

GET 00,01,30
--------------

It issues a trigger to the device with device address 0, 1, 30.

# CMD

## Send an interface message

### Format

#### CMD [messages]

Send an interface message on the GP-IB bus. The interface message is a multiline message sent from the active controller to all the devices on the GP-IB bus using the DIO signal when the ATN signal is true.

Bits ②	b7				b6				b5				b4				b3				b2				b1							
	column				row				column				row				column				row											
	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1				
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1
	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0
	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1
	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1
	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1
	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1
	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

### 【Argument】

Messages: A hexadecimal two-digit interface message represented by an uppercase ASCII character separated by 1 to 31 commas.

### 【Example】

```
CMD 3F,20,21,43
```

Send 3F(UNL), 20(LA0), 21(LA1), 43(TA3).

## TAD

### Set a specified device as a talker

#### Format

```
TAD [address]
```

Set a specified device as a talker on the GP-IB bus.

### 【Argument】

Address: Device address of two decimal digits, device address range is 00 to 30.

### 【Example】

```
TAD 01
```

Set the device with device address 1 as a talker.

## LAD

### Set a specified device as a listener

#### Format

```
LAD [addresses]
```

Set a specified device as a listener on the GP-IB bus.

### 【Argument】

Addresses: It is a device address of two decimal digits separated by 1 to 31 commas. Device address range is 00 to 30.

### 【Example】

```
LAD 00,01,30
```

Set the device with device address 0, 1, 30 as a listener.

# DAT

## Send a device message as ASCII character string data

### Format

#### DAT [ascii-chars]

Send a device message on the GP-IB bus. Use the ASCII character as the argument of the message.

#### 【Argument】

ascii-chars: ASCII character string from 0x21 to 0x7e. the ASCII character string must be less than 16384 characters in length including the command delimiter.

#### 【Note】

When using the multi-command function, the colon “:” character can not be used. When using the colon “:” character, please disable the multi-command function. In this command, delimiters are not output on the GP-IB bus at the end of the character string.

#### 【Example】

```
DAT ABCD1234
```

ABCD1234 is sent as a device message on the GP-IB bus.

# DATB

## Send a device message as a binary data

### Format

#### DATB [HByte-chars]

Send a device message on the GP-IB bus. Use an argument with a byte string as a hexadecimal ASCII character string.

#### 【Argument】

HByte-chars: Two hexadecimal digit byte data represented by uppercase ASCII characters separated by 1 to 5000 commas.

#### 【Note】

In this command, delimiters are not output on the GP-IB bus at the end of the character string.

#### 【Example】

```
DATB 05, F0, 0A, A0
```

0x05, 0xf0, 0x0a, 0xa0 are sequentially sent as device messages on the GP-IB bus.

## OUT

### Send device message with listener device specification

#### Format

**OUT [listener-addr];[ascii-chars]**

Send the device message to the specified one listener device on the GP-IB bus. Use the ASCII character as the argument of the message. Add the delimiter set by the DLM command to the end of the message and send it on the GP-IB bus.

#### 【Argument】

listener-addr: It is a listener device address of two decimal digits, address range is 00 to 30.

ascii-chars: It is ASCII character string from 0x21 to 0x7e. The ASCII character string must be less than 16384 characters in length including the command delimiter.

#### 【Note】

When using the multi-command function, you can not used the colon " : " character string. Please disable the multi-command function when using the colon " : ".

#### 【Example】

```
OUT 01;1234WXYZ
```

Set device address 1 as a listener. Send device message "1234WXYZ" with the delimiter which is set by the DLM command at the end of the device message to the GP-IB bus.

## OUTB

### Send device message with listener device specification

#### Format

**OUTB [listener-addr];[HByte-chars]**

Send the device message to the specified one listener device on the GP-IB bus. Use byte string as a hexadecimal ASCII character string, as an argument of the message. The delimiter is always EOI and sends to the last byte of the message.

#### 【Argument】

listener-addr: It is a listener device address of two decimal digits, address range is 00 to 30.

HByte-chars: Hexadecimal two digits byte data that is represented by uppercase ASCII characters and separated by 1 to 5000 commas.

#### 【Note】

The setting of DLM command is ignored, and the delimiter is always EOI only.

#### 【Example】

```
OUTB 01;50,F0,0A,A0
```

Set device address 1 as a listener. As a device message "0x50, 0xf0, 0x0a, 0xa0" are sequentially sent on the GP-IB bus, and EOI of the delimiter is sent together with the last byte 0xa0.

## IND

### Receive a device message as ASCII character string

#### Format

#### IND

It receives device messages from devices specified as talkers on the GP-IB bus. Received message are imported as ASCII characters, and reception is terminated by receiving the delimiter set by DLM command. ZS-6180AF is possible to receive device messages up to 16 Kbytes from the talker device, but received device message exceeding 16 Kbytes are discarded.

This command is used to repeated device messages from devices already specified as talkers.

#### 【Argument】

None

#### 【Return value】

ascii-chars: It is ASCII character string from 0x00 to 0xff. However, be sure to confirm that the talker equipment sends out only the printable code.

#### 【Note】

When using the multi-command function, use this command at the end. If an error occurs in the return value, the error information is preferentially returns.

#### 【Example】

IND
-----

It receives the device message that is sent ASCII character string and delimiter on the GP-IB bus from the equipment specified as a talker, and extracts the ASCII character string.

## INDB

### Receive a device message as a binary data

#### Format

#### INDB

It receives device messages from devices specified as talkers on the GP-IB bus. After setting the delimiter to EOI with DLM command, the received message is imported as a hexadecimal ASCII string of bytes, and reception is terminated by receiving the EOI of the delimiter. ZS-6180AF is possible to receive device messages up to 16 Kbytes from the talker device, but received device message exceeding 16 Kbytes are discarded.

This command is used to repeated device messages from devices already specified as talkers.

#### 【Argument】

None

**【Return value】**

HByte-chars: Hexadecimal two digits represented by ASCII characters up to 16 Kbytes.

**【Note】**

When using the multi-command function, use this command at the end. If an error occurs in the return value, the error information is preferentially returns.

**【Example】**

INDB
------

It receives the device message that is sent ASCII character string and delimiter on the GP-IB bus from the equipment specified as a talker, and extracts the ASCII character string.

## INP

### Receive device message with talker device specification

**Format**

**INP [talker-addr]**

It receives device messages from devices specified as talkers on the GP-IB bus. Received messages are imported as ASCII characters, and reception is terminated by receiving the delimiter set by the DLM command. ZS-6180AF is possible to receive device messages up to 16 Kbytes from the talker device, but received device message exceeding 16 Kbytes are discarded.

**【Argument】**

talker-addr: It is a talker device address of two decimal digits, address range is 00 to 30.

**【Return value】**

ascii-chars: It is ASCII character string from 0x00 to 0xff. However, be sure to confirm that the talker equipment sends out only the printable code.

**【Note】**

When using the multi-command function, use this command at the end. If an error occurs in the return value, the error information is preferentially returns.

**【Example】**

INP 01
--------

Set device address 1 as a talker, receive ASCII character string, delimiter sent as a device message from talker on GP-IB bus, and extract ASCII character string.

## INPB

### Receive device message with talker device specification

#### Format

#### INPB [talker-addr]

It receives device messages from devices specified as talkers on the GP-IB bus. After setting the delimiter to EOI with DLM command, the received message is imported as a hexadecimal ASCII string of bytes, and reception is terminated by receiving the EOI of the delimiter. ZS-6180AF is possible to receive device messages up to 16 Kbytes from the talker device, but received device message exceeding 16 Kbytes are discarded.

#### 【Argument】

talker-addr: It is a talker device address of two decimal digits, address range is 00 to 30.

#### 【Return value】

HByte-chars: Hexadecimal two digits represented by ASCII characters up to 16 Kbytes.

#### 【Note】

When using the multi-command function, use this command at the end. If an error occurs in the return value, the error information is preferentially returns.

#### 【Example】

INPB 01
---------

Set device address 1 as a talker, receive ASCII character string, delimiter sent as a device message from talker on GP-IB bus, and extract ASCII character string.

## INC

### Receive specified device message of the number of bytes with talker device specification

#### Format

#### INC [talker-addr];[Byte-chars]

Specify one talker device on GP-IB bus and receive device message. Received messages are imported as ASCII characters, and reception is terminated by receiving the specified number of bytes. The delimiter setting is invalid with this command, so please do not output EOI. ZS-6180AF is possible to receive device messages up to 16 Kbytes from the talker device, but received device message exceeding 16 Kbytes are discarded.

#### 【Argument】

talker-addr: It is a talker device address of two decimal digits, address range is 00 to 30.

Byte-chars: it is decimal two digits of specified number of bytes, range is 01 to 99.

#### 【Return Value】

ascii-chars: It is ASCII character string from 0x00 to 0xff. However, be sure to confirm that the talker equipment sends out only the printable code.

**【Note】**

When using the multi-command function, use this command at the end. If an error occurs in the return value, the error information is preferentially returns.

**【Example】**

```
INC 01;04
```

Set device address 1 as a talker, receive four bytes of ASCII character string sent as a device message from talker on GP-IB bus, and extract ASCII character string.

## INCB

Receive specified device message of the number of bytes with talker device specification

**Format**

```
INCB [talker-addr];[Byte-chars]
```

Specify one talker device on GP-IB bus and receive device message. Received messages are imported as ASCII characters, and reception is terminated by receiving the specified number of bytes. The delimiter setting is invalid with this command, so please do not output EOI. ZS-6180AF is possible to receive device messages up to 16 Kbytes from the talker device, but received device message exceeding 16 Kbytes are discarded.

**【Argument】**

talker-addr: It is a talker device address of two decimal digits, address range is 00 to 30.

Byte-chars: it is decimal two digits of specified number of bytes, range is 01 to 99.

**【Return Value】**

HByte-chars: Hexadecimal two digits represented by ASCII characters up to 16 Kbytes.

**【Note】**

When using the multi-command function, use this command at the end. If an error occurs in the return value, the error information is preferentially returns.

**【Example】**

```
INPC 01;04
```

Set device address 1 as a talker, receive four bytes of the data sent as a device message from talker on GP-IB bus, and extract hexadecimal two digits ASCII data string.

# RDS

## Execute a serial poll

### Format

#### RDS [addresses]

Execute a serial poll for a specific device on the GP-IB bus. After execution, returns the device address and status byte. The host computer judges which device issued the SRQ.

#### 【Argument】

Addresses: Device address of decimal two digits separated by 1 to 31 commas, device address range is 00 to 30.

#### 【Return Value】

adr-stb: The device address of the specified device and the status byte are returned hexadecimal two digits. If there are two or more specified device addresses, the return values of those devices are also added. In case of the status byte with delimiter is 40 or more in hexadecimal, it indicates that the device is generating SRQ.

#### 【Example】

```
RDS 00,01,30
```

Serial poll is executed on the device with device address 0, 1, 30. If the return value is returned as below, the device with device address 0 is generating SRQ.

```
004001001E00
```

# DLM

## Set a delimiter of device message

### Format

#### DLM [delimiter]

Set the delimiter when outputting device message from the ZS-6180AF onto the GP-IB bus. After turning on the power, delimiter is set CR, LF, EOI.

#### 【Argument】

Delimiter: It is parameter of decimal two digits, setting value is 00 to 04.

Setting value	Delimiter
00	CR, LF, EOI
01	LF, EOI
02	LF
03	CR, LF
04	EOI

**【Example】**

DLM 01

Set the delimiter LF, EOI

## TOE

### Set a timeout of GP-IB handshake

**Format**

**TOE [time]**

Set the time from GP-IB handshake stop to restart. When handshake stop period exceeds setting value, G-ERR error message is sent to the host computer. ZS-6180Af does not execute the recovery of the handshake stop. The setting time is value multiplied by 100 ms to the value expressed in hexadecimal two digits. After turning on the power, it is set to FF and timeout is set to 25.5 seconds.

**【Argument】**

time: It is parameter of hexadecimal two digits, setting value is 00 to FF.

Setting value	Setting time
00	Invalid (Send P-ERR)
01	100 ms
02	200 ms
:	:
:	:
FF	25.5 sec

**【Example】**

TOE 02

Set the time to 200 ms until G-ERR is sent.

## SRQE

### Enable SRQE mode

**Format**

**SRQE**

When SRQ occurs on the GP-IB system, set to send SRQ message to the host computer.

If SRQ occurs while another command is being executed, SRQ message is sent after completed of the command execution.

**【Argument】**

None

### 【Note】

If SRQ has occurred on the GP-IB system before this command is executed, ZS-6180AF is not possible to detect that SRQ. ZS-6180Af is possible to detect SRQ when SRQE mode is set and it is in SRQE mode. Therefore, in order to forcibly release the SRQ, execute the RDS command for all the connected devices.

### 【Sending message】

SRQ **CR** **LF**

### 【Example】

SRQE

When SRQ occurs on the GP-IB system, set to send SRQ message to the host computer.

## SRQD

### Disable SRQ mode

#### Format

SRQD

When SRQ occurs on the GP-IB system, set not to send SRQ message to the host computer.

After turning on the power, this mode is set.

### 【Argument】

None

### 【Example】

SRQD

When SRQ occurs on the GP-IB system, set not to send SRQ message to the host computer.

## SGA

### Set the GP-IB address of ZS-6180AF

#### Format

SGA [address]

Set the GP-IB address of ZS-6180Af. After tuning on the power, GP-IB address is set 00.

### 【Argument】

Address: Device address of decimal two digits, device address rang is 00 to 30.

### 【Example】

SGA 06

Set the GP-IB address of ZS-6180AF to 6.

# MCE

## Enable multi-command

### Format

#### MCE

Set the mode to enable multi-command. After turning on the power, ZS-6180Af is set to disable multi-command.

#### 【Argument】

None

#### 【Example】

MCE
-----

Set the mode to enable multi-command.

# MCD

## Disable multi-command

### Format

#### MCD

Set the mode to disable multi-command. After turning on the power, ZS-6180Af is set to disable multi-command.

#### 【Argument】

None

#### 【Example】

MCD
-----

Set the mode to disable multi-command.

# RST

## Reset ZS-6180AF

### Format

#### RST

It is initializes ZS-6180AF. If it is not R-ERR, ZS-6180Af is possible to be initialized by this command at any time from the host computer.

#### 【Argument】

None

#### 【Example】

RST
-----

It is initializes ZS-6180AF.

## 7. Sample program

It explains the sample program that is possible to be downloaded from our website.

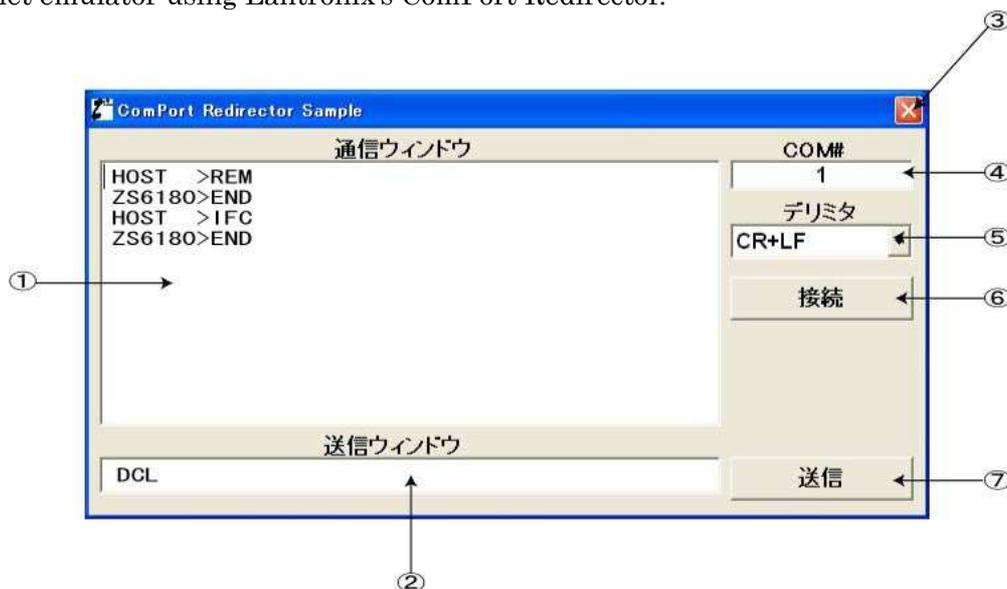
This program is created with Microsoft®VisualBasic 6, VisualBasic.NET, Visual C++6, VisualBasic C++.NET and gcc for Linux.

The function of this program is a basic Telnet emulator.

In Visual basic and Visual C++, two types of programs are prepared for each version. On Linux, prepared TCP/IP Telnet emulator.

- ① Telnet emulator using Lantronix's ComPort Redirector.
- ② TCP/IP Telnet emulator using Winsock API or Win32 API.

### 1. Telnet emulator using Lantronix's ComPort Redirector.

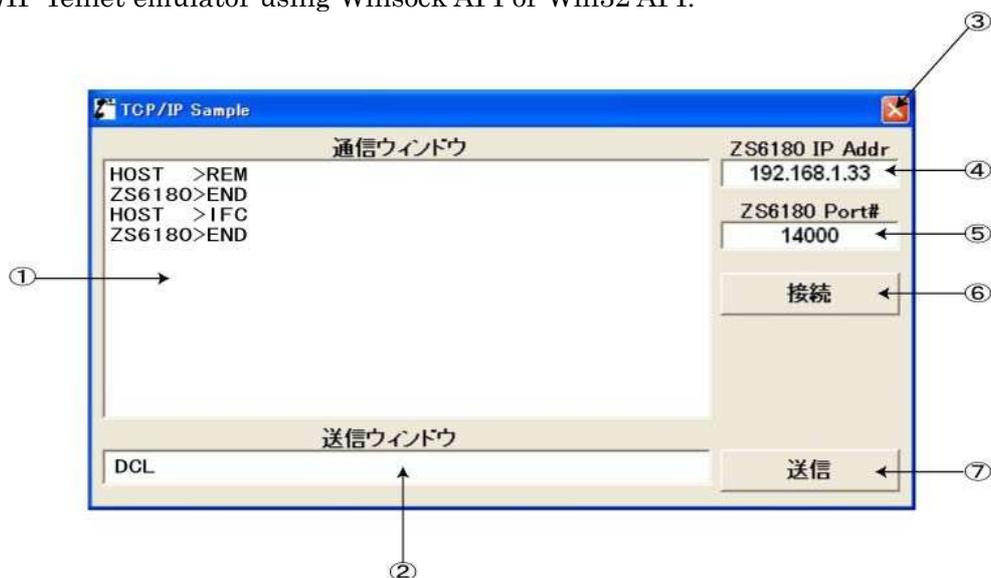


### Description of each function

- ① Communication window (Text Box)  
This window displays the communication contents between the host computer and ZS-6180AF.  
It does not correspond to the latest 25 rows binary.
- ② Command sending window (Text Box)  
Enter the command that the host computer sends to ZS-6180AF.
- ③ Closed button  
Press this button to end the program.
- ④ ComPort number window (Text Box)  
Enter the ComPort number set by ComPortRedirector.
- ⑤ Delimiter setting box (combo box)  
Delimiters "CR", "LF", "CR, LF" can be selected, but always select "CR, LF"
- ⑥ Connect/Disconnect button (command button)  
Set the ComPort to Open/Closed
- ⑦ Send button (command button)  
Send the command entered in window②.

Note) Communication protocol is 19200bps, no parity, stop bit 1, character bit length 8. The communication speed can be up to 230.4Kbps. You can set it freely in this range.

## 2. TCP/IP Telnet emulator using Winsock API or Win32 API.



### Description of each function

- ① Communication window (Text box)  
This window displays the communication contents between the host computer and ZS-6180AF.  
It does not correspond to the latest 10 rows binary.
- ② Command sending window (Text box)  
Enter the command that the host computer sends to ZS-6180AF.
- ③ Closed button  
Press this button to end the program.
- ④ IP address of ZS-6180AF setting window  
Enter the IP address of ZS-6180AF.
- ⑤ Port number of ZS-6180AF setting window  
Enter the port number of ZS-6180AF.
- ⑥ Connect/Disconnect button  
Set the TCP/IP to Open/Closed.
- ⑦ Send button (command button)  
Send the command entered in window.

3. TCP/IP Telnet emulator for Linux (Program name: ZS6180smp).  
This program runs on the console.

```
masa@localhost: ~/ZS6180
ファイル(F) 編集(E) 表示(V) 端末(T) 移動(G) ヘルプ(H)
[masa@localhost ZS6180]$ ./ZS6180smp 192.168.1.38 14000 ----- ①
connected to '192.168.1.38'----- ①'
REM ----- ②
END ----- ②'
IFC ----- ③
END ----- ③'
DCL ----- ④
END ----- ④'
quit ----- ⑤
[masa@localhost ZS6180]$ ----- ⑤'
```

#### Description of console screen

- ① [masa@localhostZS-6180]\$ is the command prompt. Enter the program name in the underlined part of the screen and execute it. If the path does not connect, it needs to enter the full path or relative path. Enter the IP address and port number of ZS-6180AF as an argument.
- ①' When connecting with ZS-6180AF, it is displayed like this.
- ② Send REM command to ZS-6180AF.
- ②' There was an END response from ZS-6180AF.
- ③ Send IFC command to ZS-6180AF.
- ③' There was an END response from ZS-6180AF.
- ④ Send DCL command to ZS-6180AF.
- ④' There was an END response from ZS-6180AF.
- ⑤ Enter "quit" for ZS-6180smp program and instruct program termination. The program will release the connection with ZS-6180AF according to this instruction.
- ⑤' The program exits and returns to the command prompt.

## 8. Glossary

### .NET (dot net)

A system infrastructure that provides a network-based application operating environment that Microsoft announced in July 2000. It further evolved the company's "Windows DNA" strategy. Aiming to build a set of rules such as software, description language, protocol, etc. that are the foundation of applications spread on the network including the internet as "service" and use from various terminals.

### 100BASE-TX

A representative of a star Ethernet defined as the IEEE 802.3u standard. Ethernet is built using STP or two pairs of Category 5 UTP, maximum cable length is 100m.

### 10BASE-T

Ethernet connection method using twisted cable. "10" of 10BASE-T represents an Ethernet transmission rate of 10Mbps, and "-T" represents a twisted pair cable. In this method, each node constituting the network is connected in a star form by a hub, and nodes can not be directly connected without hub. The maximum length from the hub to the network card is 100m.

### ARP (address resolution protocol)

In TCP/IP network, a protocol used to obtain Ethernet physical address (MAC address) from IP address. It is RARP (reverse address resolution protocol) to obtain the IP address based on the physical address.

### Auto IP (dynamic configuration of IPv4 Link-Local Address)

A protocol that automatically assigns IP address in IPv4. Select an appropriate address, inquiry by ARP and assign it if there is no response.

### BSC (binary synchronous communication)

Data transmission method developed by IBM Corporation in 1964. Also known as asynchronous transmission procedure, it is used for one-to-one short distance information transmission. It is a communication transmission system standardly installed in many personal computers, and it is widely used as a simple communication processing device.

### BOOTP (BOOT strap protocol)

Protocol for the client machine to automatically read the network setting from the server on the TCP/IP network. It is defined as RFC951. A client machine that is corresponded BOOTP automatically configures host name, domain name, IP address, subnet mask, DNS server, etc.

### CSMA/CD (carrier sense multiple access with collision detection)

It is one of the communication methods used on the LAN, and Ethernet adopts it. The node that wants to transmit data monitors the communication status of the cable, and starts transmission when a cable is useable. At this time, if a plurality of nodes start transmission at the same time, since data collides and breaks in the cable, both of them stop transmission and wait for a random time to resume transmission. According to this method, a signal cable can be shared by a plurality of nodes and communicate with each other.

### COM port (communication port)

Serial port of PC/AT compatible machine, expansion board with external communication function, etc. in addition, it may point to a connector on the PC side corresponding to them. These are sometimes called "RS-232C ports". Most of the connector shape is D-sub 9 pin, there is conversion cable and conversion connector by USB connection.

### **DHCP (dynamic host configuration protocol)**

A protocol that automatically assigns necessary information such as IP address to a computer temporarily connected to the internet. It is set the IP address of the gateway server and DNS server, the subnet mask, the range of IP address that may be allocated to the client in the DHCP server. Provide these information to computers that have accessed using dialup etc. When the client finishes communicating, it automatically collects the address and assigns it to another computer.

### **DMZ (demilitarized zone)**

In a network connected to the internet, it is an area isolated from a foreign network (internet) and an internal network within the organization by a firewall. By placing a server to be released to the outside here, unauthorized access from the outside can be eliminated by the firewall, and even if the public server is hijack, the internal network will not be damaged.

### **Ethernet**

This is LAN standard conceived by Xerox and DEC. ethernet was standardized by the IEEE802.3 committee. CSMA/CD is adopted for access control. Most of LANs are Ethernet except for special applications. The connection form Ethernet includes a bus type in which one line is shared by a plurality of devices and a star type in which each device is connected via a hub. There are also several types depending on the maximum transmission distance and communication speed.

### **Fast Ethernet**

High-speed Ethernet standard with communication speed increased to 100Mbps. Fast Ethernet has 100BASE-TX using twisted pair cable and 100BASE-FX using optical fiber cable. Most of the devices for 100BASE-TX are compatible with 10BASE-T, and can be mixed in one network.

### **FTP (file transfer protocol)**

FTP is defined by IETF in RFC959. A protocol used when transferring files on a TCP/IP network such as the internet or intranet. It is a protocol that is frequently used alongside HTTP and SMTP/POP on the internet.

### **Gigabit Ethernet**

High-speed Ethernet standard with communication speed increased to 1Gbps. In the Gigabit Ethernet standard, 1000BASE-SX and 1000BASE-LX commonly using optical fiber cable are standardized as IEEE802.3z. Standards using category 5 twisted pair cable which is compatible with widely popular 10BASE-T and 100BASE-TX also have been established.

### **MAC (media access control)**

Transmission control technology used in LAN, etc. In the OSI reference model, it is the lower sublayer of the data link layer, and specifies the transmission/reception method of the frame, the format of the frame, the error detection method, and the like. MAC includes CSMA/CD used for Ethernet, Token passing method used for TokenRing, FDDI, etc.

### **MAC address**

Each Ethernet card has a unique ID number. Every one of the Ethernet cards in the world is assigned a unique number, and data is exchanged between the cards based on this number. It is represented by a combination of a unique number for each manufacturer managed and assigned by the IEEE and a number that the manufacturer independently assigns to each card.

### **RJ-45**

One of connector shapes connecting cables. 8-conductor modular connector used for Ethernet cable, ISDN line, etc. The shape is similar to RJ - 11 used for telephone line, but this one is larger than RJ-11.