

INSTRUMENTATION AMPLIFIER**WGI-400A****INSTRUCTION MANUAL****For****OPTIONAL FUNCTIONS****RS-232C****RS-485****BCD**

Thank you for purchasing KYOWA's product WGI-400A Instrumentation Amplifier with Multipurpose Indicator.

Read this Instruction Manual for Optional Functions for the WGI-400A carefully in order to make full use of the high performance capabilities of the product.

Do not use the product in methods other than described in this Manual.

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The Manual has been compiled with great care. However, if the need should arise for more information, contact KYOWA or our representatives.

The contents of the Manual are subjected to change without prior notice.

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1. RS-232C/RS-485 CONNECTION METHOD

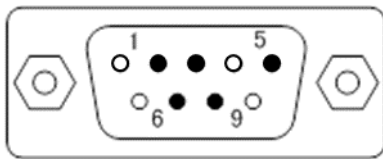
1-1 RS-232C OPTION

By using RS-232C interface equipped WGI-400A-02 and WGI-400A-12 Instrumentation Amplifier with Multipurpose Indicator (hereinafter referred to as the WGI-400A), various functions can be set as well as measured values can be read from external devices.

1) Specifications

	Conforming to RS-232C	Initial Set Value
Communication method	Full duplex system	
Transmission speed	2400, 4800, 9600, 19200, or 38400 bps	9600 bps
Data length	7 bits or 8 bits	7 bits
Parity bit	None, odd number or even number	Odd number
Stop bit	1 bit or 2 bits	1 bit
Delimiter	CR or CR+LF	Transmit: CR+LF, Receive: CR
Output code	ASCII	

2) Connector Pin and Signal Name



Pin type (male)

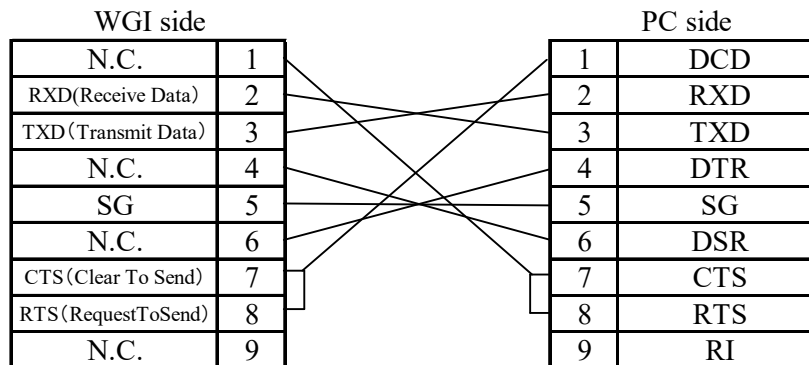
Front view of the RS-232C connector
(D-sub connector) on the rear panel.

Pin No.	Signal Name
1	N.C.
2	RXD (Receive Data)
3	TXD (Transmit Data)
4	N.C.
5	SG
6	N.C.
7	CTS (Clear To Send)
8	RTS (Request To Send)
9	N.C.

3) Connecting to External Devices

(1) Connection

For connecting external devices to the PC, use commercially available RS cross cable (Reversible type).



(2) Setting External Devices

Set external devices by conforming to WGI-400A signal specifications.

Note: The WGI-400A is not compatible with XON/XOFF control and send brake signal.

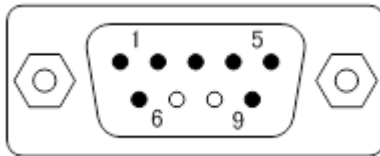
1-2 RS-485 OPTION

By using RS-485 interface equipped WGI-400-03 and WGI-400-13, various functions can be set as well as measured values can be read from external devices.

1) Specifications

	Conforming to RS-485	Initial Set Value
Communication method	2-wire half duplex system	
Transmission speed	2400, 4800, 9600, 19200, or 38400 bps	9600 bps
Data length	7 bits or 8 bits	7 bits
Parity bit	None, odd number, or even number	Odd number
Stop bit	1 bit, or 2 bits	1 bit
Delimiter	CR or CR+LF	Transmit: CR+LF, Receive: CR
Output code	ASCII	

2) Connector Pins and Signal Names



Pin type (male)

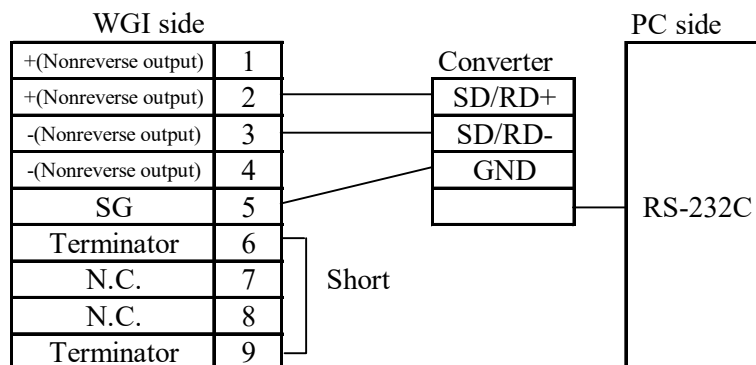
Front view of the RS-485 connector
(D-sub connector) on the rear panel.

Pin No.	Signal Name
1	+ (Non-reversing output)
2	+ (Non-reversing output)
3	- (Reversing output)
4	- (Reversing output)
5	SG
6	Terminator
7	N.C.
8	N.C.
9	Terminator

3) Connecting to External Devices

(1) Connection

- For connecting external devices to the PC, use the RS-485 ↔ RS-232C converter. (See the following recommended converter.)
- Pin Nos. 1 and 2 as well as pin Nos. 3 and 4 are provided with the same functions to be used for bys wiring.
- It is required to attach a terminating resistor to a device connected at the end of the transmission line. Short-circuit connector pins No. 6 and 9. Then, terminating resistor (200 Ω) attached state is obtained.
- Set the converter switch to DTE.



Recommended converter: SI-30 (RS-485 ↔ RS-232C converter) LINEEYE CORP. made.

(2) Setting External Devices

Set external devices by conforming to signal specifications of the WGI-400A.

RS-485 transceiver of the WGI-400A is provided with fail-safe function that is designed to have the CPU output (RO) becomes 'Hi' when signal is received and when between outputs A and B (Between reverse and non-reverse outputs) is short-circuited or in float state.

In addition, when the WGI-400A is waiting to receive the signal, outputs between A and B becomes nearly short-circuited. And if transceiver of the external device does not have fail-safe function, the output side of the external devices may not become 'Hi.' As a result, data transmitted from the WGI-400A may not be properly received. Therefore, it is recommended to use the transceiver with the fail-safe function.

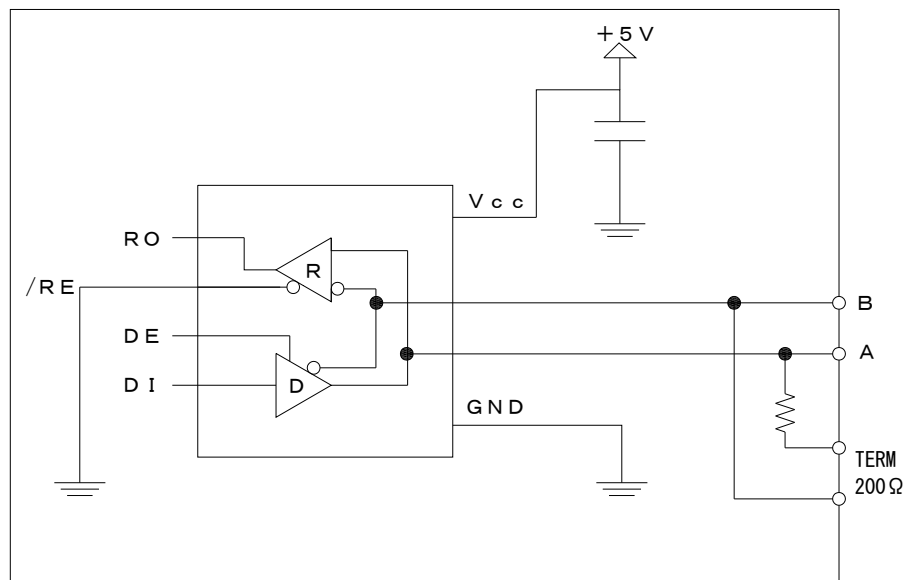


Figure 1. WGI-400A Side RS-485 Circuit

Logic Table

[When transmitting data]

INPUT			OUTPUT	
/RE	DE	DI	B	A
0	1	1	0	1
0	1	0	1	0
X	0	X	Hi-Z	Hi-Z

[When receiving data]

INPUT		A-B	OUTPUT
/RE	DE		RO
0	0	$\geq 300 \text{ mV}$	1
0	0	$\leq -300 \text{ mV}$	0
0	0	OPEN	1
0	0	SHORT	1

4) Communication Procedures

(1) Establishing Communication

Since the RS-485 is in a 'one-to-n' communication system, the RS-485 communication is established by specifying the ID.

Use a software that is capable of sending binary code and input the following commands.

Communication establishing command.

<ENQ>01<CR>
 └── Device ID (Specified with 2 digits)

After establishing the communication, the following response is received.

<ACK>01<CR><LF>
 └── Device ID

(No response is received with different device IDs.)

(2) Entering Command

After establishing the communication, input the required command by referring to "2-1 CONTROL COMMAND LIST."

(3) Opening Communication

Input the following command to open the communication.

<EOT><CR><LF>

(No response is received to this open command.)

If a different ID is specified without opening the communication, the new communication is established with the newly specified ID.

(4) Command Interval

When command is transmitted from the PC, sequencer, etc., set command transmit interval to a time more than that obtained by the following expression.

$$\text{Command interval} = \text{Transmit command time} + 20 \text{ ms} + \text{Response command time} + 5 \text{ ms}$$

where, Transmit command time: Send character transmit time with the preset baud rate.

Response command time: Response characters transmit time with the preset baud rate.

In the default setting^{*1}, the recommended command interval of the display value output command "GDT1" is 50 ms or more.

*1: (Transmission speed: 9600 bps, Parity bit: Odd number, Stop bit: 1 bit, Receive delimiter: CR, Transmit delimiter: CR+LF)

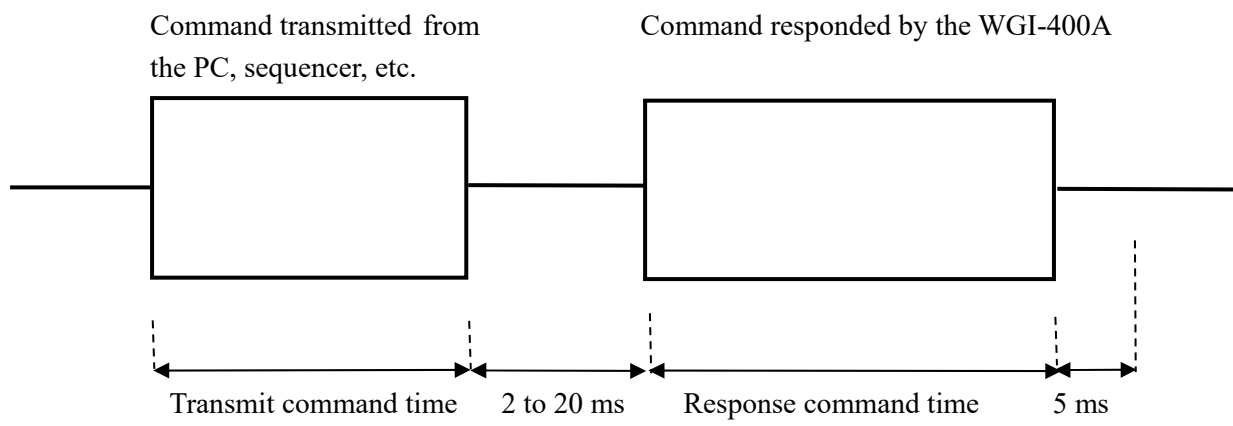


Figure 2. Command Transmit/Receive Timing

1-3 SETTING RS-232C OUTPUT & RS-485 OUTPUT

Set RS communication with functions 'F-15' and 'F-16.'

Function 'F-17' is used for setting device ID (With only RS-485).

Function Selecting Mode Function Name	Key Operation and WGI-400A Movement in Function Setting Mode	Functional Description
F-15 Setting RS '1' Initial value: '2.1.0' Baud rate: 9600 bps Receive delimiter: CR Transmit delimiter: CR+LF	Displays the following items 1), 2), and 3). 1) Baud rate 0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 2) Receive delimiter 3) Transmit delimiter 0: CR + LF 0: CR + LF 1: CR 1: CR Select and change items 1), 2), and 3) and press the SET key.	A function capable of setting baud rate, receive delimiter and transmit delimiter.
F-16 Setting RS '2' Initial value: '0.1.1' Data length: 7 bits Parity bit: Odd number parity Stop bit: 1 bit	Displays the following items 1), 2), and 3). 1) Data length 0: 7 bits 1: 8 bits 2) Parity bit 3) Stop bit 0: No parity 0: 2 bits 1: Odd number parity 1: 1 bit 2: Even number parity Select and change items 1), 2), and 3) and press the SET key.	A function capable of setting data length, parity bit, and stop bit.
F-17 Setting device ID (For only RS-485) Initial value: '0.1.'	Set the device ID and press the SET key. • Setting range: 01 to 99 '00' is invalid. In addition, set the ID different from other devices.	When RS-485 is used, by setting device IDs, establishing communication is enabled by connecting in parallel multiple WGI-400As.

Key operation: See "3-9 FUNCTION SELECTING MODE" in the WGI-400A Instruction Manual (Separate Volume)

1-4 SETTING HYPERTERMNAL

This section describes an example of using HyperTerminal that is included Windows accessory as a communication means.

- 1) Startup HyperTerminal.

Point to **Accessories**. Select **Communications** and then, select **Hyperterminal**.

- 2) Set the communication port as shown in the following figure according to the WGI-400A signal specifications.

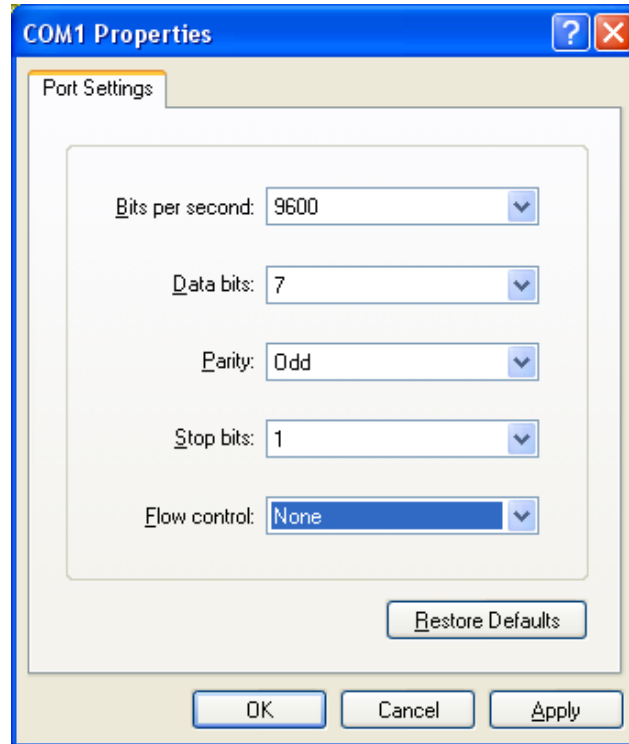


Figure 3. Port Settings Screen

- 3) For RS-232C

Communication is established with the above setting.

Check the communication state by referring to item 5) in the next page.

- 4) For RS-485

Transmit the communication establish command.

Communication establish command

`<ENQ>>01<CR>`
 └── Device ID (Specified by 2 digits)

For details actually entering from the keyboard, see "2-2-7 Code Table."

At this time, input `Ctrl` + `E 0 1` keys.

After communication is established, the device ID returns as '01.'

(Not respond with different device ID.)

5) Checking Communication State

To check whether or not communication is established, input RS line test command.

Press the **R** **S** **□** <CR> keys.

(Press the **Enter** key to function as same as the <CR>)

If the following response 'RS-485 <CR><LF>' is received, the communication is correctly established.

When using the RS-232C, 'RS-232C <CR><LF>' appears.

(<CR>: Return to line head. <LF>: Leave 1 blank line)

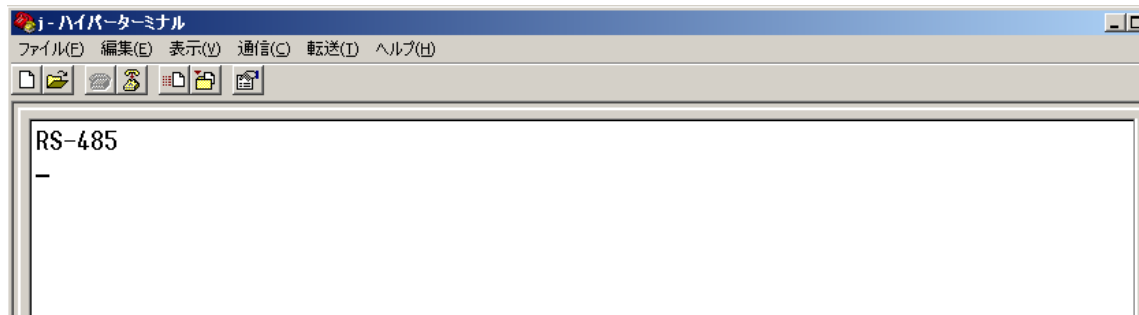


Figure 4. HyperTerminal Screen

2. CONTROL COMMAND

2-1 CONTROL COMMAND LIST

Type	Contents	Command	Pages
Initial Setting	1) RS line test	RS-	9
	2) Initialize	RES	9
	3) Output model name, etc.	SYS	9
	4) Set transmission mode (Only RS-232C)	MOD	10
	5) Setting save command	/M	11
Read	6) Read measured value	GDT1	12
	7) Read status	GST	12
	8) Read various set values	PRR	13
	9) Display original value	GOD	15
Setting	10) Actual load calibration	VCL	15
	11) Sensitivity registering calibration	EIC	15
	12) Numeric value registering calibration	VRC	15
	(13) Smoothing	SSM*	16
	14) Additional value	SZM*	16
	15) Auto-Zero compensation	SZT*	16
	16) Analog output	SAO*	17
	17) Comparator	SCV*	17
	18) Hysteresis	SHY*	17
	19) Level test	LVS*	18
	20) Operation pattern	SOP*	18
	21) BV Select	SBV*	18
	22) Key lock	LCK	18
	23) Set RS	SRS*	19
Measurement	24) Self check	CHK	19
	25) Digital Zero	ZAD	19
Others	26) Not defined command response	ng	21
	27) Communication error	Error X	21
Binary code (Only RS-485)	[1] Establishing communication	<ENQ>	21
	[2] Opening communication	<EOT>	21

Commands with asterisk mark (*) correspond to “Setting save command ‘/M.’

For details, see item “5) ‘/M’ on page 11.

2-2 DETAILS OF VARIOUS CONTROL COMMANDS

This section describes various control commands and parameters following after the commands.
(<CR> and <CR><LF> denote termination codes.)

2-2-1 Setting Default

1) [RS-]

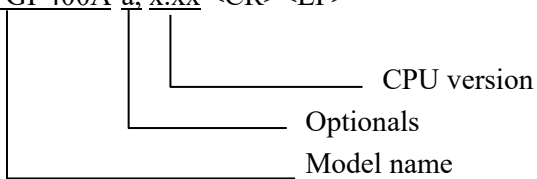
Contents:	RS line test
Format:	RS - <CR>
Parameter:	None
Return value format:	RS-232C <CR><LF> or RS-485 <CR><LF> Corresponding to the cable in use. (When command is normally received.)

2) [RES]

Contents:	Initialize (Relevant to panel operation 'F-12.')
Format:	RES<CR>
Parameter:	None
Return value format:	ok <CR><LF>

Description & others: Results of this command is enabled even if the power is turned OFF.

3) [SYS]

Contents:	Output model name, etc.
Format:	SYS<CR>
Parameter:	None
Return value format:	<u>WGI-400A-a</u> , <u>x.xx</u> <CR><LF> 

Description & others: Contents of return value a are as follows.

- 0: No optional
- 1: BCD option
- 2: RS-232C option
- 3: RS-485 option

4) [MOD] Only for RS-232C

Contents:	Sets transmission mode
Format:	MODpp<CR>
Parameter:	pp (Transmission mode) 00: Repeatedly output the indicated value and status. 02: Output the indicated value and status only once at hold mode. 10: Operation by control command.
Description & others:	This command becomes disabled with the power OFF. Power ON, and it is in Mode 10 operation mode.
Return value format:	None

(1) Mode 00 return value

D1±xxxxxx<CR><LF>

Sabcdefgh<CR><LF>

- Mode 00 sequentially outputs the indicated value and status in order.
- The return value ±xxxxxx is a indicated value with a decimal point.
- If the indicated value has no decimal point, it is filled with '0s' from the head.
- Return value abcdefgh represents status with '1' or '0.'

Numeric '1' is outputted to describe the following state.

- a: Comparator H is [ON].
- b: Comparator L is [ON].
- c: OK output is [ON].
- d: Spare
- e: During measurement
- f: Detecting peak
- g: During hold
- h: Spare

- To stop the output, set the mode to Mode 10.
- If it is not available to set the Mode 10, turn OFF the WGI-400A once and turn ON again. Then, setting the Mode 10 is available.

(2) Mode 02 return value

D1±xxxxx<CR><LF>

Sabcdefg<CR><LF>

- Mode 02 outputs the indicated value and status only once at hold.
- After outputting the indicated value and status, the mode automatically becomes to Mode 10.
Contents of the indicated value and status are as same as those of Mode 00.
- When the WGI-400A is operating in Mode 00, if the Mode 02 is specified, the following is sent back.
ng <CR><LF>

(3) Mode 10 return value

ok <CR><LF>

- Mode 10 controls the WGI-400A according to control command.
- The WGI-400A operates according to contents of the control commands.

5) [/M]

Contents: Write setting save command and setting item in non-volatile memory.

Format: *****/M<CR>

_____ Corresponding command

Description & others:

Add ‘/M<CR>’ at the end of the determined command. Then, it is stored in the non-volatile memory.

If the power is turned OFF, the contents determined without this command shall return to the original setting.

(Only commands with asterisk mark (*) in 2-1 CONTROL COMMAND LIST.)

2-2-2 Read

6) [GDT1]

Contents: Outputs indicated value.
Format: GDT1 <CR>
Parameter: None
Return value format: DI ±xxxxx <CR><LF>

Description & others: Return value ±xxxxx is an indicated value with a decimal point.
If the indicated value has no decimal point, it is filled with '0s' from the head.

Ex.) Return value when the indicated value is '99.99.'

DI + 99.99 (CR><LF>

Ex.) Return value when the indicated value is '-99.'

DI - 00099 (CR><LF>

Ex.) Return value when the indicated value is '+OVER.'

DI + OFL (CR><LF>

7) [GST]

Contents: Outputs status.
Format: GST <CR>
Parameter: None
Return value format: Sabcdefgh <CR><LF>

Description & others: Return value abcdefgh denotes the status with '1' or '0.'
Numeric '1' is outputted in the following state.

a: Comparator H is [ON].

b: Comparator L is [ON].

c: OK output is [ON].

d: Spare

e: During measurement

f: Detecting peak

g: During hold

h: Spare

8) [PRRppp]

Contents: Outputs set value.

Format: PRRppp<CR>

Parameter: ppp

010	Sensitivity registering value
020	Smoothing
030	Additional value
040	Analog output set value
050	Hysteresis set value
051	Comparator H set value
052	Comparator L set value
058	Operation pattern
062	Level test
090	Auto-Zero compensation set value
101	RS set value

Return value format: None

(1) Return value of sensitivity registering value

±x.xxxx, ±yyyyy

Indicates an indicated value with a decimal point. If the indicated value has no decimal point, it is filled with '0s' from the head.

Sensor rated output value (mV/V)

(2) Return value of smoothing value

a, b<CR><LF>

Minimum scale set value

Moving average set value

See SSM command. (Page 17)

(3) Return value of additional value

1, ±xxxxx<CR><LF>

If the indicated value has no decimal point, it is filled with '0s' from the head.

(4) Return value of analog output set value

a, ±xxxxx, ±yyyyy

Indicated value in full scale

Indicated value when 0 V or 4 mA

0: Voltage output

1: Current output

If the indicated value has no decimal point, it is filled with '0s' from the head.

(5) Return value of hysteresis set value

xxxxx, yyyyy <CR><LF>

└──────────┬──────────┘
 Hysteresis set value of comparator L
 Hysteresis set value of comparator H

If the indicated value has no decimal point, it is filled with '0s' from the head.

(6) Return value of comparator H

±xxxxx <CR><LF>

Return value of comparator L

±xxxxx <CR><LF>

If the indicated value has no decimal point, it is filled with '0s' from the head.

(7) Return value of operation pattern

a <CR><LF>

└──────────┘
 0: Operation pattern 0
 1: Operation pattern 1
 2: Operation pattern 2
 3: Operation pattern 3

(8) Return value of level test

a, ±xxxxx <CR><LF>

└──────────┬──────────┘
 Level test value
└──────────┘
Adding function set value { 0: Disabled
 1: Enabled

If the indicated value has no decimal point, it is filled with '0s' from the head.

(9) Auto-Zero compensation set value response

xxxxx, y.y, z

└──────────┬──────────┬──────────┘
 Zero near Zero range
 Definition time
 Zero compensation range

If the indicated value has no decimal point, it is filled with '0s' from the head.

(10) Return value of RS set value

a, b, c, d, e, f <CR><LF>

└──────────┬──────────┬──────────┬──────────┬──────────┘
 Stop bit
 Parity bit
 Data length
 Transmit delimiter
 Receive delimiter
 Baud rate

See SRS command. (Page 20)

9) [GOD]

Contents:	Indicate the original value. (Relevant to panel operation F-01)
Format:	GOD<CR>
Parameter:	None
Return value format:	D0 $\pm x.xxxx$ <CR><LF>

Description & others: Return value $\pm x.xxxx$ is an input value with unit mV/V.

2-2-3 Setting

10) [VCL]

Contents:	Conduct actual load calibration (Relevant to panel operation F-02)
Format:	VCL $\pm xxxxx$ <CR>
Parameter:	<u>$\pm xxxxx$</u> └────────── Indicated value with a decimal point. If no decimal point is included, it is filled with '0s' from the head.
Return value format:	ok<CR><LF> (Normal) E-10<CR><LF> (+ side over error) E-11<CR><LF> (- side over error) E-12<CR><LF> (Gain error)

Description & others: Results of this command is overwritten and saved.

11) [EIC]

Contents:	Conduct sensitivity registering calibration. (Relevant to panel operation F-03)
Format:	EIC $\pm x.xxxx, \pm yyyyy$ <CR>
Parameter:	<u>$\pm x.xxxx, \pm yyyyy$</u> └──────────┬────────── Indicated value with a decimal point. If no decimal point is included, it is filled with '0s' from the head. └────────── Sensor rated output value (mV/V)
Return value format:	ok<CR><LF> E-12<CR><LF> (Gain error)

Description & others: Saves the results of this command.

12) [VRC]

Contents:	Conduct numeric value registering calibration. (Relevant to panel operation F-04)
Format:	VRC $\pm x.xxxx$ <CR>
Parameter:	$\pm x.xxxx$ (Input value with unit mV/V)
Return value format:	ok<CR><LF>

13) [SSM]

Contents: Set smoothing, moving average and minimum scale.
(Relevant to panel operation F-07.)

Format: SSM a, b<CR>

Parameter: a, b

Moving average times	Minimum scale
0: None	0: 1
1: 2 times	1: 2
2: 4times	2: 5
3: 8 times	3: 10
4: 16 times	4: 20
5: 32 times	5: 50
6: 64 times	6: 100
7: 128 times	

Return value format: ok<CR><LF>

14) [SZM]

Contents: Set additional value (Relevant to panel operation F-08.)

Format: SZM1, ±xxxxx<CR>

Parameter: ±xxxxx

└── Additional value (Setting range: ±9999)
Indicated value with a decimal point.
If no decimal point is included, it is filled with '0s' from the head.

Return value format: ok<CR><LF>

15) [SZT]

Contents: Set auto-Zero compensation. (Relevant to panel operation F-09.)

Format: SZT xxxxx, y, y, z<CR>

Parameter: xxxxx, y, y, z

Zero near Zero range
Definition time range
Zero compensation range

Indicated value with a decimal point.
If no decimal point is included, it is filled with '0s' from the head.

Return value format: ok>CR><LF>

16) [SAO]

Contents:	Set analog output (Relevant to panel operation F-06)
Format:	SAOa, ±xxxxx, ±yyyyy<CR>
Parameter:	a, <u>±xxxxx</u>, <u>±yyyyy</u> Indicated value in full scale Indicated value when 0 V or 4 mA 0: Voltage output 1: Current output Indicated value with a decimal point. If no decimal point is included, it is filled with '0s' from the head.
Return value format:	ok<CR><LF>

17) [SCV]

Contents:	Set comparator
Format:	SCVa, ±xxxxxx<CR>
Parameter:	a, <u>±xxxxxx</u> Comparative value (Setting range: ±9999) 1: Comparator H 2: Comparator L Indicated value with a decimal point. If no decimal point is included, it is filled with '0s' from the head.
Return value format:	ok<CR><LF>

18) [SHY]

Contents:	Set hysteresis (Relevant to panel operation F-10.)
Format:	SHYa, xxxxxx<CR>
Parameter:	a, <u>xxxxxx</u> Hysteresis (Setting range: 0 to 9999) 1: Comparator H 2: Comparator L Indicated value with a decimal point. If no decimal point is included, it is filled with '0s' from the head.
Return value format:	ok<CR><LF>

19) [LVS]

Contents:	Set level test (Relevant to panel operation F-25.)
Format:	LVSa, ±xxxxx <CR>
Parameter:	a, ±xxxxx Level test value (Setting range: ±9999) Additional function set value 0: Disabled 1: Enabled Indicated value with a decimal point. If no decimal point is included, it is filled with '0s' from the head.
Return value format:	ok<CR><LF>

20) [SOP]

Contents:	Set operation pattern (Relevant to panel operation F-14)
Format:	SOPa<CR>
Parameter:	a 0: Operation pattern 0 1: Operation pattern 1 2: Operation pattern 2 3: Operation pattern 3
Return value format:	ok<CR><LF> ng<CR><LF> (Controlling pattern from terminal)

21) [SBV]

Contents:	BV Select (Relevant to panel operation F-13)
Format:	SBVa<CR>
Parameter:	a 0: 2 V 1: 4 V
Return value format:	ok<CR><LF>

22) [LCK]

Contents:	Set keylock
Format:	LCKa<CR>
Parameter:	a 0: Cancel keylock 1: Set keylock
Return value format:	ok<CR><LF>

23) [SRS]

Contents: Set RS (Relevant to panel operations F-15 and F-16)
Format: SRSa, b, c, d, e, f(CR)

Contents of parameters are described in the following.

a: Baud rate	b: Receive delimiter
0: 2400 bps	0: CR/LF
1: 4800 bps	1: CR
2: 9600 bps	
3: 19200 bps	
4: 38400 bps	
c: Send delimiter	d: Data length
0: CR/LF	0: 7 bits
1: CR	1: 8 bits
e: Parity bit	f: Stop bit
0: No parity	0: 2 bits
1: Odd number parity	1: 1 bit
2: Even number parity	

Return value format: ok<CR><LF>

2-2-4 Measurement

24) [CHK]

Contents: Self-check (Relevant to panel operation F-05)
Format: CHK<CR>
Parameter: None
Return value format: ok<CR><LF> (Normal)
E-01<CR><LF> (RAM failure)
E-02<CR><LF> (Flash memory failure)

25) [ZAD]

Contents: Digital Zero command
Format: ZAD<CR>
Parameter: None
Return value format: ok<CR><LF>
ng<CR><LF> (When DZ command control input terminal is LO)

2-2-5 Others

26) Undefined Command Response

Contents: Response responded to undefined command.

Return value format: ng<CR><LF>

27) Communication Error

Contents: Communication error response is described in the following table.

Error Response	Framing Error	Parity Error	Over-Run Error
Error A			○
Error B		○	
Error C		○	○
Error D	○		
Error E	○		○
Error F	○	○	
Error G	○	○	○

2-2-6 Binary Code (RS-485)

[1] Establishing communication

Format: <ENQ>xx<CR>

└── Device ID (Specified with 2 digits)

Return value format: <ACK>xx<CR><LF>

└── Device ID
(Not respond if the device ID differs)

[2] Opening communication

Format: <EOT><CR>

Return value format: None

2-2-7 Code Table

Char	Key	Code	Char	Code	Char	Code	Char	Code
NUL	^@	0x00	SPACE	0x20	@	0x40	`	0x60
SOH	^A	0x01	!	0x21	A	0x41	a	0x61
STX	^B	0x02	”	0x22	B	0x42	b	0x62
ETX	^C	0x03	#	0x23	C	0x43	c	0x63
EOT	^D	0x04	\$	0x24	D	0x44	d	0x64
ENQ	^E	0x05	%	0x25	E	0x45	e	0x65
ACK	^F	0x06	&	0x26	F	0x46	f	0x66
BEL	^G	0x07	,	0x27	G	0x47	g	0x67
BS	^H	0x08	(	0x28	H	0x48	h	0x68
HT	^I	0x09	)	0x29	I	0x49	i	0x69
LF	^J	0x0A	*	0x2A	J	0x4A	j	0x6A
VT	^K	0x0B	+	0x2B	K	0x4B	k	0x6B
FF	^L	0x0C	,	0x2C	L	0x4C	l	0x6C
CR	^M	0x0D	-	0x2D	M	0x4D	m	0x6D
SO	^N	0x0E	.	0x2E	N	0x4E	n	0x6E
SI	^O	0x0F	/	0x2F	O	0x4F	o	0x6F
DLE	^P	0x10	0	0x30	P	0x50	p	0x70
DC1	^Q	0x11	1	0x31	Q	0x51	q	0x71
DC2	^R	0x12	2	0x32	R	0x52	r	0x72
DC3	^S	0x13	3	0x33	S	0x53	s	0x73
DC4	^T	0x14	4	0x34	T	0x54	t	0x74
NAK	^U	0x15	5	0x35	U	0x55	u	0x75
SYN	^V	0x16	6	0x36	V	0x56	v	0x76
ETB	^W	0x17	7	0x37	W	0x57	w	0x77
CAN	^X	0x18	8	0x38	X	0x58	x	0x78
EM	^Y	0x19	9	0x39	Y	0x59	y	0x79
SUB	^Z	0x1A	:	0x3A	Z	0x5A	z	0x7A
ESC	^[	0x1B	;	0x3B	[	0x5B	{	0x7B
FS	^¥	0x1C	<	0x3C	¥	0x5C		0x7C
GS	^]	0x1D	=	0x3D	]	0x5D	}	0x7D
RS	^^	0x1E	>	0x3E	^	0x5E	~	0x7E
US	^_	0x1F	?	0x3F	_	0x5F	DEL	0x7F

“^”: “Ctrl + ” (Pressing the key at the same time)

0x**: Hexadecimal

3. BCD OUTPUT

By using BCD output equipped WGI-400A-01 (or WGI-400A-11), indicated values can be acquired as BCD coded data. By connecting a sequencer, printer, etc., the WGI-400A can be used for controlling and printing out the acquired data.

Pin No. and Signal Name (Connector and Cable)

A side (Cable)		B side (Cable)		Cable Color
No.	Signal Name	No.	Signal Name	
A1	Data 1	B1	Data 2	Red
A2	Data 4	B2	Data 8	Gray
A3	Data 10	B3	Data 20	Gray
A4	Data 40	B4	Data 80	Gray
A5	Data 100	B5	Data 200	Green
A6	Data 400	B6	Data 800	Gray
A7	Data 1000	B7	Data 2000	Gray
A8	Data 4000	B8	Data 8000	Gray
A9	POL (- Polarity)	B9	OVER	Gray
A10	EOC (End of Conversion)	B10	ENABLE (Output prohibited)	Green
A11	N.EOC (EOC logic reverse)	B11	(Connection prohibited)	Gray
A12	(Connection prohibited)	B12	(Connection prohibited)	Gray
A13	(Connection prohibited)	B13	(Connection prohibited)	Gray
A14	(Connection prohibited)	B14	(Connection prohibited)	Gray
A15	(Connection prohibited)	B15	(Connection prohibited)	Green
A16	(Connection prohibited)	B16	(Connection prohibited)	Gray
A17	COM	B17	COM	Gray
A18	COM	B18	COM	Gray

Note: (1) Connection prohibited terminals are used for adjusting the product on KYOWA's side. Do not connect anything on customers' side.

(2) Cable colors described in the above table are in the case when the accessory 'BCD output cable for WGI-400A N-43' is used.

Compatible connector: Equivalent to 8822E-036-171-F (KEL CORP. made)

Accessory: BCD output cable for WGI-400A N-43

Cable length 2 m, Cutoff at the end

3-1 CONNECTING BCD OUTPUT

When connecting the WGI-400A to external devices, take care for wiring by referring to aforementioned pin Nos. and signal names as well as the following figure.

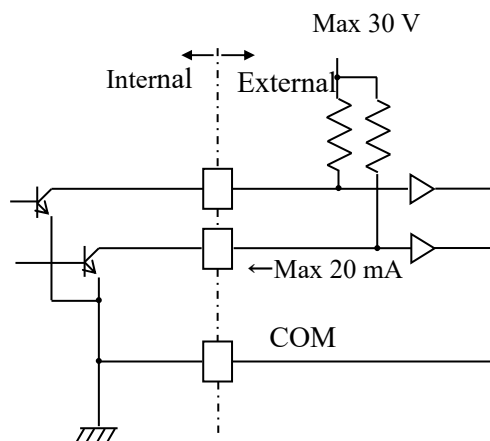


Figure 5. Example of Connecting to External Device

3-2 SETTING BCD OUTPUT

Function selecting mode F-11 is capable of setting data logic, minus (-) polarity logic, and over logic.

The EOC (End Of Conversion) logic is fixed to negative logic and change is not available.

To reverse the EOC logic to the positive logic, connect the N. EOC terminal to COM terminal. Then, the EOC logic operates with positive logic.

F-11 BCD Output logic Initial value: '0.0.0' Data logic: Negative logic Minus (-) polarity logic: Negative logic Over logic: Negative logic:	Items 1), 2), and 3) are displayed. 1) Data logic 0: Negative logic 1: Positive logic 2) Minus (-) polarity logic (POL) 0: Negative logic 1: Positive logic 3) Over logic (OVER) 0: Negative logic 1: Positive logic Select and set items 1), 2), or 3) and press the SET key.	• A function to set output logic. • When open collector transistor is set to ON, it is negative logic.
--	--	---

For key operation, refer to “3-9 FUNCTION SELECTING MODE” in WGI-400A Instruction Manual (Separate Volume).

3-3 SIGNAL TIMING

When data is read by EOC (End Of Conversion) logic, read BCD data, minus (-) polarity data, and over data within 10 msec from rising (positive) edge (When data changed to Hi from Lo).

When the data is read by reversing the EOC logic, read the BCD data, minus (-) polarity data, and over data within 10 msec from falling (negative) edge (When data changed to Lo from Hi).

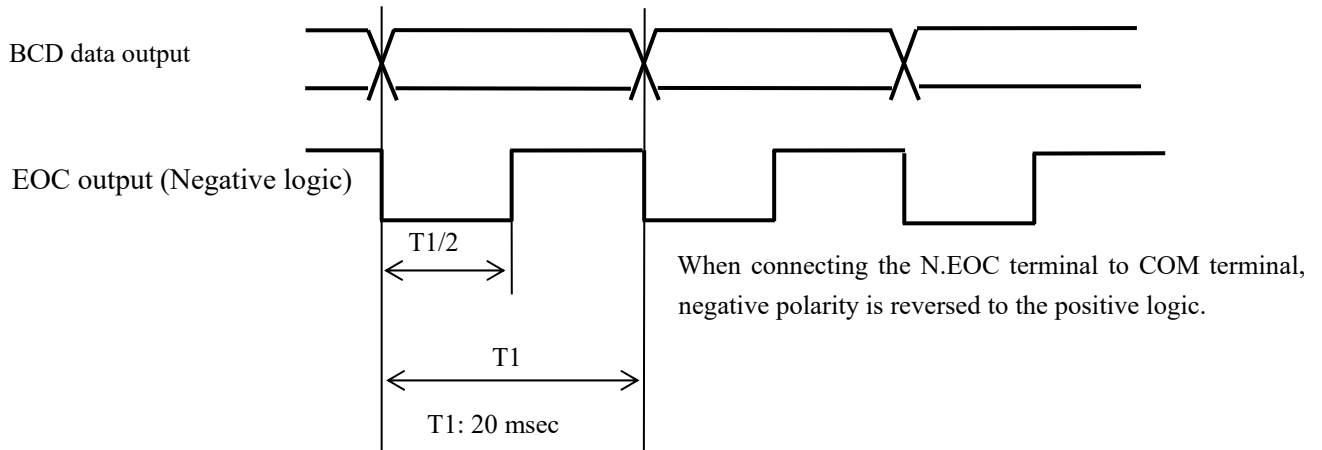


Figure 6. Signal Timing

1) OVER

The OVER signal is outputted when the signal exceeds the input range or display range (Error codes OFL1, OFL2, OFL3, and OFL4 are displayed)

BCD output at this time shall be issued with a value just before detecting the over value.

2) POL (Minus (-) Polarity)

Outputted when the indicated value is minus (-) value.

3) N.EOC (EOC logic reverse)

By connecting the N.EOC and COM terminals, the EOC output (Negative logic) can be reversed to positive logic.

4) ENABLE (Output Prohibit)

By connecting the ENABLE and COM terminals, outputting signals is prohibited.

It is used when connecting multiple BCD outputs or when selecting an arbitrary channel.

3-4 BCD OUTPUT CABLE

1) BCD output cable for WGI-400A N-43 (Optional)

Connector type: WGI-400A side 8822E-036-171-F (KEL CORP. equivalent)

Cable: FLEX-B 20-7/0.127 2651P (Oki Electric Industry equivalent)

※20 lines are thinned out to 18 lines for use. Cutoff at the end.

Length: Approx. 2 m

External view: See the following figure.

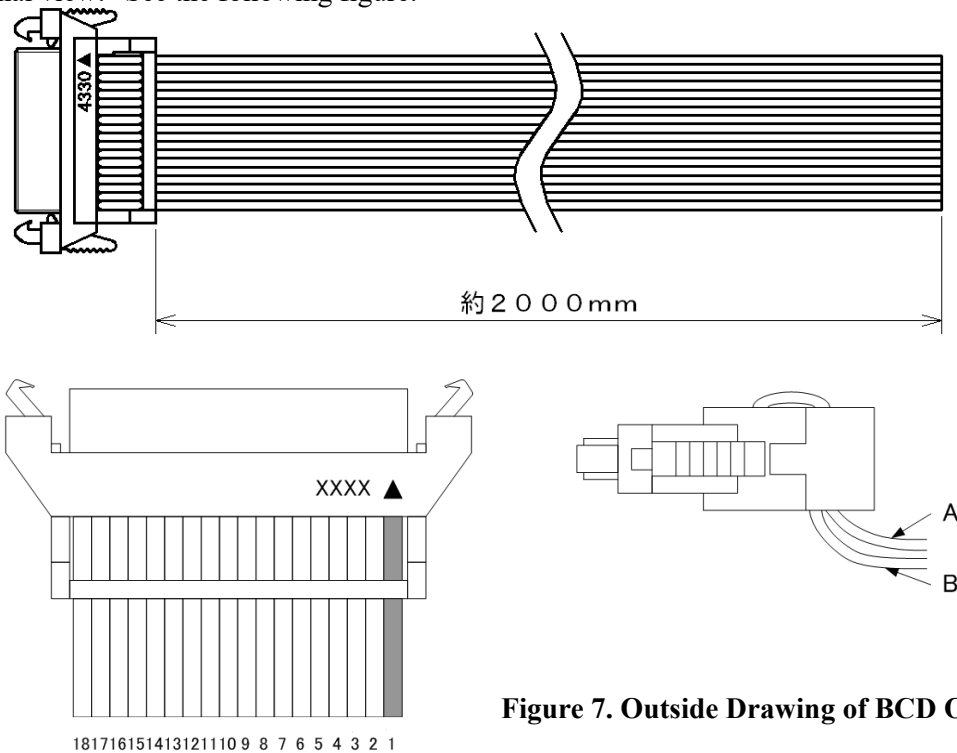


Figure 7. Outside Drawing of BCD Output Cable

Wiring: See Pin No. and Signal Name (Connector and Cable) in “3. BCD OUTPUT.”

2) BCD Printer Cable for WGI-400A N-44 (Optional)

This cable is dedicated for connecting a printer 3402-K01 or 3401-K01 to the WGI-400A.

It is used by connecting to printer equipped cable.

Connector type: WGI-400A side 8822E-036-171F (KEL CORP. equivalent)

Printer side 57-60360 (DDK Ltd. equivalent)

Cable: FLEX-B 20-7/0.127 2651P (Oki Electric equivalent)

※20 lines are thinned out to 18 lines for use.

Length: Approx. 0.5 m

Appearance: See the following figure.

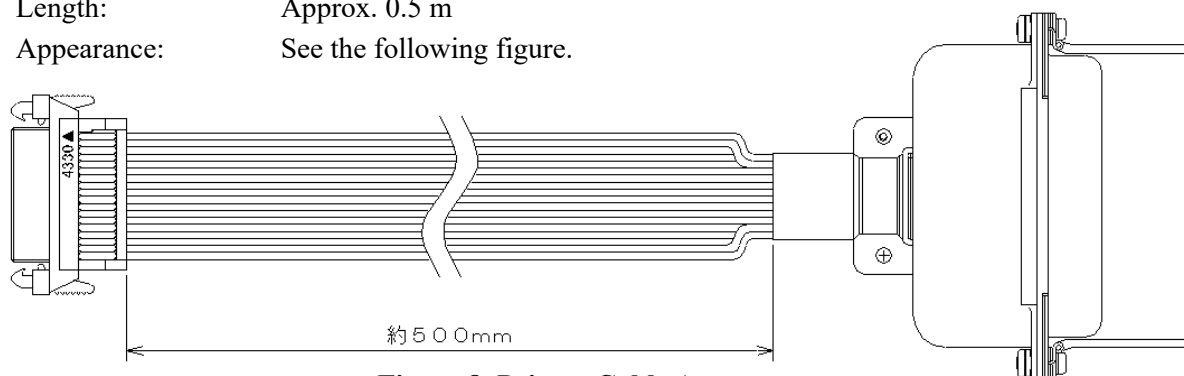


Figure 8. Printer Cable Appearance

Wiring: See the following figure.

8822E-036-171-F (KEL CORP. equivalent)

57-60360 (DDK Ltd. equivalent)

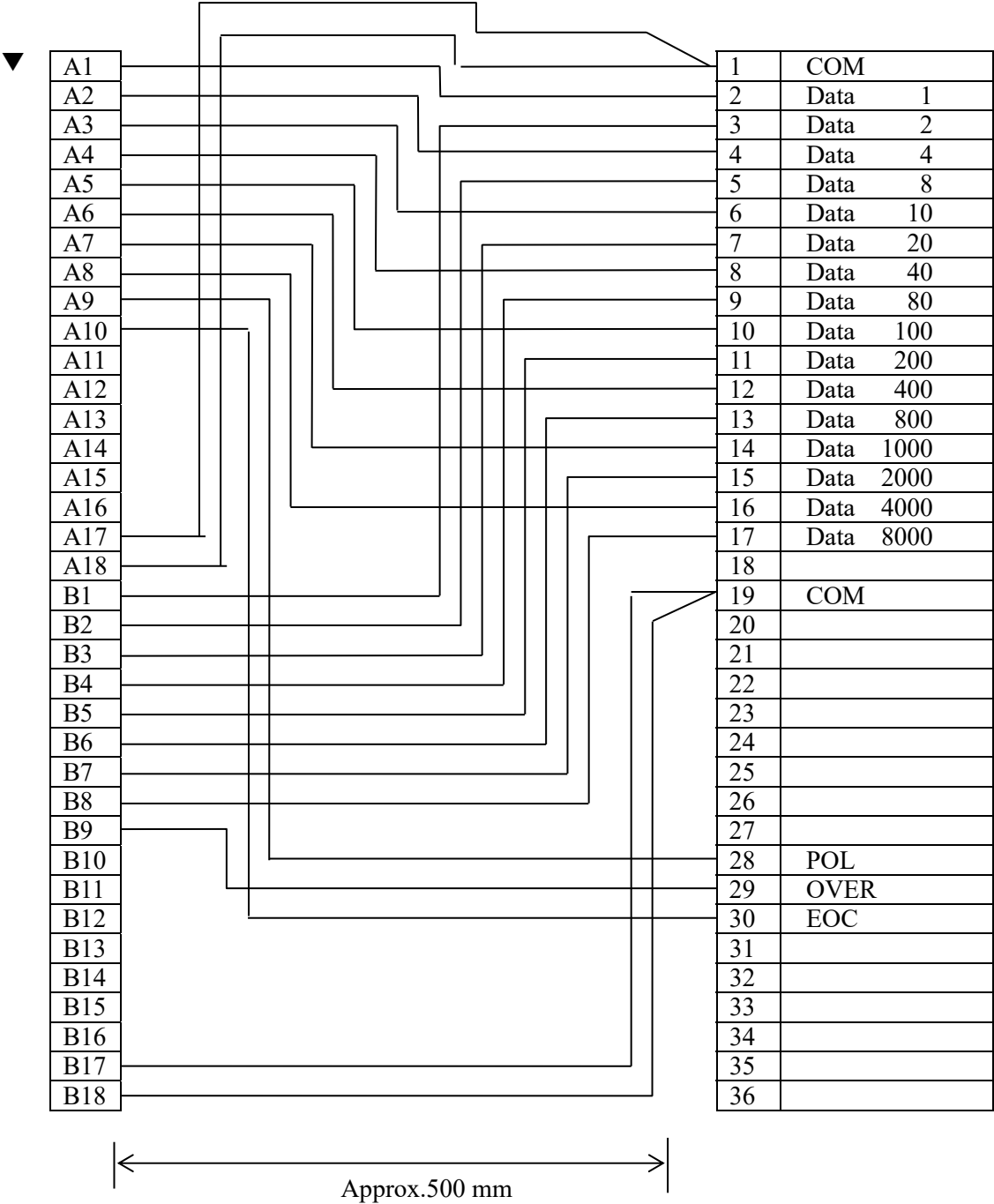


Figure 9. Wiring Diagram

Reference: When connecting printers 3402-K01 or 3401-K01 to the WGI-400A, set all the BCD output logics to negative logic.



Kyowa Electronic Instruments Co.,Ltd.

3-5-1, Chofugaoka, Chofu, Tokyo 182-8520 Japan

<https://www.kyowa-ei.com/>