

Programming manual



2-1-15 Ohara, Fujimino, Saitama 356-8502, Japan
Phone: +81-49-278-7829, Facsimile: +81-49-263-9328
e-mail: info@fiberlabs.co.jp
web: <http://www.fiberlabs.co.jp>

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1. Remote control interface

This instrument is equipped with RS-232C and GP-IB (IEEE488.1 conformed) interface port on rear panel. These ports are used to connect external devices such as a PC to remote control this instrument.

1.1 RS232C Interface

1.1.1 RS232C Interface specifications

RS232C interface specifications are shown Table 1. Message terminator (delimiter) is 'CR' or 'LF' (Setting from front panel). All commands are sent and received using ASCII characters.

Table 1 RS232C Interface specifications

Electrical characteristics	Conforms to RS-232C
Cable type	Straight
Baud rate	9600 / 19200 / 38400 / 57600*
Parity	none
Data length	8 bit
Stop bit	1 bit
Flow control	none
Delimiter	'CR' / 'LF' *

*Setting from front panel

1.1.2 Setting up RS-232C connection

(1) Turn OFF all power switches of this instrument and devices to be connected to it. Connect a cable to the RS-232C port on the rear panel of this instrument.

Always turn OFF the power to the instrument and devices to be connected to it when connecting or disconnecting communication cables. Failure to turn OFF the power can result in malfunction or damage to internal circuitry.

(2) Set the baud rate and delimiter from front panel to agree to the setting of PC. (Refer to operation manual.)

1.2 GP-IB Interface

1.2.1 GP-IB Interface specifications

GP-IB interface specifications are shown Table 2 and Table 3. Message terminator (delimiter) is 'CR' or 'LF' (Setting from front panel) +EOI. All commands are sent and received using ASCII characters.

Table 2 GP-IB Interface specifications

Electrical characteristics	Conforms to IEEE 488.1
Address	0~30 *
Delimiter	'CR' / 'LF' *

*Setting from front panel

Table 3 Functional specifications

Subset (Function)	Description
SH1 (Source handshake)	All capabilities of send handshake
AH1 (Acceptor handshake)	All capabilities of receive handshake
T2 (Talker)	Basic talker function
L2 (Listener)	Basic listener function
SR1 (Service request)	All capabilities of service request
RL2 (Remote local)	Local lockout function not provided
PP0 (Parallel port)	not provided
DC0 (Device clear)	not provided
DT0 (Device trigger)	not provided
C0 (Controller)	not provided

1.2.2 Setting up GB-IB connection

(1) Turn OFF all power switches of this instrument and any devices to be connected to it.

Connect a cable to the GP-IB port on the rear panel of this instrument, and securely fasten the screw that is attached to the GP-IB cable connector.

Always turn OFF the power to the instrument and devices to be connected to it when connecting or disconnecting communication cables. Failure to turn OFF the power can result in malfunction or damage to internal circuitry.

(2) Set the GP-IB address and delimiter from front panel to agree to the setting of PC. (Refer to operation manual.)

1.2.3 Service Request(SRQ)function

A setting (ON/OFF) of Service Request function of this instrument can be switched from front panel. (Refer to operation manual.)

When the SRQ function is set to ‘ON’, the SRQ signal is asserted when the receiving buffer overflows, or alarms are detected. A controller (PC) may then perform serial poll and get the status byte. The structure of the status byte is shown Table 4.

Table 4 The structure of the status byte

bit	7	6	5	4	3	2	1	0
Event name (0: normal/ 1: alarm)	BUFOVF	RQS	0	0	TEMP alarm	IN alarm	LDC alarm	OUT alarm

bit	function	Bit clear timing
7	Receiving buffer (64bytes) overflow	<ul style="list-style-type: none"> • Turn OFF the power • Reading the Status Byte
6	SRQ signal asserting	<ul style="list-style-type: none"> • Turn OFF the power • Reading the Status Byte
5	Not used (always 0)	
4	Not used (always 0)	
3	Detect case temperature alarm	<ul style="list-style-type: none"> • Turn OFF the power • Reading the Status Byte
2	Detect input power alarm	<ul style="list-style-type: none"> • Turn OFF the power • Reading the Status Byte
1	Detect pump-LD current alarm	<ul style="list-style-type: none"> • Turn OFF the power • Reading the Status Byte
0	Detect output power alarm	<ul style="list-style-type: none"> • Turn OFF the power • Reading the Status Byte

The request service bit is cleared only by reading the status byte using a serial poll or by turn OFF the power to this instrument. It is possible to inhibit assertion of bit0-bit3 by setting each alarm not to be detected from front panel or by remote command.

For specification of this instrument, if setting of detection of output power alarm is valid, it is sure that output power alarm is detected when the power to this instrument is turned ON.

For using SRQ function, you make sure to set the optical output to active (by sending command “ACTIVE”), and perform a serial poll to clear the status byte on startup of your program.

2. Command list

The list of the remote commands is shown Table 5, and the list of error messages is shown Table 6. This instrument does not conform to the common commands and the SCPI basically, but when ”*IDN?” is received, the information of this instrument is returned.

Throughout this manual, the following rules are used for command syntax.

- Triangle brackets (< >) indicate that you must substitute a value for the enclosed parameter.
- Curly brackets ({ }) indicate the parameter of argument (type, span, unit, etc.) you can set.
- A vertical bar (|) separates multiple parameter choices.

Table 5 List of remote commands

Command	Argument	function
Command for monitor		
MONOUT	None	Get monitor of optical output level
MONIN	None	Get monitor of optical input level
MONRET	None	Get monitor of optical return level
MONCTMP	None	Get monitor of case temperature
MONLDC,<ch>	<ch>: Pump-LD channel {1 2 3 4}	Get monitor of pump-LD forward current
MONLDT,<ch>	<ch>: Pump-LD channel {1 2 3 4}	Get monitor of temperature of pump-LD
MONTEC,<ch>	<ch>: Pump-LD channel {1 2 3 4}	Get monitor of TEC current of pump-LD
Command for setting		
ACTIVE,<set>	<set>: Output state {0: OFF 1: ON}	Switch state of the optical output
PRMACTV,<set>,<man>	<set>: Start operation {0:stop 1:start} <man>: Setting of recovery {0:auto 1:manual}	Switch setting of the auto recovery operation
SETMOD,<ch>,<mode>	<ch>: Pump-LD channel {1 2 3 4} <mode>: Driving mode {0: ALC 1: ACC}	Set/get setting of pump-LD driving mode
SETACC,<ch>,<cur>	<ch>: Pump-LD channel {1 2 3 4} <set>: Setting of of pump-LD current	Set/get setting of pump-LD forward current
SETALC,<ch>,<out>	<ch>: Pump-LD channel {1 2 3 4} <set>: Setting of of output power	Set/get setting of optical output level
SAVEREF	None	Save the present setting
Command for alarm		
ALMSTAT	None	Get the present alarm state
ALMOUT ,<path>,<th>,<set>,<hyst>	<path>: Optical path {1 2 3 4} <th>: Threshold value of alarm <set>: Setting of detection {0: invalid 1: valid} <hyst>: Setting of hysteresis	Set/get setting of optical output level alarm
ALMIN ,<path>,<th>,<set>,<hyst>	<path>: Optical path {1 2 3 4} <th>: Threshold value of alarm <set>: Setting of detection {0: invalid 1: valid} <hyst>: Setting of hysteresis	Set/get setting of optical input level alarm
ALMRET ,<path>,<th>,<set>,<hyst>	<path>: Optical path {1 2 3 4} <th>: Threshold value of alarm <set>: Setting of detection {0: invalid 1: valid} <hyst>: Setting of hysteresis	Set/get setting of optical return loss alarm
SETIL,<set>	<set>: Setting of interlock on input/return alarm {0: invalid 1: valid}	Set/get setting of interlock on input level / return loss alarm
ALMCTMP ,<th>,<set>,<hyst>	<th>: Threshold value of alarm <set>: Setting of detection {0: invalid 1: valid} <hyst>: Setting of hysteresis	Set/get setting of case temperature alarm
ALMLDC ,<path>,<th>,<set>,<hyst>	<ch>: Pump-LD channel {1 2 3 4} <th>: Threshold value of alarm <set>: Setting of detection {0: invalid 1: valid} <hyst>: Setting of hysteresis	Set/get setting of pump-LD current alarm
ALMLDT ,<path>,<th>,<set>,<hyst>	<ch>: Pump-LD channel {1 2 3 4} <th>: Threshold value of alarm <set>: Setting of detection {0: invalid 1: valid} <hyst>: Setting of hysteresis	Set/get setting of pump-LD temperature alarm

Common command	
*IDN?	Get information of this instrument

Table 6 List of error messages

Message	Description	Major cause
!!BUFOVFL	Receiving buffer overflow error	Mistake delimiter setting
!!NORPLY	Internal device reply error	Disorder of internal circuit
??CMD	Command error	Invalid command
??ARG	Argument error	Invalid argument
??NODTCT	Invalid channel error	Invalid channel
??MODE LOCKED	Switch driving mode error	ACC ONLY channel cannot switch driving mode

3. Explanation of each command

3.1 Command for monitor

· MONOUT

Argument: none

Explanation: Get monitor of optical output level (dBm). If the optical path is not available, "N/A" is returned.

Example: **MONOUT** // Send > get monitor of optical output level
10.00, 13.00, N/A, N/A // Reply > out #1: 10.00dBm / out #2: 13.00dBm /
out #3~: Not Available

· MONIN

Argument: none

Explanation: Get monitor of optical input level (dBm). If the optical path is not available, "N/A" is returned.

Example: **MONIN** // Send > Get monitor of optical input level
-3.00, N/A, N/A, N/A // Reply > in #1: -3.00dBm / in #2~: Not Available

· MONRET

Argument: none

Explanation: Get monitor of optical return level (dBm). If the optical path is not available, "N/A" is returned.

Example: **MONRET** // Send > Get monitor of optical return level
-15.00, N/A, N/A, N/A // Reply > ret #1: -3.00dBm / ret #2~: Not Available

• **MONCTMP**

Argument: none

Explanation: Get monitor of case temperature (deg.C).

Example: **MONCTMP** // Send > Get monitor of case temperature.
32.0 // Reply > case temperature: 32.0deg.C

• **MONLDC,<ch>**

Argument: <ch> : Pump-LD channel {integer ; 1 | 2 | 3 | 4 }

Explanation: Get monitor of Pump-LD forward current (mA). When <ch> is omitted, all channel are returned.

Example: **MONLDC, 1** // Send > Get monitor of Pump-LD_ch1 current
500.0 // Reply > Pump-LD_ch1 current: 500.0mA

• **MONLDT,<ch>**

Argument: <ch> : Pump-LD channel {integer ; 1 | 2 | 3 | 4 }

Explanation: Get monitor of Pump-LD temperature (deg.C). When <ch> is omitted, all channel are returned.

Example: **MONLDT,2** // Send > Get monitor of Pump-LD_ch2 temperature
25.0 // Reply > LDch2: 25.0deg.C

• **MONTEC,<ch>**

Argument: <ch> : Pump-LD channel {integer ; 1 | 2 | 3 | 4 }

Explanation: Get monitor of Pump-LD TEC (Thermo Electric Cooler) current (mA). When <ch> is omitted, all channel are returned.

Example: **MONTEC,1** // Send > Get monitor of Pump-LD_ch1 TEC current
250 // Reply > Pump-LD_ch1 TEC current: 250mA

3.2 Command for setting

• **ACTIVE,<set>**

Argument: <set> : Output state {integer ; 0: OFF | 1: ON}

Explanation: Switch pump-LD output state.

Example: **ACTIVE, 1** // Send > Switch pump-LD output to ON
ACTIVE, 1

• **PRMACTV,<set>,<man> *Not recommended**

Argument: <set> : On auto set : same as 'ACTIVE' { integer ; 0:stop | 1:start }
 On manual set : start operation
 <man> : Setting of recovery { integer ; 0:auto | 1:manual }

Explanation: Switch setting of the auto recovery operation. When <set>, <man> are omitted, the present setting is returned. Refer to the operating guide for details of the auto recovery operation

* The auto recovery from the interlock might be dangerous depending on the laser class of the instrument. If you want to use this function, please use it on sufficient safe operating rules.

Example: **PRMACTV** // Send > Get the present status
PRMACTV, 0, 1 // Reply > Outout:halt & manual recovery
PRMACTV, 1, 0 // Send > Set to auto recovery & start the auto recovery operation
PRMACTV, 1, 0 // Reply > Status: now operating at the auto recovery
PRMACTV, 0, 0 // Send > Stop the auto recovery (reset to status of power ON)
PRMACTV, 0, 0 // Reply > Status: now waiting for starting the auto recovery

• **SETMOD,<ch>,<mode>**

Argument: <ch> : Pump-LD channel { integer ; 1 | 2 | 3 | 4 }
 <mode> : Setting of pump-LD driving mode { integer ; 0: ALC | 1: ACC }

Explanation: Switch setting of pump-LD driving mode. When driving mode is switched, the optical output is turned OFF. When <mode> is omitted, the present setting is returned.

Example: **SETMOD, 1** // Send > Get the present driving mode of pump-LD_ch1
SETMOD, 1, 0 // Reply > The present setting: ALC
SETMOD, 1, 1 // Send > Set the driving mode of pump-LD_ch1 to ACC
SETMOD, 1, 1 // Reply > The new setting: ACC

• **SETACC,<ch>,<set>**

Argument: <ch> : Pump-LD channel { integer ; 1 | 2 | 3 | 4 }
 <set> : Setting of pump-LD current { integer ; mA }

Explanation: Set the temporary setting of pump-LD current for ACC. When <set> is omitted, the present setting is returned. When the power to this instrument is turned OFF or pump-LD is interlocked, the temporary setting is reset. Send 'SAVEREF' to save setting.

Example: **SETACC, 2** // Send > Get the present setting of pump-LD_ch1 current
SETACC, 2, 200 // Reply > The present setting: 200mA
SETACC, 2, 400 // Send > Set to 400mA
SETACC, 2, 400 // Reply > The new setting: 400mA

• **SETALC,<ch>,<set>**

Argument: <ch> : Pump-LD channel {integer ; 1 | 2 | 3 | 4 }
 <set> : Setting of optical output level { decimal ; dBm }

Explanation: Set the temporary setting of optical output level for ALC. When <set> is omitted, the present setting is returned. When the power to this instrument is turned OFF or pump-LD is interlocked, the temporary setting is reset. Send 'SAVEREF' to save setting.

Example: **SETALC,1** // Send > Get the present setting of optical output level
 SETALC,1,10.0 // Reply > The present setting: 10.0dBm
 SETALC,1,13.5 // Send > Set to 13.5dBm
 SETALC,1,13.5 // Reply > The new setting: 13.5dBm

• **SAVEREF**

Argument: none

Explanation: Save the temporary settings. EEPROM for save settings is specified the average limit of rewriting, therefore avoid the extremely frequent use of this command. Refer to "4. Notes for programming" for more information.

Example: **SAVEREF** // Send > Save the temporary settings
 SAVEREF // Reply > Saving OK

3.3 Command for Alarm

• **ALMSTAT**

Argument: none

Explanation: Get the present state of alarms by the hexadecimal number. Each bit indicates the state of alarm. The assignment of each alarm is shown in Table 7

Example: **ALMSTAT** // Send > Get the present state of alarms
 ALMSTAT,5 // Reply > 5(hex) → 0101(binary): input and output alarm

Table 7 The structure of status of alarm

bit	7	6	5	4	3	2	1	0
Allocation of alarm (0: normal/ 1: Alarm)	Not used 0	Not used 0	Not used 0	Not used 0	TEMP alarm	IN alarm	LDC alarm	OUT alarm

• **ALMOUT,<path>,<th>,<set>,<hyst>**

Argument: <ch> : Optical path {integer ; 1 | 2 | 3 | 4 }
 <th> : Threshold value of alarm {integer ; dBm }
 <set> : Setting of alarm detection {integer ; 0: invalid | 1: valid}
 <hyst> : Setting of hysteresis {decimal ; dB}

Explanation: Set the setting of optical output level alarm. The setting is saved immediately. When <th>, <set> and <hyst> is omitted, the present setting is returned.

Example: **ALMOUT, 1** // Send > Get the setting of alarm
ALMOUT, 1, 10, 1, 0.5 // Reply > Threshold value: 10dBm / detect: valid /
 hysteresis : 0.5dB(recover at >10.5dBm)
ALMOUT, 1, 7, 1, 0.5 // Send > Set the threshold value to 7dBm
ALMOUT, 1, 7, 1, 0.5 // Reply > Threshold value: 7dBm / detect: valid

• **ALMIN,<path>,<th>,<set>,<hyst>**

Argument: <ch> : Optical path {integer ; 1 | 2 | 3 | 4 }
 <th> : Threshold value of alarm {integer ; dBm }
 <set> : Setting of alarm detection {integer ; 0: invalid | 1: valid}
 <hyst> : Setting of hysteresis {decimal ; dB}

Explanation: Set the setting of optical input level alarm. The setting is saved immediately. When <th>, <set> and <hyst> is omitted, the present setting is returned. The error message is returned if input level monitor is not installed

Example: **ALMIN, 2** // Send > Get the setting of alarm
ALMIN, 2, -10, 1, 0.5 // Reply > Threshold value: -10dBm / detect: valid /
 hysteresis : 0.5dB(recover at >-9.5dBm)
ALMIN, 2, -10, 0, 0.5 // Send > Set the setting of detection to invalid
ALMIN, 2, -10, 0, 0.5 // Reply > Threshold value: -10dBm / detect: invalid

• **ALMRET,<path>,<th>,<set>,<hyst>**

Argument: <ch> : Optical path {integer ; 1 | 2 | 3 | 4 }
 <th> : Threshold value of alarm {integer ; dB }
 <set> : Setting of alarm detection {integer ; 0: invalid | 1: valid}
 <hyst> : Setting of hysteresis {decimal ; dB}

Explanation: Set the setting of the return loss alarm. The setting is saved immediately. When <th>, <set> and <hyst> is omitted, the present setting is returned. The error message is returned if return loss monitor is not installed

* Threshold must be set in the return loss (out-return).

Example: **ALMRET, 1** // Send > Get the setting of alarm
ALMRET, 1, 0, 1, 0.5 // Reply > Threshold value: 0dBm / detect: valid /
 hysteresis : 0.5dB(recover at <-0.5dBm)
ALMRET, 1, 0, 0, 0.5 // Send > Set the setting of detection to invalid
ALMRET, 1, 0, 1, 0.5 // Reply > Threshold value: 0dBm / detect: invalid

• **SETIL,<set>**

Argument: <set> : Setting of interlock on inputlevel / return loss alarm {integer ; 0: invalid | 1: valid}

Explanation: Set the setting of interlock on input level / return loss alarm. The setting is saved immediately. When <set> is omitted, the present setting is returned.

Example: SETIL // Send > Get the setting of interlock on input/return alarm
SETIL, 1 // Reply > the setting of interlock: valid
SETIL, 0 // Send > Set the setting of interlock to invalid
SETIL, 0 // Reply > the setting of interlock: invalid

• **ALMCTMP,,<th>,<set>,<hyst>**

Argument: <ch> : Optical path {integer ; 1 | 2 | 3 | 4 }
<th> : Threshold value of alarm {integer ; deg.C }
<set> : Setting of alarm detection {integer ; 0: invalid | 1: valid}
<hyst> : Setting of hysteresis {decimal ; deg.C }

Explanation: Set the setting of case temperature alarm. The setting is saved immediately. When <th>,&br/><set> and <hyst> is omitted, the present setting is returned.

Example: ALMCTMP // Send > Get the setting of alarm
ALMCTMP, 40, 1, 0.5 // Reply > Threshold value: 40deg.C / detect: valid /
hysteresis : 0.5deg.C (recover at <39.5 deg.C)
ALMCTMP, 50, 1, 0.5 // Send > Set the setting of detection to invalid
ALMCTMP, 50, 1, 0.5 // Reply > Threshold value: 50deg.C / detect: invalid

• **ALMLDC,<ch>,<th>,<set>,<hyst>**

Argument: <ch> : Pump-LD channel {integer ; 1 | 2 | 3 | 4 }
<th> : Threshold value of alarm {integer ; mA }
<set> : Setting of alarm detection {integer ; 0: invalid | 1: valid}
<hyst> : Setting of hysteresis {decimal ; mA }

Explanation: Set the setting of pump-LD current alarm. The setting is saved immediately. When <th>,&br/><set> and <hyst> is omitted, the present setting is returned.

Example: ALMLDC,1 // Send > Get the setting of alarm
ALMLDC, 1, 500, 1, 5.0 // Reply > Threshold value: 500mA / detect: valid /
Hysteresis: 5mA (recover at <495mA)
ALMLDC, 1, 600, 1, 5.0 // Send > Set the threshold value to 600mA
ALMLDC, 1, 600, 1, 5.0 // Reply > Threshold value: 600mA / detect: invalid

• **ALMLDT,<ch>,<th>,<set>,<hyst>**

Argument:	<ch> :	Pump-LD channel	{integer ; 1 2 3 4 }
	<th> :	Threshold value of alarm	{integer ; deg.C }
	<set> :	Setting of alarm detection	{integer ; 0: invalid 1: valid}
	<hyst> :	Setting of hysteresis	{decimal ; deg.C }

Explanation: Set the setting of pump-LD temperature alarm. The setting is saved immediately. When <th>, <set> and <hyst> is omitted, the present setting is returned.

Example:	ALMLDC, 1	// Send > Get the setting of alarm
	ALMLDT, 1, 35, 1, 0.5	// Reply > Threshold value: 35deg.C / detect: valid / Hysteresis: 0.5deg.C (recover at < 34.5mA)
	ALMLDT, 1, 20, 1, 0.5	// Send > Set the threshold value to 20deg.C
	ALMLDT, 1, 20, 1, 0.5	// Reply > Threshold value: 20deg.C / detect: invalid

4. Notes for programming

- (1) All commands are terminated by the delimiter (Set from front panel).
- (2) There is no distinction between the capital letter and the small letter in all commands.
- (3) The receiving buffers of this instrument are 64 bytes. The total number of character this instrument receives at a time must not exceed 64(including the delimiter). If receiving buffers overflow, the error message is returned and buffers are cleared.
- (4) Reply messages to command via GPIB I/F are not accumulated in the buffer, and be overwritten by the newer message.

It is recommended to fetch and validate the reply message each time you send a command for safety, because it might cause unintended settings due to limits of instrument or missing command, etc.

- (5) EEPROM for save settings in this instrument is specified the average limit of rewriting. The manufacturers usually specify the average limit of rewriting being 10^7 or more.

This number is not a problem in popular use, but if you save settings extremely frequent in your program, it may be a problem. Therefore avoid the extremely frequent use of "SAVEREF" command. For example, refrain programming that always rewrites settings in infinite loop.

Regarding commands to read settings, and set temporary settings ('SETACC' and 'SETALC'), there is no problem if you use it frequently.

END

Appendix. Version history

Date	Ver. No.	Description
2009.9.27	1.0	<ul style="list-style-type: none"> • New making
2009.10.13	1.1	<ul style="list-style-type: none"> • Add the description about the state of pump-LD at “SETALC”/”SETACC”
2010.01.14	1.2	<ul style="list-style-type: none"> • Fixed a typo
2010.04.08	1.3	<ul style="list-style-type: none"> • Fixed a typo
2010.05.25	2.0	<ul style="list-style-type: none"> • Revised with the firmware upgrade • Remove the description about the state of pump-LD at “SETALC”/”SETACC” • Fixed a typo
2010.05.25	2.0.1	<ul style="list-style-type: none"> • For the product with 4LD / 2port signal monitor
2010.07.02	2.1	<ul style="list-style-type: none"> • Integrate v2.0 / v2.0.1 • Add the explanation of the monitor and alarm commands • Revised font size / layout • Fixed a typo
2012.02.22	2.3	<ul style="list-style-type: none"> • Changed the date format
2012.08.10	3.0	<ul style="list-style-type: none"> • Revised with the firmware upgrade • Modified specifications of ”SETMOD”, ”SETACC”, ”SETALC” The setting is possible in the other drive mode. The previous setting is called and the optical output is turned OFF when the mode is changed. • Delete from the error messages ”??MODE_AxC” • Modified specifications of commands for alarm, add the argument for hysteresis. • Modified specifications of “ALMRET”, add the argument for path. • Changed the size of buffer. • Fixed a typo & Modified a layout.
2012.11.01	3.1	<ul style="list-style-type: none"> • Fixed a typo
2013.09.27	3.2	<ul style="list-style-type: none"> • Add the description about the reply message buffer.
2013.11.19	4.0	<ul style="list-style-type: none"> • Revised with the firmware upgrade • Modified specifications of ”ALMRET” Return level to Return loss • Add the new command ”PRMACTV”. • Modified specifications of the buffer of GPIB, modified the description
version rule		