OPERATION MANUAL

GP-IB INTERFACE

MODEL IB01-PCR

Model IB01-PCR GP-IB Interface is an optional device for the PCR Series Frequency Converter. The IB01-PCR cannot be used for other equipment.

This manual covers primarily the method of hooking up the IB01-PCR to the PCR Series Frequency Converter.

When using the IB01-PCR, be sure to read also the operation manual for the PCR Series Frequency Converter.

First Edition

KIKUSUI ELECTRONICS CORPORATION

(KIKUSUI PART NO. Z1-987-220)

M-91031

Thank you verymuch for purchasing KIKUSUI PCR series.

Due to the requests from many of the PCR users, we have decided to change a part of the functions of the PCR.

* Version: 1-1, 1-2, 1-3

  PCR stops its power line abnormality simulation mode operation when over loaded during simulation mode.

* Version: 1-6 or higher version

  PCR will continue to be in simulation mode even when over loaded for a moment. (PCR will stop its simulation mode then turn off the output voltage when the over loading condition is not removed)

* The version number of the PCR series can be checked by the operator.
  Please refer page 56.

  PCR with lower version can be upgraded to higher version with replacing a "ROM".

  Please have a contact with one of KIKUSUI's sales offices or distributors.

IB01-PCR

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1. GENERAL

1.1 Introduction

The GP-IB Interface, Model IB01-PCR, allows to control remotely through a GP-IB bus (IEEE-1978) all functions identical with those controllable locally at the panel of the PCR Frequency Converter. The IB01-PCR also allows to control power line abnormality simulation operation (which lets the PCR Frequency Converter deliver an output with simulated abnormalities such as power interruption and voltage pop/dip) and to control the phases of line voltages for 3-phase operation.

When operating the IB01-PCR, be sure to read the instruction manuals for the PCR Frequency Converter and other optional devices as well as that for the IB01-PCR.

1.2 Features

The major features of the IB01-PCR can be summarized as follows:

(a) From the host computer (GP-IB controller), the various functions and statuses of the frequency converter can be controlled as programmed and can be read-back for verification through a GP-IB bus, thereby allowing still more effective and safe operation of the equipment.

(b) The IB01-PCR allows simulated power line abnormality operation.

(c) The IB01-PCR has a REMOTE/LOCAL switch to select either a remote mode to control the equipment with programs from a host computer (GP-IB controller) or a local mode to control the equipment directly with its panel switches.

(d) By using the 3P01-PCR 3-phase Driver (optional) in conjunction, the IB01-PCR allows to control the phases of line voltages when in 3-phase operation.

2. SPECIFICATIONS

The specifications given below are for operation of the IB01-PCR Interface as it is hooked up to the PCR Frequency Converter. The specifications not covered below are identical with those of the PCR Frequency Converter.

2.1 GP-IB Specifications

Table 2-1

Standard	IEEE488-1978
Interface Functions	SH1, AH1, T6, L4, SR1, RL1, DC1, DT0, C0
Addresses	0 - 30

2.2 Functional Specifications

2.2.1 Setting of Output

Table 2-2

	Resolution	Accuracy
Output Voltage	0.1 V	*1
Output Frequency	0.01 Hz (at 5.00 - 99.99 Hz)	*1
	0.1 Hz (at 100.0 - 500.0 Hz)	*1

*1: Identical with the specification of the PCR Frequency Converter.

2.2.2 Read Back of Output Voltage and Output Current

Table 2-3

	Resolution	Accuracy
Output Voltage	0.1 V	*2
Output Current	0.01 A (Models PCR500 and PCR1000)	*2
	0.1 A (Models PCR2000 and PCR4000)	*2

*2: Identical with the indicating meter specification of the PCR Frequency Converter.

2.2.3 Read Back of Statuses and SRQ Generation

The SRQ can be generated as shown in Table 2-4 and the status can be read back.

Table 2-4

Mnemonic	Description
3PERR	Connection error when in 3-phase operation
ALARM	Trip of overheat protector or overvoltage protector
SYNC	Not in synchronized mode
OVERLOAD	Trip of overload protector
PON	Power is on.
ERR	Setting error (setting of invalid value)

* PON is masked with DIP switches and others with commands.

2.2.4 Power Line Abnormality Simulation

Table 2-5

Selectable Frequency	50.00 Hz or 60.00 Hz

○ Parameters for Power Line Abnormality Simulation

Table 2-6

Voltage Change Start Time	T1	0 - 9.9 ms (Resolution 0.1 ms, *1 accuracy +0.2 ms)
Slope Time	T2	0 - 9999 ms (Resolution 1 ms, accuracy ±1 ms)
Pop/Dip Time or Interruption Time	T3	0 - 9999 ms (Resolution 1 ms, accuracy ±1 ms)
Slope Time	T4	0 - 9999 ms (Resolution 1 ms, accuracy ±1 ms)
Number of Restored Power Cycles	N	0 - 9998 (Resolution 1, accuracy ±1, 9999 for infinitive)
Voltage Change Start Polarity	POL	To cross the zero voltage level in positive going or negative going direction (selectable)
Pop/Dip Voltage	V (T3)	*2
Pop/Dip Mode or Interrupt Mode Select	MODE	Either the voltage pop/dip mode or the power interrupt mode is selectable.

*1 When slope time is set at T2 = 0 in the pop/dip mode, the output waveform may appear as if errors were introduced into T1 due to the inaccuracy of T2. For details, see Page 34a.

*2 The number of setting digits, resolution and accuracy are identical with those of the output voltage.

2.2.5 Phase Control (3-phase Operation)

When in 3-phase operation employing the 3P01-PCR 3-phase Driver (optional), the phases of the V-phase and W-phase lines can be controlled with the IB01-PCR Interfaces hooked up to PCR Frequency Converters of these phase lines.

Table 2-7

	Controllable Range	Resolution	Accuracy
V-phase	0-359 degrees (delay)	1 degree	±4 degrees
W-phase	0-359 degrees (delay)	1 degree	±4 degrees

2.2.6 Other Functions

- Turning on/off the OUTPUT switch
- Turning off the POWER switch

2.3 Other Specifications

Table 2-8

Ambient Operating Temperature and Humidity	0 to +50°C, 10 to 90% RH (Non condensing)	
Insulation Resistances	Between GP-IB connector and chassis	20MΩ, with 500 VDC
	Between GP-IB connector and input power terminal	
	Between GP-IB connector and output terminal	
Withstanding Voltage	Between GP-IB connector and chassis	500 VDC, for 1 minute
	Between GP-IB connector and input power terminal	1500 VDC, for 1 minute
	Between GP-IB connector and output terminal	
Overall Dimensions	29 W × 137 H × 124 D mm (1.14 W × 5.39 H × 4.88 D in.)	
Weight	Approx. 120 g (4.2 oz)	
Accessory	Instruction manual (1 copy)	

2.4 Overall Dimensions

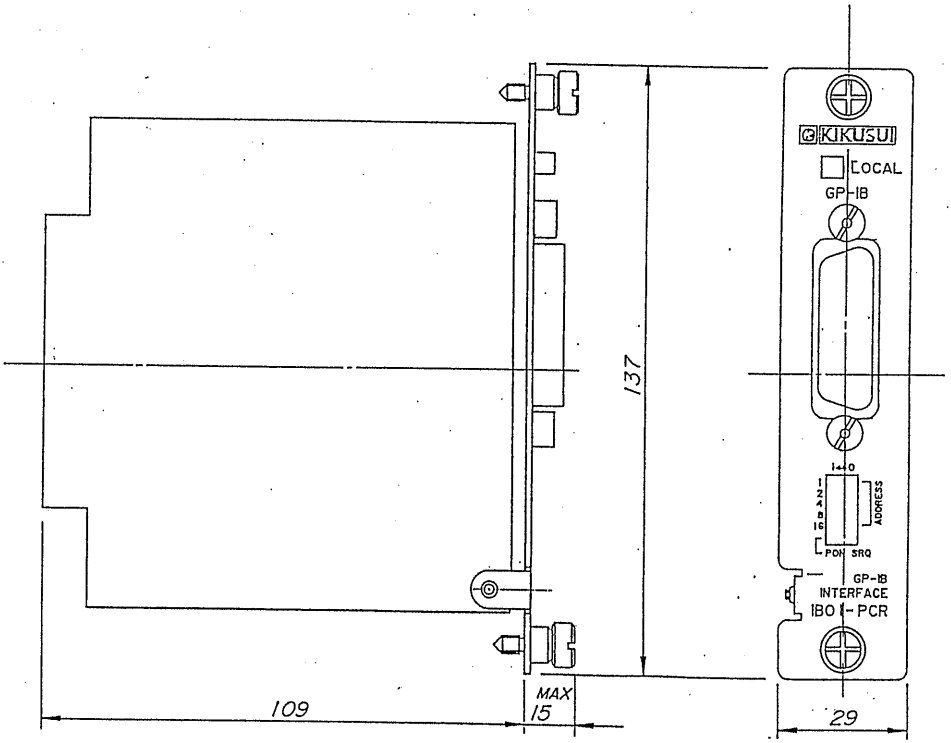
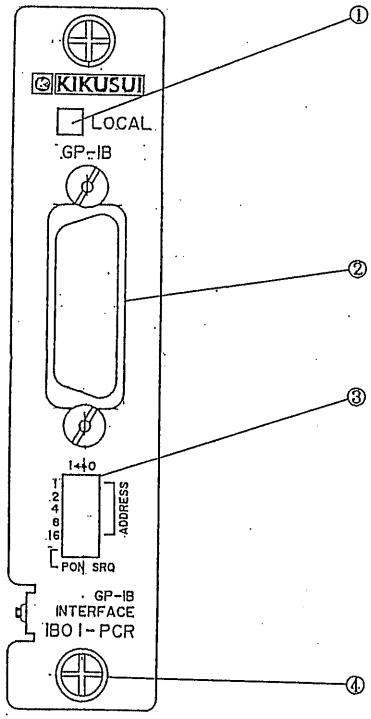


Figure 2-1

3. PREPARATION FOR OPERATION

3.1 Panel Description

For the locations and description of the panel items of the IB01-PCR GP-IB Interface, see Figure 3-1.



① LOCAL Switch
Sets the PCR Frequency Converter to the LOCAL mode. (See Section 10.)

② GP-IB Connector
Connects the GP-IB cable.

③ DIP Switches
Set a GP-IB address.
Enable/disable the PON SRQ (power on service request).

④ Clamping-screw

Figure 3-1

3.2 Limitation on Number of IB01-PCR Units

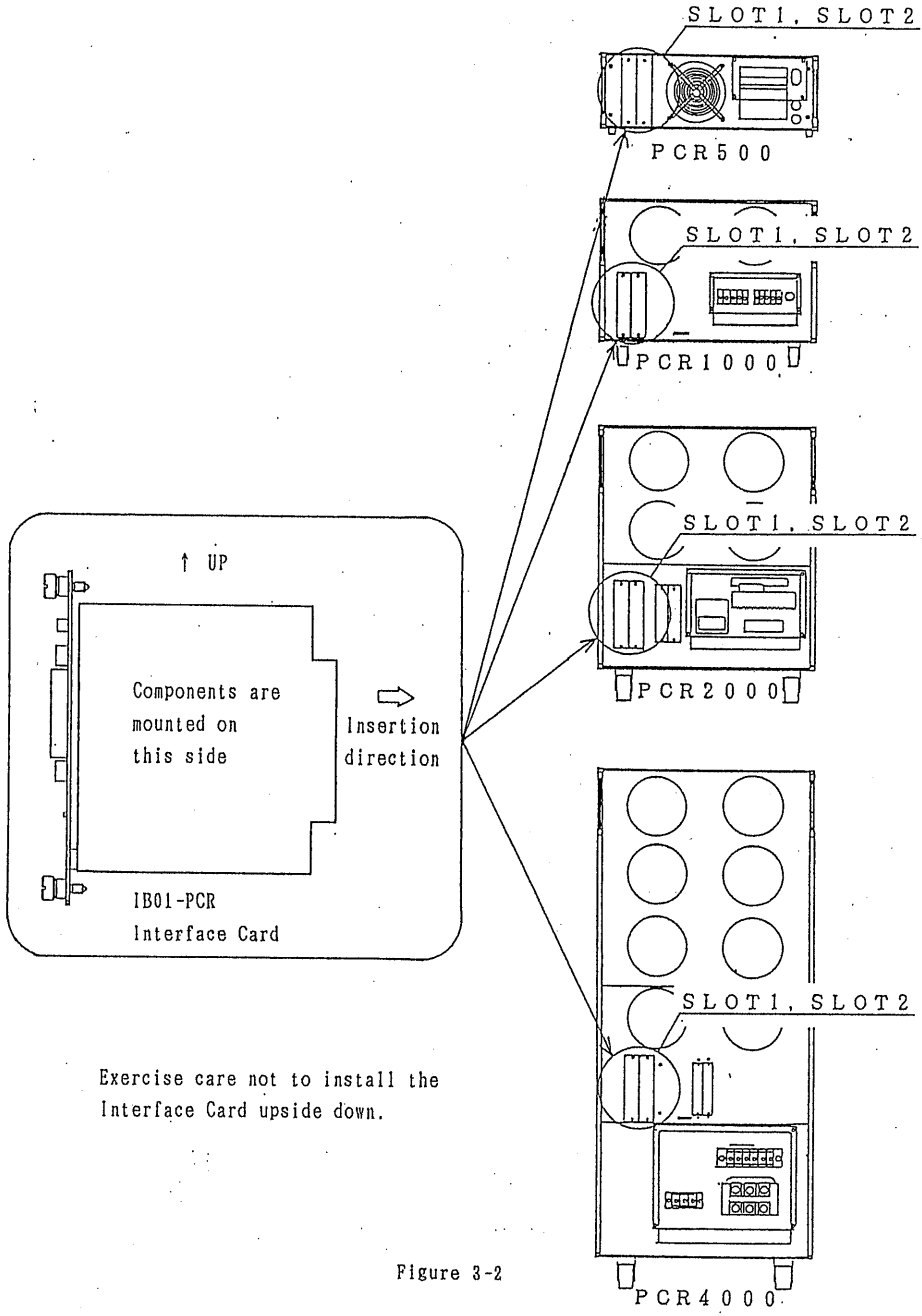
Only one unit of IB01-PCR GP-IB Interface can be used per one unit of PCR Frequency Converter (can be installed in I/O SLOT 1 or SLOT 2).

Precaution: Note that the equipment can be damaged if two units of IB01-PCR are used simultaneously for one unit of frequency converter.

3.3 Hooking up GP-IB Interface to PCR Frequency Converter

Precaution:	Before hooking up the GP-IB Interface to the PCR Frequency Converter, make sure that the converter power is turned off. Note that the interface has an exposed and unprotected PCB. Exercise care when taking it out of the carton and installing it on the converter, so that the PCB is not damaged by static electricity. Never touch the components other than the front panel of the interface.

(1) Insert the interface in SLOT 1 or SLOT 2 at the rear of the converter and securely fix the interface with the clamping-screws using a screwdriver. (See Figure 3.2.)



Exercise care not to install the Interface Card upside down.

Figure 3-2

3.4 Setting the DIP Switches

Precautions:	Be sure to set the DIP switches before turning on the POWER switch. The interface may not operate correctly if you set the DIP switches after turning on the POWER switch.

(1) Setting a GP-IB Address

A GP-IB address for the interface can be set with the top five elements of the DIP switches for a binary number (0 to 30). For example, when the elements are set as shown in Figure 3-3, the interface address is binary "10100" or decimal "20".

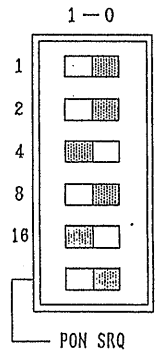


Figure 3-3

(2) Setting for PON SRQ (Power On Service Request)

If you set the bottom one of the DIP switches and turn on the POWER switch, a PON SRQ is sent out to the GP-IB bus.

The interface has an internal watchdog timer and generates an SRQ if the internal microcomputer runs away, as when the POWER switch is turned on. The event is recorded on the PON bits of the serial poll registor. Thus, an event of POWER switch on is reported to the host controller of the GP-IB system. (Refer to Section 8 "SRQ".)

3.5 Hooking up GP-IB Interface to GP-IB Controller

Precaution:	Before hooking up the GP-IB Interface to the GP-IB controller, make sure that both GP-IB host controller power and PCR Frequency Converter power are off.

(1) To hook up the interface to the controller, connect the respective GP-IB connectors using a GP-IB bus cable.

4. COMMANDS, READ BACK DATA FORMATS, AND DELIMITERS

Each of the commands and read back data items consists of a string of characters (in ASCII codes) followed by a delimiter, for transaction between the GP-IB interface and the GP-IB host controller.

COMMAND + DELIMITER	.....	From controller to interface
READ BACK DATA + DELIMITER	.....	From interface to controller

Example: For transaction of command and read back data between GP-IB controller (assuming that an NEC PC-9801 Personal Computer is used for the controller) and GP-IB Interface (assuming that its address is set at 7).

(1) Sending a command

```
PRINT @7; "VSET 100 V"↵
```

... Send command "VSET 100 V" from the controller to the interface. (The delimiter is sent automatically.)

(2) Receiving read back data

```
PRINT @7; "VOUT?"↵
```

... Let command "VOUT?" specify the output voltage for the read back data item.

```
INPUT @7; V$ ↵
```

... Let the controller accept the data item sent from the interface and assign the data item for variable "V$".

Remarks: Symbol (↵), denotes the Remturn key (PC-9801 computer).

Note: Actually, the following commands should be executed before executing the above examples.

ISET IFC ↵ ... Interface clear.
ISET REN ↵ ... Set the remote enable line to L.

If a comma (,) is included in the read back data, use LINE INPUT @ instead of INPUT@ for "T3, VSET△", "PHASE,V△", and "PHASE,W△".

Example: To read back V(T3)

```
PRINT @7; "T3,VSET?"
    └── Specifies to read back V(T3).

LINE INPUT @7; A$
    └── Specifies to assign read back data for variable A$
```

4.1 Command Format

The functions and read back data items of the GP-IB interface can be selected by sending comands from the GP-IB host controller. Each of the commands consists of a header and an argument. The argument consists of a word data (a string of letters), or a numerical data and a unit data.
See Figure 4-2.

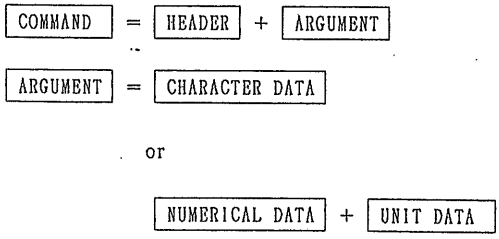
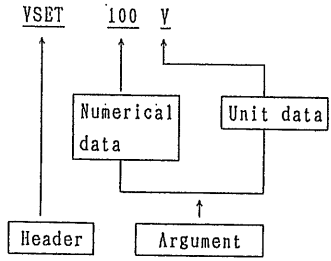
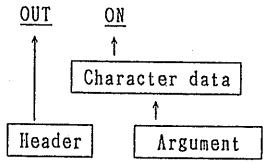


Figure 4-2

Examples: A command for setting an output voltage and that for turning on the output are shown below.



To set an output voltage



To turn on the output

(1) Header

The header consists of a string of letters such as "VSET", "OUT" or "TI", and defines the function of the command.

(2) Argument

The argument consists of a string of letters such as "ON" or "PLUS", or a numerical data plus engineering unit of measure such as "50 V" or "400 Hz". The argument defines how to set the function.

Notes: (a) Both uppercase and lowercase letters are equally effective for the commands.

(b) The spaces are ignored.

Remarks: (a) The symbols used for explanation of commands in this manual are as follows:

xxx ···:		Numerical data
△	:	Space
[ ]	:	The item enclosed in the brackets can be omitted.
( )	:	The item enclosed in the parentheses denotes an abbreviation of an argument.

(b) The numerical data is taken as follows:

Example: xxx.x

123 → 123.0

34.56 → 34.6 (Rounded to one decimal)

000123 → 123.0

All of the above types of numerical data are valid.

(c) All of the examples of commands introduced in this manual are on the assumptions that an NEC PC-9801 personal computer is used for the GP-IB host controller and that the GP-IB address of the interface is 7 and that of the controller is 8.

4.2 Read Back Data Format

Each of the read back data item consists of a header and an argument. The argument consists of a charactor data, or a numerical data and a unit data. See Figure 4-3.

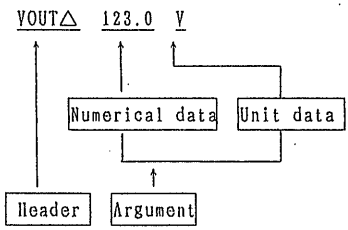
Read back data = Header + Argument

Argument = Character data

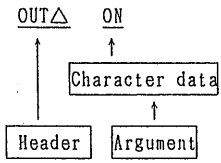
Numerical data + Unit data

Figure 4-3

Examples: An example of output voltage read back data and that of on/off status read back data are given below.



Means that the output voltage is 123.0 V



Means that the output is in the ON status.

(1) Header

The header consists of a character data such as "VOUT△" or "SYNC△" to indicate the type of the read back data.

(2) Argument

The argument consists of a mnemonic symbol such as "ON" or "OFF", or a code symbol such as "0" or "1", or of a combination of a numerical data and a unit data such as "50 V" or "100 ms", to indicate the type or state of the data to be read back.

Notes: (a) The header and unit data can be added or omitted. For this selection, see Section 5.7.

(b) For the character data, either a mnemonic symbol such as "ON" or "OFF" or a code symbol such as "0" or "1" can be used. For this selection, see Section 5.7.

Remarks: Hereafter, each numerical data item is denoted by "×××…". Of the actual numerical value, the number of digits changes due to zero suppression.

Examples: When reading the output voltage, the read back data is as follows:

VOUT△×××.×

(See Table 5-2.)

When the output voltage is 5 V, the read back data is as follows:

VOUT△5.0V

(It is not as VOUT△005.0V.)

4.3 Delimiters

The GP-IB interface can act either as a listener or a talker. There are two types of delimiters, namely, sending delimeters and receiving delimiters. When the interface is designated for a listener by the GP-IB controller (host computer), a receiving delimiter must be provided at the end of each receiving data item (command statement) to indicate its termination. When the interface is designated for a talker by the GP-IB controller, a sending delimiter must provided at the end of each sending data item to indicate its termination.

4.3.1 Receiving Delimiters

When the interface is acting as a listener, one of the receiving delimiters shown in Table 4-1 must be provided at the end of each command.

Table 4-1

1	CR	
2	LF	
3	CR + LF	
4	CR + EOI	EOI must be sent simultaneously with the final byte.
5	LF + EOI	
6	LF + LF + EOI	
7	EOI	
8	;	By using a semicolon or semicolons, two or more commands can be sent within a single statement.*

* Example: 10 PRINT @7; "VSET 100; FSET 50"

4.3.2 Sending Delimiter

When the interface is acting as a talker, the sending delimiter as shown in Table 4-2 is provided at the end of the data being sent.

Table 4-1

CR + LF + EOI	EOI is sent simultaneously with LF.

5. SETTING OF FUNCTIONS AND READ BACK OF DATA

5.1 Basic Operation Procedures

This section describes the basic procedures for setting the data for the PCR Frequncy Converter output and reading back the set data.

5.1.1 Output Voltage and Its Range

(A) Setting

To set an output voltage, use a VSET command; to select an output voltage range, use a RANGE command.

Table 5-1

Header	Argument	Setting Range ＊1	Resolu-tion	Default Value	Back up ＊3
VSET	×××.×[V]	0.0V - 142.5V (Nominal 100 V range) 0.0V - 285.0V (Nominal 200V range) or 0.0 V - Set limit voltage (lower one)＊2	0.1 V	0.0V	○
RANGE	100[V] (0) 200[V] (1)	—	—	100V	○

＊1: The rated output voltage ranges are 1.0 - 140.0V(nominal 100 V range) and 2.0 - 280.0 V (nominal 200 V range).

＊2: Refer to Section 5.1.2.

＊3: The "○" and "×" symbols means that battery back up is provided or not, respectively.

(1) VSET Command

(a) The VSET command is used to set an output voltage.

(2) Range Command

(a) The RANGE command is used to select an output voltage range.

(b) The RANGE command is ineffective when in the OUTPUT ON mode.

(c) For approximately 2 seconds after execution of the RANGE command, although the interface can receive the next command (can make handshake), it cannot execute the next command.

(d) Argument "100V" is for the nominal 100 V range and argument "200 V" is for the nominal 200 V range

(B) Read Back

The output voltage, preset voltage and output voltage range can be read back using the commands VOUT?, VSET? and RANGE?, respectively.

Table 5-2

Command	Read Back Data
VOUT?	VOUT△×××.×V
VSET?	VSET△×××.×V
RANGE?	RANGE△100V (RANGE△0) RANGE△200V (RANGE△1)

(1) VOUT? Command

(a) The command specifies the output voltage for the data item to be read back.

(b) The output voltage is read back when POWER is on.

(2) VSET? Command

(a) The command specifies the preset voltage for the data item to be read back.

(3) RANGE? Command

(a) The command specifies the output voltage range for the data item to be read back.

(b) The meaning of the argument is identical with that for output voltage range setting.

Examples: Setting an output voltage and reading back the set voltage

```
10  ISET IFC : ISET REN
20  PRINT @7 ; "VSET 100V" ..... Set output voltage at 100 V.
30  For I = 0 TO 10000 : NEXT I ..... Allow a period for PCR voltmeter to
                                      respond.
40  PRINT @7 ; "VOUT?" ..... Specify the output voltage for the
                              data item to be read back.
50  INPUT @7 ; V$ ..... Receive the read back data and
                        assign it to character variable V$.
```

5.1.2 Limit Voltage

(A) Setting

With the VLIM command, a limit voltage can be set as shown in Table 5-3.

Table 5-3

Header	Argument	Setting Range	Resolution	Default Value	Back Up
VLIM	×××.×[V]	30.0 V - 285.0 V	0.1 V	285.0 V	○

(1) VLIM Command

(a) The command sets the output voltage limit of the equipment.

(B) Read Back

With the VLIM? command, the limit voltage can be read back as shown in Table 5-4.

Table 5-4

Command	Read Back Data
VLIM?	VLIM△×××.× V

(1) VLIM? Command

The command specifies the limit voltage for the data item to be read back.

5.1.3 Output Frequncy

(A) Setting

With the FSET command, an output frequency can be set as shown in Table 5-5.

Table 5-5

Header	Argument	Setting Range	Resolution	Default Value	Back Up
FSET	××.××[Hz] or ×××.×[Hz]	5.00 Hz - 500.0 Hz	0.01 Hz (5.00 Hz - 99.99 Hz) 0.1 Hz (100.0 Hz - 500.0 Hz)	50.00 Hz	○

(1) FSET Command

(a) The command sets the output frequency.

(b) The command is ineffective when in the synchronized mode or in the power line failure simulation mode of operation.

(B) Read Back

With the FSET? command, the output frequency can be read back as shown in Table 5-6.

Table 5-6

Command	Read Back Data
FSET?	FSET△ ××.×× Hz (5.00 Hz - 99.99 Hz) FSET△×××.×× Hz (100.0 Hz - 500.0 Hz)

(1) FSET? Command

(a) The command specifies the preset frequency for the data item to be read back.

(b) When in the synchronized mode of operation, the preset frequency is changed so that the output frequency is synchronized with the input line frequency and, therefore, no meaningful data can be obtained by reading back the preset frequency.

5.1.4 Output ON/OFF

(A) Setting

With the OUT command, the output can be turned on or off as shown in Table 5-7.

Table 5-7

Header	Argument	Setting Range	Resolution	Defaut Value	Back Up
OUT	ON (1) OFF (0)	—	—	OFF	×

(1) OUT Command

(a) The command sets the output to the ON or OFF state.

(b) Argumend ON (1) is for turning on the output and argument OFF (0) is for turning off the output.

(c) The output cannot be turned on when in any of the following conditions:

① When the ALARM lamp of the PCR Frequency Converter is illuminating.

② When the 3P01-PCR 3-phase Driver(optional) is used in conjunction and its connections are incorrect.

(B) Read Back

With the OUT? command, the ON/OFF state of the output can be read back as shown in Table 5-8.

Table 5-8

Command	Read Back Data
OUT?	OUT△ON (1) OUT△OFF (0)

(1) OUT? Command

(a) The command specifies the ON/OFF status of the output for the data item to be read back.

(b) The meanings of the arguments are the same as those for the setting explained in (A).

5.1.5 Output Current

(A) Read Back

With the IOUT? command, the output current can be read back as shown in Table 5-9.

Table 5-9

Command	Read Back Data
IOUT?	IOUT△××.×× (for Models PCR500 and PCR1000) IOUT△×××.× (for Models PCR2000 and PCR4000)

(1) IOUT? Command

(a) The command specifies the output current for the data item to be read back.

5.2 Synchronized Operation

5.2.1 Synchronized Operation Execution and Stop

(A) Setting

With the SYNC command, synchronized operation statuses can be set as shown in Table 5-10. [The term "execution" as used here includes status "2" (running in the synchronized mode) and status "1" (ready for synchronized operation). Status "0" means that the equipment is not in the synchronized mode.]

Table 5-10

Header	Argument	Setting range	Resolution	Default Value	Back up
SYNC	ON (1) OFF (0)	—	—	OFF	×

(1) SYNC Command

(a) The command sets the synchronized operation to execution or to stop.

(b) Argument ON is for execution and OFF is for stop.

(c) The command is ineffective unless the preset frequency is within 50.00 ±1.9 Hz or 60.00 ±1.9 Hz.

(d) The command is ineffective when in the power line abnormality simulation mode of operation.

5.2.2 Synchronized Operation Statuses

There are three types of synchronized operation statuses (1, 2, and 3) as shown in Table 5-11.

Table 5-11

Status	Symbol	Remarks (Refer to the instruction manual of PCR Frequency Converter)
Not in synchronized operation	0	—
Ready for synchronized operation	1	SYNC STANDBY mode
Running in synchronized mode	2	SYNC mode

(A) Read Back

With the SYNC? command, the synchronized operation status can be read back as shown in Table 5-12.

Table 5-12

Command	Read Back Data
SYNC?	SYNC△0 SYNC△1 SYNC△2

(1) SYNC? Command

(a) The command specifies the synchronized operation status for the data item to be read back.

(b) The meanings of the arguments (0, 1, 2) are the same as those shown in Table 5-11.

5.3 Initialization

With the CLR command, all of the GP-IB controlled items of the PCR equipment can be reset to the initial values (default values). They can be reset also by using a GP-IB interface message "DC" or "SDC".
The CLR command is as shown in Table 5-13.

Table 5-13

Header	Argument	Setting Range	Resolution	Default Value	Back up
CLR	—	—	—	—	×

(1) CLR Command

The command initializes the PCR equipment.

Examples: Sending of DC and SDC

```
WBYTE &H3F, &H48, &H14, ; ..... Sending of DC
WBYTE &H3F, &H48, &H27, &H04 ; ... Sending of SDC
```

5.4 Memory

The PCR equipment has memory units for preset voltage data (V memory) and for preset frequency data (F memory), each of which has three addresses (A, B and C) and can be expanded up to 99 addresses by using the IBO1-PCR GP-IB Interface or the RC01-PCR Remote Controller as shown in Figure 5-1.

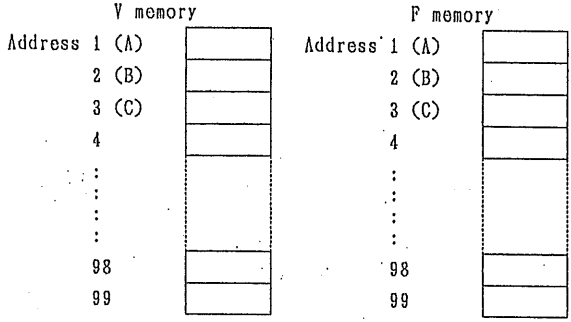


Figure 5-1

Addresses 1 - 3 are corresponding to memory addresses A, B and C of the PCR equipment. Addresses 1 - 99 are corresponding to those of the RC01-PCR Remote Controller.

(A) Setting

With the VSTO command and FSTO command, a preset voltage and a preset frequency, respectively, can be written on memory as shown in Table 5-14. With the CLRMEMORY command, memory can be cleared.

Table 5-14

Header	Argument	Setting Range	Resolution	Default Value	Back up
VSTO	××	1 - 99	1	—	×
FSTO	××	1 - 99	1	—	×
CLRMEMORY	—	—	—	—	×

(1) VSTO Command

(a) The command is to write a preset voltage at the V memory address indicated by the argument.

(2) FSTO Command

(a) The command is to write a preset frequency at the F memory address indicated by the argument.

(3) CLRMEMORY Command

(a) The command is to clear all of the addresses (1 - 99) of V and F memory.

(B) Application Example

The IB01-PCR GP-IB Interface may be used to improve the test efficiency also when a device connected to the PCR Frequency Converter is manually tested via the RC01-PCR Remote Controller.

Example: Test by employing memory for betterment of test efficency

① Prepare data patterns of different preset voltages and frequencies for different test items and devices to be tested, on the GP-IB controller (host computer).

② Before starting a test, write the required data on the V memory and F memory.

③ Set the PCR Frequency Converter to the local mode (see Section 10). Now the test can be made by reading back the memory data from the RC01-PCR Remote Controller. Even when test items and types of devices to be tested are required to be changed, tests can be efficiently made by repeating the procedure starting by Step ②.

(C) Read Back

With the VSTO ××? command or FSTO ××? command, the data stored in the V. memory or F memory can be read back as shown in Table 5-15.

Table 5-15

Command	Read Back Data
VSTO ××?	VSET△×××.× V
FSTO ××?	FSET△××.×× Hz (for 5.00 Hz - 99.99 Hz)
	FSET△×××.× Hz(for 100.0 Hz - 500.0 Hz)

(1) VSTO ×× ? Command

The command specifies the data in address ×× of V memory for the data item to be read back.

(2) FSTO ×× ? Command

The command specifies the data in address ×× of F memory for the data item to be read back.

5.5 Status Monitor

The GP-IB Interface monitors the status of the PCR Frequency Converter at every 8 milliseconds and sends the status information to the GP-IB host controller.

5.5.1 Status Register

The GP-IB Interface has a status register to report the status of the PCR Frequency Converter to the GP-IB host controller. The interface also has an accumulated status register to support the status register.

Status Register

MSB b7	b6	b5	b4	b3	b2	b1	LSB b0
3PERR	—	ALARM	—	$\overline{\text{SYNC}}$	OVERLOAD	PON	ERR

Accumulated Status Register

MSB b7	b6	b5	b4	b3	b2	b1	LSB b0
3PERR	—	ALARM	—	$\overline{\text{SYNC}}$	OVERLOAD	PON	ERR

The bits indicated with a bar (-) are not used.

Figure 5-2

For the meanings of the mnemonic symbols shown in Figure 5-2, see Section 2.2.3.

(1) Status Register

(a) Of each of the bits, status "1" denotes the effective status.

(b) The ERR and PON bits are storage bits. Once they are set (tuened to the "1" status), they are not reset. (not turned to the "0" status) until the GP-IB host controller reads back the status register or until serial polling is made when SRQ is generated.

(c) The other bits than the ERR and PON bits are real bits which are set or reset depending on the result of status monitoring.

(2) Accumulated Status Register

(a) Of each of the bits, status "1" denotes the effective status.

(b) All of the bits are storage bits. Once they are set, they are not reset until the GP-IB controller reads back the accumulated status register.

5.5.2 Status Read Back

For the GP-IB host controller, there are two ways of finding the status of the PCR Frequency Converter. One is by employing a STATUS? command or a ASTATUS? command as shown in Table 5-16 and the other is by employing a serial polling method. For the latter, see Section 8.

Table 5-16

Command	Read Back Data
STATUS?	STATUS△××× ASTATUS△×××
ASTATUS?	

(1) STATUS? Command

(a) The command specifies the status register data for the item to be read back.

(b) The numerical data is of a decimal number.

(2) ASTATUS? Command

(a) The command specified the accumulated status register data for the item to be read back.

(b) The numerical data is of a decimal number.

5.6 POWER Switch Off

The POWER switch of the PCR frequency converter can be turned off by employing the POW command as shown in Table 5-17.

Table 5-17

Header	Argument	Setting Range	Resolution	Default Value	Back Up
POW	OFF (0)	–	–	–	×

(1) POW Command

(a) The command turns off the POWER switch of the PCR Frequency Converter.

(b) The command may be used when a system emergency has occurred and power of the frequency converter is required to be turned off immeditely.

5.7 Read Back Data Format Setting

(A) Setting

The format of read back data can be set with the HEAD command or WORD command as shown in Table 5-18. The commands may be used when no header or engineering unit of measure is required or when a numerical value is more desirable than a mnemonic symbol for the argument.

Table 5-18

Header	Argument	Setting Range	Resolution	Default Value	Back Up
HEAD	ON (1) OFF (0)	–	–	ON	×
WORD	0 1	–	–	1	×

(1) HEAD Command

(a) The command indicates whether the header and the engineering unit of measure is to be included or eliminated.
Argument ON is for inclusion and argument OFF is for elimination.

(b) When the header and engineering unit are not required, "HEAD 0" may be specified for simplification of read back data calculation, for example.

(2) WORD Command

(a) The command indicates either mnemonic symbols (such as "ON" and "OFF") or code symbols (such as "0" and "1") are to be used for character data.

(b) Argument 1 is for mnemonic symbols and argument 0 is for code symbols.

Example: When the nominal output voltage range is set at 100 V and this data is read back (see Section 5.1.1), the read back data is as shown in Table 5-19.

Table 5-19

	WORD 1	WORD 0
HEAD ON	RANGE△100V	RANGE△0
HEAD OFF	100	0

6. POWER LINE ABNORMALITY SIMULATION

The PCR equipment is capable of delivering an output simulating power line abnormalities such as power interruptions, voltage pops and dips.

Note: (1) The power line abnormality simulation can be made only at 50.00 Hz or 60.00 Hz. The frequency is not continuously variable.

(2) When in the power line abnormality simulation operation, the synchronized operation is disabled. That is, the two types of operation cannot be conducted at the same time.

(3) Power line abnormality simulation mode is stopped if overloading condition is not removed or ALARM state.
Please be aware that the output waveforms of the PCR series may be distorted when the PCR series are over loaded.
Make sure that the load current is not greater than the rated output current. (Refer to the instruction manual of the PCR Frequency Converter.)

The types of simulation abnormalities are power interruption (INT), voltage pop and voltage dip (P/D) as shown in Figure 6-1.

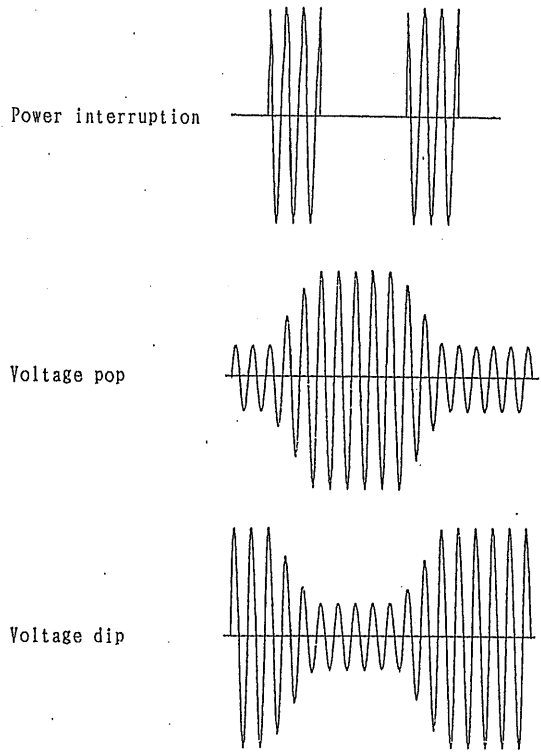


Figure 6-1

6.1 Setting the Parameters

The parameters for power line abnormality simulation are as follows:

T1: Voltage change start time

The period from the zero-crossing point immediately before starting of voltage abnormality (interruption, pop or dip) to the point where the abnormality starts.

T2: Slope time

The period in which the voltage rises up (for pop) or falls down (for dip).

T3: Power interruption time/Pop time/dip time

The period during which the voltage remains in the power interruption, popped up state or dipped down state.

T4: Slope time

The period in which the voltage falls down (from pop) or rises up (from dip).

N: Power restoration cycles

The number of cycles for which the power remains in the restored voltage (normal voltage) between abnormalities.

POL: Polarity

The POL indicates whether the voltage at the start point of T1 crosses the zero level in the positive-going direction or in the negative-going direction (see Figure 6-2). With this parameter, the phase of T1 can be varied for a range of 0 to 360 degrees.

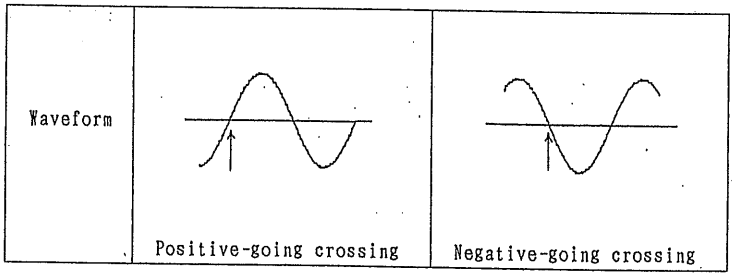


Figure 6-2

Note: When the voltage is raised or lowerd with T2 =0, the supply voltage change start phase (timing) may be displayed being shifted (delayed by approximately 0.8 ms) reflecting the inaccuracy of T2. If this is the case, adjust the set value of T1 by reducing it by 0.8 ms [set T1 as {(Desired value of T1) - (0.8 ms)} , where T1 ≧ 0.8ms], or use the INT made when lowering the output voltage to zero.
For example, if parameters are set as T1 = 5 ms and T2 = 0 ms, the actual supply voltage change start timing will be at approximately 5.8 ms. To correct this, set T1 at (5 -0.8) ms = 4.2 ms.

MODE: Type of abnormality

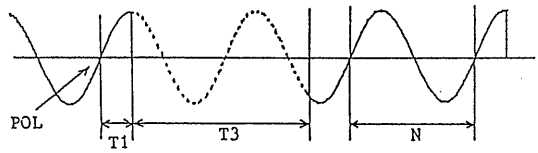
The MODE indicates the type of simulated line voltage abormality--interruption or pop/dip.

V (T3): Pop voltage/dip voltage

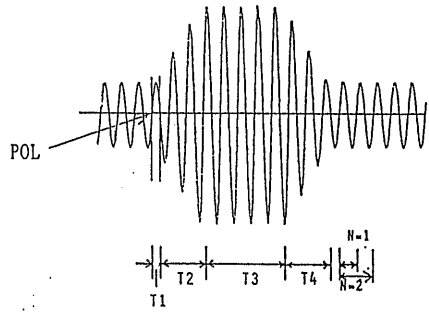
The V (T3) denotes the popped up voltage or dipped down voltage.

The parameters for power interruption, voltage pop and dip are as shown in Figure 6-3.

Power interruption
(INT mode)



Voltage pop
(P/D mode)



Voltage dip
(P/D mode)

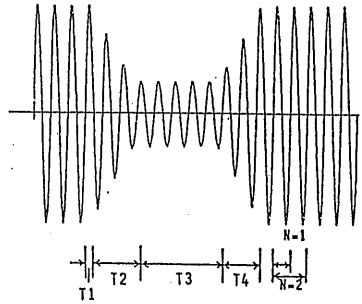


Figure 6-3

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○ 3-phase Operation

Precaution:	Be sure to install the GP-IB interface board in the frequency converter of the U-phase. Note that, if the interface board is installed in other frequency converter, operation of the equipment is not guaranteed.

By employing the 3-phase Driver 3P01-PCR (optional device) together with the GP-IB interface, power line abnormality simulation for a 3-phase power line can be made. Each of the U, V and W phase lines can simulate power interruption, voltage pop up and dip down with timinges identical with those of a single-phase line. Examples of power interruption waveforms are shown in Figure 6-4.

Example: Power interrption

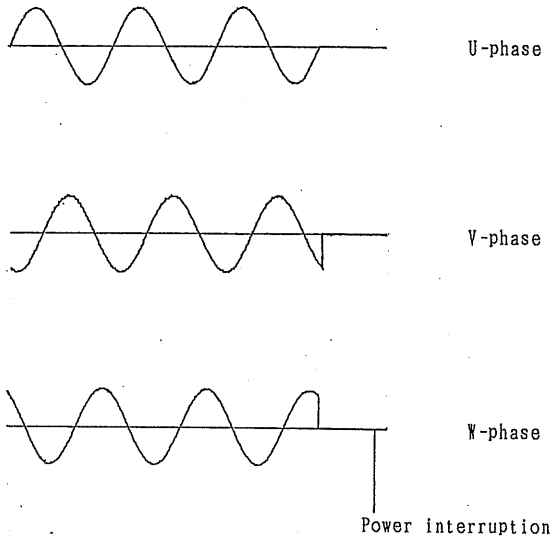


Figure 6-4

(A) Setting

The parameters for power line abnormality simulation can be set with the T1, T2, T3, T4, N, POL, MODE, and T3,VSET commands as shown in Table 6-1.

Table 6-1

Header	Argument	Setting Range	Resolution	Default Value	Back Up
T1,	×.× [ms]	0.0 ms - 9.9 ms	0.1 ms	0.0 ms	○
T2,	×××.×[ms]	0 ms - 9999 ms	1 ms	0 ms	○
T3,	×××.×[ms]	0 ms - 9999 ms	1 ms	0 ms	○
T4,	×××.×[ms]	0 ms - 9999 ms	1 ms	0 ms	○
N	××××	0 - 9999	1	0	○
POL	PLUS (0) MINUS (1)	—	—	PLUS	○
MODE	INT (0) PD (1)	—	—	INT	○
T3,VSET	×××.×[V]	0.0 V - 142.5 V (nominal 100 V range), 0.0 V - 285.0 V (nominal 200 V range), or 0.0 V - Limit voltage	0.1 V	0.0 V	○

(1) T1 Command

(a) The command sets the T1 period.

(2) T2 Command

(a) The command sets the T2 period.

(3) T3 Command

(a) The command sets the T3 period.

(4) T4 Command

(a) The command sets the T4 period.

(5) N Command

(a) The command sets the N (number of cycles).

(b) Number 9999 is taken for infinitive and the abnormal waveform is generated only once resulting in a one-shot type of power line abnormality simulation operation.

(c) Number N may be added or subtracted by 1 depending on the set value of T1, T2, T3 or T4.

(6) POL Command

(a) The command specifies the POL (polarity of zero level crossing).

(b) Argument PLUS is for crossing the zero level in the positive-going direction and argument MINUS is for that in the negative-going direction.

(7) MODE Command

(a) The command specifies the type (mode) of abnormality--INT mode (interruption mode) or P/D mode (pop/dip mode).

(8) T3,VSET Command

(a) The command sets the V(T3)--the voltage for period T3.

(b) When a voltage higher than 142.5 V is set with the nominal 200 V range, the set voltage remains effective even when the range is changed to nominal 100 V.

(c) When the limit voltage is set at a voltage lower than V(T3), the set V(T3) voltage remains effective even when the limit voltage is set at a voltage lower than the set V(T3) voltage.

Example:

```
10  ISET IFC:ISET REN
20  PRINT@7; "RANGE 200V"
30  PRINT@7; "T3,VSET 200V"
40  PRINT@7; "T3,VSET?"
50  LINE INPUT@7; A$ : PRINT A$
60  PRINT@7: "RANGE 100V"
70  LINE INPUT@7; B$ : PRINT B$
```

When the above program is executed, data read back by the PRINT statements of 50 and 70 is displayed as follows:

```
A$→T3,VSET△200V
B$→T3,VSET△200V
```

Thus, the voltage set by the T3,VSET command ramains effective even when the output voltage range is changed to nominal 100 V.

(B) Read Back

The parameters set for power line abnormality simulation can be read back by using the T1?, T2?, T3?, T4?, N?, POL?, MODE?, and T3,VSET? commands as shown in Table 6-2.

Table 6-2.

Command	Read Back Data
T1?	T1△×.× ms
T2?	T2△×××× ms
T3?	T3△×××× ms
T4?	T4△×××× ms
N?	N△××××
POL?	POL△PLUS (POL△0) POL△MINUS (POL△1)
MODE?	MODE△INT (MODE△0) MODE△PD (MODE△1)
T3,VSET?	T3,VSET△×××.× V

(1) T1? Command

Specifies T1 for the data item to be read back.

(2) T2? Command

Specifies T2 for the data item to be read back.

(3) T3? Command

Specifies T3 for the data item to be read back.

(4) T4? Command

Specifies T4 for the data item to be read back.

(5) N? Command

Specifies N for the data item to be read back.

(6) POL? Command

Specifies POL for the data item to be read back. The meanings of the arguments are identical with those mentioned in (A) Setting.

(7) MODE? Command

Specifies MODE for the data item to be read back. The meanings of the armuments are indentical with those mentioned in (A) Setting.

(8) T3,VSET Command

Specifies V(T3) for the data item to be read back.

6.2 Start/Stop

(A) Setting

The power line abnormality simulation operation can be started or stopped with the INT command as shown in Table 6-3.

Table 6-3

Header	Argument	Setting Range	Resolution	Default Value	Back Up
INT	0 1	—	—	0	×

(1) INT Command

(a) The command starts or stops the power line abnormality simulation operation.

(b) Argument 0 is for stop and argument 1 for start.

(c) When in the cases shown in Table 6-4, START error messages are generated. The types of errors are denoted by error messages. For the error messages, see Section 9.

Table 6-4

Type of Error	Error Message
The preset frequency is not 50.00 Hz or 60.00 Hz.	IE1
The preset frequency is 60.00 Hz and T1 is longer than 8.3 ms.	IE2
Simulation is in the P/D mode and the preset voltage for T3 is not within the preset range.	IE3
Simulation is in the P/D mode and the preset voltage for T3 is the same with that for normal operation	IE4

(B) Read Back

The start/stop status of power line abnormality simulation can be read back with the INT? command as shown in Table 6-5.

Table 6-5

Command	Read Back Data
INT?	INT△0 INT△1

(1) INT? Command

(a) The command specifies the start/stop status of power line abnormality simulation for the data item to be read back.

(b) Argument 0 of the read back data is for stop and argument 1 for start.

7. PHASE SETTING FOR 3-PHASE OPERATION

The PCR equipment can be operated for 3-phase power by using three units of PCR Frequency Converters and three units of 3P01-PCR 3-phase Driver (optional). It also is possible to control the phases of V-phase and W-phase by hooking up the IB01-PCR GP-IB Interfaces to the PCR Frequency Converters of V-phase and W-phase also as shown in Figure 7-1.

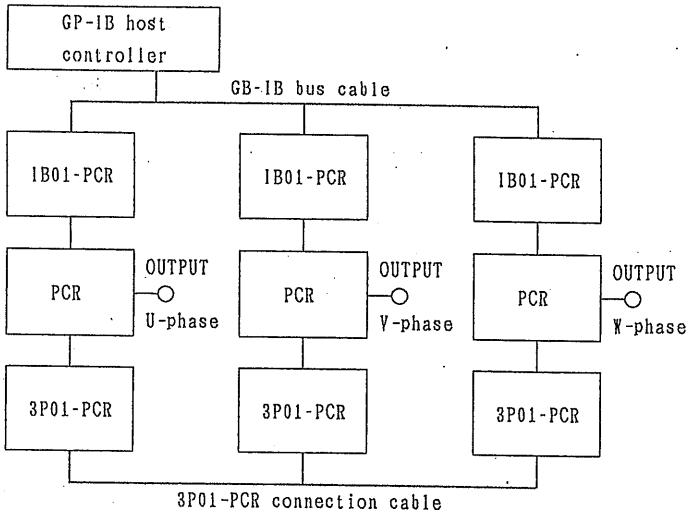


Figure 7-1

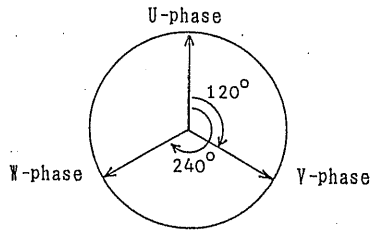


Figure 7-2. 3-phase Output Vector Diagram

(A) Setting

The phases of the V-phase and W-phase can be set with the PHASE,V command and PHASE,W command as shown in Table 7-1.

Table 7-1

Header	Argument	Setting Range	Resolution	Default Value	Back Up
PHASE,V	xxx	0 - 359	1	120	×
PHASE,W	xxx	0 - 359	1	240	×

Note: The engineering unit of measure of the argument is degree (°) of angle.

(1) PHASE,V Command

(a) The command specifies the phase angle of delay of the V-phase with respect to the U-phase.

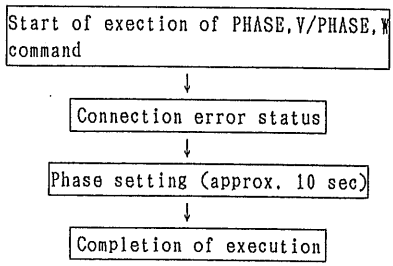
(b) The command is effective only for the GP-IB Interface assigned for the V-phase.

(2) PHASE,W Command

(a) The command specifies the phase angle of delay of the W-phase with respect to the U-phase.

(b) The command is effective only for the GP-IB Interface assigned for the W-phase.

Note: The PHASE,V command and PHASE,W command require a period of approximately 10 seconds for execution (for completion of phase setting). During this period, the equipment operates as follows:



During the period of 10 seconds, the GP-IB Interface cannot execute other commands although it can accept them.

(B) Read Back

The phases of the V-phase and W-phase can be read back with the PHASE,V? and PHASE,W? commands as shown in Table 7-2.

Table 7-2

Command	Read Back Data
PHASE,V?	PHASE,V△××× PHASE,W△×××

(1) PHASE,V? Command

(a) The command specifies the delay phase angle (set value) of the V-phase with respect to the U-phase for the data item to be read back.

(b) The command is effective only for the GP-IB Interface assigned for the V-phase.

(2) PHASE,W? Command

(a) The command specifies the delay phase angle (set value) of the W-phase with respect to the U-phase for the data item to be read back.

(b) The command is effective only for the GP-IB Interface assigned for the W-phase.

8. SRQ

The GP-IB interface is able to generate an SRQ depending on the conditions (bits) of the status register described in Section 5.5. It also is able to enable/disable the SRQ generation for each of the bits. By making use of these capabilities, the automatic operation safety of the PCR equipment can be enhanced.

8.1 SRQ Generation Enable/Disable

(A) Setting

SRQ generation can be enabled by using the UNMASK command as shown in Table 8-1 and setting an UNMASK register as shown in Figure 8-1. The bit arrangement of the UNMASK register is identical with that of the STATUS register (except the PON bit).

UNMASK Register

MSB b7	b6	b5	b4	b3	b2	b1	LSB b0
3PERR	—	ALARM	—	$\overline{\text{SYNC}}$	OVERLOAD	—	ERR

Figure 8-1

Note: The bits indicated with the bars (-) are ineffective.

Table 8-1

Header	Argument	Setting Range	Resolution	Default Value	Back Up
UNMASK	×××	0 - 255	1	0	×

(1) UNMASK Command

(a) The command sets the UNMASK register.

(b) The argument is a decimal number.

(c) Bit status "1" is for SRQ generation enabled and "0" for disabled.

(d) The ineffective bits may be used for setting, but they are ineffective for SRQ generation.

Example: When the UNMASK register is set for decimal 36, which in the binary notation is 00100100, SRQ generation is enabled for b5 (ALARM) and b2 (OVERLOAD).

(B) Read Back

The status of the UNMASK register (SRQ generation enabled status) can be read back with the UNMASK? command as shown in Table 8-2.

Table 8-2

Command	Read Back Data
UNMASK?	UNMASK△×××

(1) UNMASK? Command

(a) The command specifies the data of the UNMASK register for the data item to be read back.

(b) The numerical value of the read back data is of a decimal number.

8.2 SRQ Generation Mechanism

The SRQ generation mechanism of the GP-IB interface is as shown in Figure 8-2.

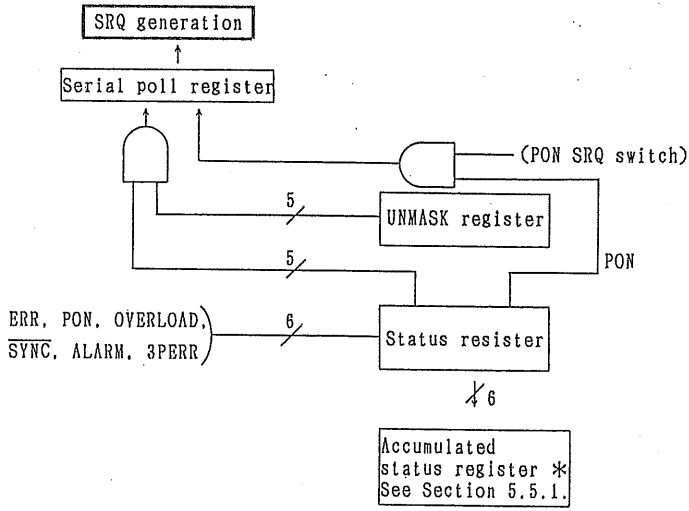


Figure 8-2. SRQ Generation Mechanism

The bit arrangement of the serial poll register is identical with that of the staus register, except that bit 6 of the former is an RQS bit (see Figure 8-3). When an SRQ is generated, the RQS bit is in the "1" status. The serial poll register can be read by sarial polling (see Section 11, Program Example 3).

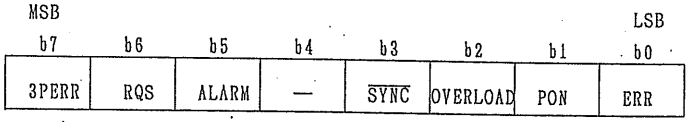


Figure 8-3. Serial Poll Register

(A) Read Back

When the command received is invalid with an error, the GP-IB Interface records the content in the form of an error message.
The GP-IB host controller can know the type of the command error by reading back the error message. The error message can be read back with the ERR? command as shown in Table 9-1.

Table 9-1

Command	Read Back Data
ERR?	ERR△××

MSB b7	b6	b5	b4	b3	b2	b1	LSB b0
—	—	IE4	IE3	IE2	IE1	DE	SE

Figure 9-1. Error Message

(1) ERR? Command

(a) The command specifies the error message for the data item to be read back.

(b) The numerical data is decimal.

(c) For the meanings of IE1 - IE4, see Section 6.2.

(d) "SE" denotes a syntax error and "DE" a set value invalid error.

Examples

Command	Error Message(Bit)
VSET 500V	DE
VSST 100V	SE

Note: The error messages are cleared as they are read back.

10. REMOTE/LOCAL MODE SELECT

The GP-IB Interface has a remote/local mode select function. Selection can be instructed from the GP-IB host controller.

It also is possible to transfer from the remote mode to the local mode with the LOCAL switch (see Section 3.1). When in the local lock out mode, however, the LOCAL switch is disabled. The functions of the controls of PCR equipment are enabled or disabled as shown in Table 10-1.

Table 10-1

Mode	PCR Frequency Converter Panel Controls	LOCAL Switch	REMOTE Lamp	Remarks
Local	○	×	Off	When POWER switch is on
Remote	×	○	On	
Local lock out	×	×	On	

Legends: "○" means enabled and "×" disabled.

The modes are transferred as follows:

(1) Local mode → Remote mode

When the REN line of GP-IB bus is L(true) and the GP-IB Interface is designated for a listener.

(2) Remote mode → Local lock out mode

When an interface message LLO is sent to the GP-IB Interface, in addition to the condition of (1).

(3) Romote mode → Local mode

When the LOCAL switch is pressed, when a multi-line message GTL is sent to the GP-IB Interface, or when the REN line of GP-IB bus is set to H (false).

(4) Local lock out mode → Local mode

When an interface message GTL is sent to the GP-IB Interface or when the REN line of GP-IB bus is set to H (false). (The LOCAL switch is ineffective.)

Programming example: Remote → Local transfer

```
10  ISET IFC
20  ISET REN                    ..... Set REN line to L.
30  PRINT @7; "VSET 100"        ..... Set to remote mode.

      (Pressing the LOCAL switch.) ..... Set to local mode.

100 PRINT @7; "VSET 100"        ..... Set to remote mode.
110 IRESET REN                  ..... Set the REN line to H and
                                       the equipment to local mode.

200 ISET REN
210 PRINT @7; "VSET 100"        ..... Set to remote mode.
220 WBYTE &H3F, &H48, &H27, &H11;  ... Send LLO and set the equip-
                                       ment to local lock out mode.

      (Pressing the LOCAL switch) ..... Remain in local lock out
                                       mode. (LOCAL switch is
                                       disabled.)

300 WBYTE &H3F, &H48, &H27, &H01;  ... Send GTL and set the equip-
                                       ment to local mode.
```

11. PROGRAMMING EXAMPLES

For the programming examples introduced here, an NEC PC-9801 personal computer is assumed for the GP-IB host controller. The GP-IB address of the host controller is assumed to be 8 and that of the GP-IB Interface to be 7. At the beginning of each of the programs, execute the following instrutions:

ISET IFC ..... Interface clear.

ISET REN ..... Set the REN line to true.

(1) Setting and Reading Back the Output Voltage

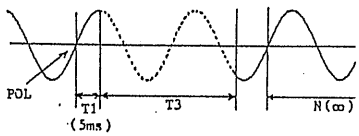
Set the output voltage from the keyboard. To read back (measure) the output voltage, enter "?" from the keyboard and the output voltage will be displayed on the PC-9801 personal computer.

```
 10  ISET IFC: ISET REN
 20  PRINT @7; "VOUT?"        ··· (Specifies the output voltage for the
                                   data item to be read back.)
 30  PRINT @7; "OUT ON"       ··· Turn on the otuput.
 40  INPUT V$                 ··· (Enter the output voltage to be set
                                   or enter "?")
 50  IF V$="?" THEN GOTO 80
 60  PRINT @7; "VSET"+V$      ··· Set the output voltage.
 70  GOTO 30
 80  '
 90  INPUT @7; Q$             ··· Read back the output voltage.
100  PRINT Q$                 ··· Display the read back data on the CRT.
110  GOTO 30
120  END
```

(2) Power Line Abnormality Simulation

To provide an interrupted power for the device to be tested, enter an interruption period from the keyboard.

```
10  ISET IFC: ISET REN
20  PRINT @7; "VSET 100; FSET 50"  ··· Set at 100 V, 50 Hz.
30  PRINT @7; "HEAD 0"             ····· Eliminate the header.
40  PRINT @7; "T1,5"               ····· Set the parameters,
50  PRINT @7; "POL PLUS"
60  PRINT @7; "MODE INT"
70  PRINT @7; "N 9999"
```




```
80  PRINT @7; "HEAD 0"             ····· Eliminate the header.
90  PRINT @7; "INT?"               ····· Read back the start/stop status
                                          of power line abnormality simu-
                                          lation.
100 '
110 INPUT "INPUT T3 (ms)"; T3$     ··· Enter T3 from keyboard.
120 PRINT @7; "T3," + T3$          ··· Set T3.
130 PRINT @7; "INT 1"              ··· Deliver the interrupted power.
140 INPUT @7; I$                   ┐ Wait untill power line
                                   ┘ abnormality simulation
150 IF VAL(I$)=1 THEN GOTO 140       operation is over.
160 GOTO 100
170 END
```

Note: Since N = 9999, interruption is of a one-shot type.

(3) SRQ Processing Example

The following programming example is for turning off the output when the frequencies have become asynchronized due to any cause while in the synchronized mode of operation.

```
 10  ISET IFC: ISET REN
 20  ON SRQ GOSUB 1000          ··· Set the head address of SRQ
                                    subroutine at 1000.
 30  PRINT @7; "FSET 50; VSET 100"  ··· Set at 50 Hz, 100 V.
 40  PRINT @7; "SYNCRO ON"      ··· Start the synchronized mode of
                                    operation.
 50  PRINT @7; "OUT ON"         ··· Turn on the output.
 60  FOR I=0 TO 5000: NEXT I    ··· Provide a delay time for start up of
                                    synchronized opration.
 70  PRINT @7; "UNMASK8"        ··· Enable SRQ generation by SYNC.
 80  N=0
 90  SRQ ON                     ··· Enable SRQ reception (PC-9801).
100  PRINT "*** SYNCHRO START ***"
110  IF N=0 THEN GOTO 110       ··· [As N = 0 is specified by statement
                                    80, a loop (for waiting for SRQ) is
                                    provided by statement 110.  When an
                                    SRQ is generated, N = 1 results for
                                    statement 1030 and consequently
                                    control goes to statement 120.]
120  PRINT @7; "OUT OFF"        ··· Turn off the output.
130  PRINT @7; "SYNC OFF"       ··· Stop the synchronized operation.
140  PRINT ***"SYNCHRO OUT"***
150  END
160  '
1000  PRINT @7; "UNMASK 0"          Disable SRQ generation.
1010  FOR I=0 TO 1000: NEXT I··· Provide a delay time for execution of
                                    UNMASK command.
1020  POLL 7,S                   ··· Execute serial polling.
1030  N=1                        ··· Indicate that SRQ is generated.
1040  RETURN
```

12. TABLE OF COMMANDS (IN ALPHABETICAL ORDER)

Table 12-1 (1)

Command	Description	Refernce Page
ASTATUS?	Read back the accumulated status register.	29
CLR	Initialize the GP-IB Interface.	25
CLR MEMORY	Initialize F memory and T memory.	26
ERR?	Read back error massage.	48
FSET ××××	Set the output frequency.	21
FSET?	Read back the preset frequency.	22
FSTO ××	Write the preset frequency at address ×× of F memory.	26
FSTO ××?	Read back the contents of address ×× of V memory.	27
HEAD ×	Use format × for read back data.	30
INT ×	Start/stop power line abnormality simulation.	40
INT?	Read back the start/stop status of power line abnormality simulation.	41
IOUT?	Read back the output current.	23
MODE ×	Set mode × for power line abnormality simulation.	37
MODE?	Read back the mode of power line abnormality simulation.	39
N ××××	Set N at ××××.	37
N?	Read back N.	39
OUT ×	Turn on/off the output.	22
OUT?	Read back the on/off status of output.	23
PHASE,V ×××	Set the phase angle of V-phase at ×××.	43
PHASE,V?	Read back the phase angle of V-phase.	44
PHASE,W ×××	Set the phase angle of W-phase at ×××.	43
PHASE,W?	Read back the phase angle of W-phase.	44
POL ×	Set the positive-going/negative-going polarity for zero level crossing at the start of power line abnormality simulation.	37
POL?	Read back the zero line crossing polarity at the start of power line abnormality simulation.	39
POW ×	Turn off the power switch.	30
RANGE ×××	Set the output voltage range at ×××.	18
RANGE?	Read back the output voltage range.	19
STATUS?	Read back the status register.	29
SYNC ×	Start/stop the synchronized operation.	24
SYNC?	Read back the status of synchronized operaiton.	25

Table 12-1 (2)

Command	Description	Reference Page
T1, ××	Set T1 at ××.	37
T1?	Read back T1	39
T2, ××××	Set T2 at ××××.	37
T2?	Read back T2.	39
T3, ××××	Set T3 at ××××.	37
T3?	Read back T3.	39
T3,VSET ×××	Set the output voltage at ××× for period T3.	37
T3,VSET?	Read back the preset voltage for T3.	39
T4, ××××	Set T4 at ××××.	37
T4?	Read back T4.	39
UNMASK ×××	Enable SRQ generation.	45
UNMASK?	Read back SRQ generation enabled/disabled status.	46
VLIM ×××	Set the limit voltage at ×××.	20
VLIM?	Read back the limit voltage.	21
VOUT?	Read back the output voltage.	19
VSET ×××	Set the output voltage at ×××.	18
VSET?	Read back the preset voltage.	21
VSTO ××	Write the preset voltage at address ×× of V memory.	26
VSTO ××?	Read back the contents of address ×× of V memory.	27
WORD ×	Use format × for read back data.	30

Version number of PCR series

The version number of the PCR series can be checked with following procedure.

(1) Turn on the POWER switch of the PCR series while MEMORY A and B switches are pressed.

(2) The version number is shown on the Ammeter on the operation/display panel.