

**OPERATION MANUAL**

**GP-IB INTERFACE  
IF01-COR**

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KIKUSUI PART No. Z1-000-132 IA000851

### **ROM Version Number**

**This manual is applicable to the IF01-COR installed on a COR5500U series digital storage oscilloscope which has the following version of the ROM (read only memory):**

#### **1.10 or later**

When making any inquiries on the IF01-COR, please mention the ROM version and the product number of the oscilloscope, and the product number of IF01-COR.

The product number of the oscilloscope is indicated on a sticker on the rear panel.

To find the oscilloscope ROM version, refer to Section 2.4 "Checking the Oscilloscope Operation" under Chapter 2 "PRECAUTIONS" in the operation manual of the oscilloscope.

The product number of IF01-COR is stamped inside the IF01-COR.



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## Indications for Cautions and Warnings

For the maximum safety of the persons who may use the instrument, IF01-COR has been designed and manufactured for full safety features and is shipped after stringent inspection. And yet, as the IF01-COR is used in conjunction with the COR5500U series oscilloscope which has high voltages, it is unavoidable to request the persons to use the instrument carefully, in order to avoid damage to the instruments and hazards to the persons.

This manual gives notes and warnings which the operator must take heed of and observe. The types of notes and warnings are as follows:

### **NOTE**

Means a matter that calls for special attention for correct and efficient use of the instruments.

### **WARNINGS**

Means a matter which might lead to damage of the instruments themselves or of other instruments.

The following symbols may be posted on the instruments:

 **“DANGER! HIGH VOLTAGE”**

This symbol means that the item can be charged up to a hazardous high voltage and must not be touched with bare hands.



**“Refer to the Corresponding Section”**

This symbol means that relative matters at other location of the manual should be referred to.

### **CAUTION**

Means a matter which can lead to electric check hazards to the person who is operating the instruments or to damage of the instruments themselves or other instruments.

## **Cautions and Warnings for Oscilloscope**

### **AC Line Voltage**

Be sure to operate the oscilloscope on an AC line voltage within its correct range.

### **AC Power Cable**

Be sure to use an AC power cable of the correct type for the oscilloscope.

### **AC Power Fuse**

Be sure to use a power fuse of the correct ratings for the oscilloscope.

### **Do not remove the covers.**

The oscilloscope has hazardous high voltages internally. Do not remove the covers of the oscilloscope lest you should expose yourself to such high voltages. The covers should be removed only by qualified experts.

### **Attaching and detaching the IF01-COR**

Be sure to turn off the power of the oscilloscope when you attach or detach the IF01-COR.



# Chapter 1. GENERAL

## 1.1 Introduction

The IF01-COR is an interface which is based on the GPIB Standard of IEEE-488-1978. It can be attached onto the COR5500U series oscilloscope (storage model only), and you can transfer data and waveforms among the devices. The GPIB function is available on the Storage Mode.

(1) **Reading back of panel settings**

The oscilloscope panel setting data can be read by a computer.

(2) **Reading back of measured data**

The oscilloscope measurement data, such as waveform and cursor measurement data can be read by a computer.

(3) **Copying screen data (Plotout)**

In the storage mode, the screen data can be copied directly—without any external computer—to a GPIB plotter which supports the Hewlett-Packard Graphics Language (HP-GL).

## 1.2 Outline of GPIB

The term “GPIB” stands for “General Purpose Interface Bus.” The GPIB is an international standard system which provides interface functions to operate various devices - even from different manufactures - on the same bus and to control them with a computer.

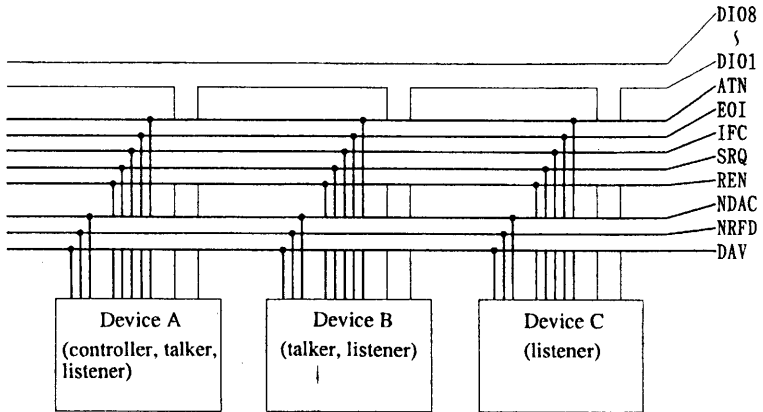
The GPIB signals are transferred through bidirectional bus of bit parallel (8 bits) and byte serial. Data is transferred through a 3-wire handshake system. All the GPIB devices of an instrumentation system are connected in parallel on the bus.

Each GPIB device can have one or more of the functions, talker, listener, and controller. Data is transferred from a taker device to other listener devices. The controller controls data transfer direction and manages the interface operation.

The bus has eight data lines, three handshake lines, five bus management lines, and eight ground lines.

GENERAL

In the below illustration, the DIO1 through DIO8 are data lines; the NDAC, NRFD and DAV are handshake lines; the ATN, EOI, IFC, SRQ and REN are bus management lines.



## Chapter 2. PRECAUTIONS

### 2.1 Receiving Inspection

Prior to the shipment from our factory, the IF01-COR has been subjected to electrical and mechanical testing and guaranteed of satisfactory quality and performance. Nevertheless, you are kindly requested to make a receiving inspection to see if the IF01-COR has any in-transit damage. If you find any, inform the transportation company of such damages without delay.

Accessories provided: Mounting screws (2 pcs)

Operation manual (1 copy)

## 2.2 General Precautions

This section describes electrical and mechanical precautions for safe and correct use of the COR5500U series oscilloscope. Be sure to read this section before start using the oscilloscope and GPIB interface.

### (1) Checking the AC line voltage and frequency

Operate the oscilloscope on its rated AC input voltage of 100 through 240V, frequency 50 through 400 Hz, although it is permissible to operate the oscilloscope on an AC line voltage of 90 through 250 V, frequency 45 through 440 Hz.

### (2) Checking the type and ratings of fuse

Before connecting the power cable to the AC inlet of the oscilloscope, check the type and ratings of the power fuse. The fuse holder of the oscilloscope is an integrated structure with the AC inlet. The fuse holder cap can be detached by a screwdriver or a pointed tool as shown below. Two fuses (one of which is for replacement spare) are put in the cap.

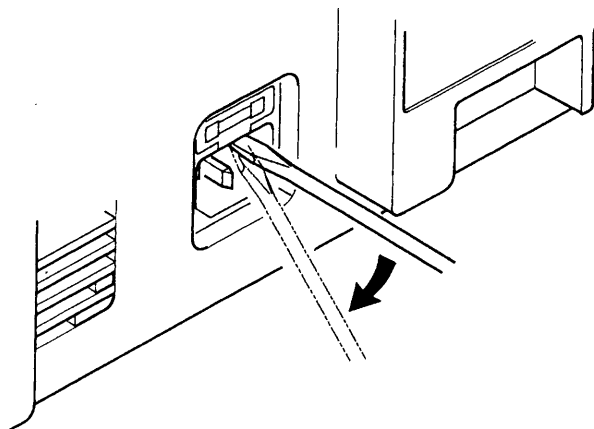


Figure 2-1. Fuse replacement

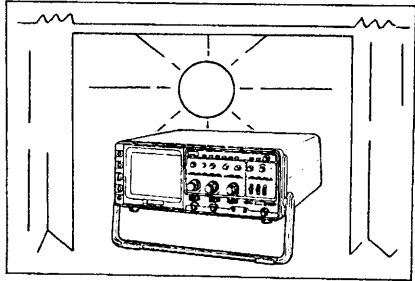
Take out the fuse and check that it is a slow-blow fuse of 250V AC, 2A. Return the fuse and cap to the original positions by following the take out procedure in the reverse order. Fully insert the cap until it clicks.

**(3) Environments**

Avoid to use the oscilloscope in environments as mentioned below.

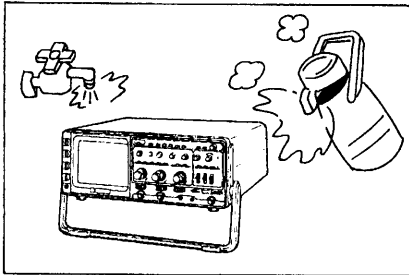
**(a) High temperature**

Do not expose the oscilloscope to direct sunlight or other source of heat. (The ambient temperature range for the guaranteed performance is 10 to 40°C or 50 to 104°F.)



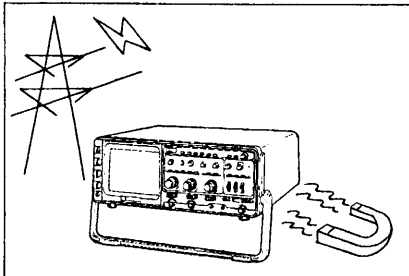
**(b) High humidity**

Do not use the oscilloscope in high humidity. (The humidity range for the guaranteed performance is up to 75% RH.)



**(c) Electric or magnetic field**

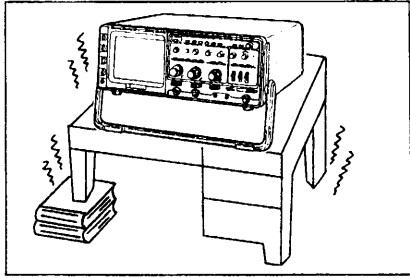
Do not use the oscilloscope in strong electric or magnetic field, lest the displayed images should be distorted or otherwise adversely affected.



PRECAUTIONS

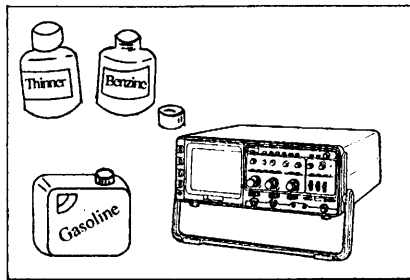
**(d) Unstable position**

Do not put the oscilloscope on a swaying bench or in other unstable position.



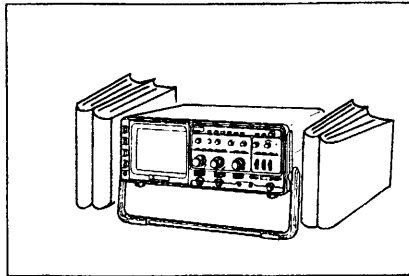
**(e) Flammable atmosphere**

Do not use the oscilloscope in flammable or explosive atmosphere, to prevent fire and explosion hazards.



**(f) Blocked ventilation holes**

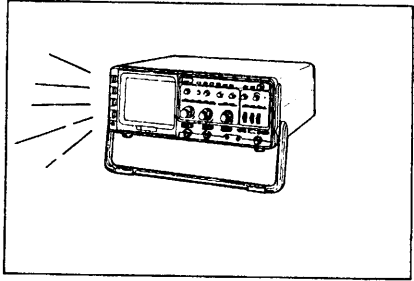
Do not block the ventilation holes. The ventilation fan of the COR5501U/COR5561U is installed on the rear panels and that of the COR5502U on the right-hand side panel. Provide ample spaces adjacent to these panels lest the ventilation air flow should be blocked.



**(4) Others**

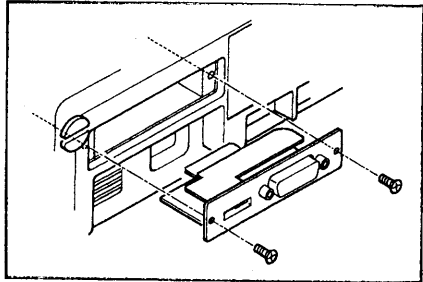
**(a) CRT intensity**

In order to prevent permanent damage to the CRT phosphor, do not make the CRT trace excessively bright or leave the beam spot stationary for an unreasonably long time.



**(b) Caution before installing or detaching the IFO1-COR**

Be sure to turn off the power switch and disconnect the power cable of the oscilloscope when you attach or detach the IFO1-COR.



## Chapter 3. PREPARATION

### 3.1 Installation

Before attaching the IF01-COR onto the oscilloscope, turn off the power of the oscilloscope and disconnect the power cable from the AC line receptacle.

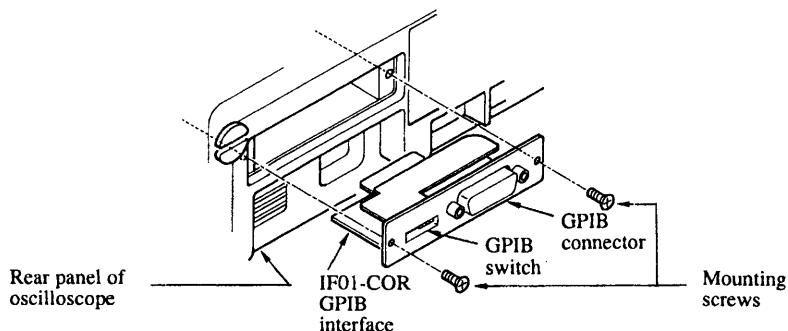


Figure 3-1. Installing the IF01-COR

Insert the IF01-COR GPIB Interface into the option slot on the rear panel of oscilloscope to the deepest position. And, fix it to the oscilloscope with the two mounting screws.

### 3.2 Description of Components

- GPIB switch:** The GPIB switch selects an operation mode of the interface board—either the Address Mode or the Talk Only Mode. The Address Mode can set a GPIB address number of the IF01-COR in order to transfer data between the oscilloscope and a GPIB controller. The Talk Only Mode is useful for transferring data without any external controller. Then, you can copy the screen data of the oscilloscope to a GPIB plotter which accepts HP-GL commands.
- GPIB connector:** This connector has 24 pins and complies with the IEEE-488-1978 Standard. It is used to connect the IF01-COR to a GPIB controller (such as personal computer) or a GPIB plotter. To connect a GPIB cable, securely mate the connectors and fix them with the screws.



### 3.3 Setting of GPIB Switch

#### 3.3.1 Setting for Address Mode

In order to communicate IF01-COR with a computer, the IF01-COR must have an address number. The address number can be set within 0 through 30 with the right most five switches marked as "16•4•1." The markings are abbreviations for 16, 8, 4, 2, and 1, the dot marks (•) stand for 2 and 8. The switches placed at the ON positions (upper positions) are taken into account, and the sum of their significance becomes the address number. The switches placed at the OFF positions (lower positions) are not taken into account. So, if all the five switches are at the OFF positions, the address number is 0. To set the address number at six for example, since  $6 = 4 + 2$ , you should place the "4" switch and the "2" switch (the dot-marked switch between "1" and "4") at the ON positions.

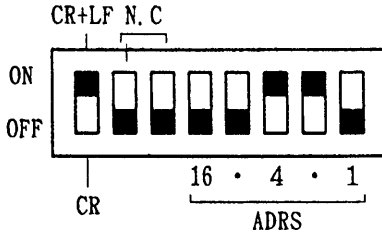


Figure 3-2. An Example of Address Setting

**NOTE** : When the IF01-COR is shipped from manufacturer, the default address number is set at "2."

### 3.3.2 Setting for Talk Only Mode

To connect the oscilloscope directly—without any GPIB controller—to a GPIB plotter, the IF01-COR must be set to the Talk Only Mode. For this setting, place all the five switches (ADRS section) to the ON positions.

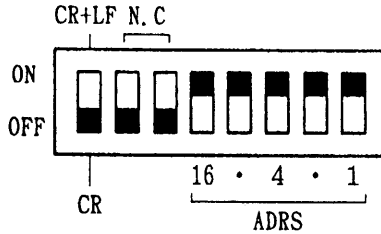


Figure 3-3. Setting for Talk Only Mode

**NOTE** : In this setting, the IF01-COR cannot communicate with the GPIB controller any longer. You can connect only a GPIB (HP-GL) plotter to the IF01-COR. Then, the GPIB plotter should be Listen Only Mode.

### 3.3.3 Setting a Delimiter

For the delimiter of the IF01-COR, you may select one of the following five types.

- ① EOI
- ② CR
- ③ CR (+EOI)                      CR : Carriage return
- ④ CR/LF                              LF : Line feed
- ⑤ CR/LF (+EOI)                  EOI : End or identify

A delimiter can be specified with the GPIB switch (CR LF section) and an “EOI” command via GPIB. (For the “EOI” command, see Section 4.4.1 “System Commands.”) When you read waveform data, the EOI delimiter will be used temporarily irrespective of delimiter setting.

Table 3-1. Delimiter Setting

Delimiter	GPIB switch	EOI command
EOI	any position	ONLY
CR	CR	OFF
CR (+EOI)	CR	ON
CR/LF	CR/LF	OFF
CR/LF (+EOI)	CR/LF	ON (default)

When you send a command from the computer, even if the delimiter is other than EOI, the transfer will be terminated when an EOI signal is encountered.

- NOTES** : (a) When the IF01-COR is shipped from manufacturer, the CR/LF (+EOI) is set for the default delimiter with the GPIB switch.
- (b) At the power-on default state, the EOI command is set to ON.
- (c) You cannot use only a line feed character as a delimiter.
- (d) In a waveform transfer operation, the EOI is automatically used for the delimiter irrespective of delimiter setting.

**Remarks for GPIB Switch**

- The GPIB switch setting is checked only once when the oscilloscope is turned on. Even if you alter the dip switches while power on, the delimiter and address number will not change. If you use a new setting of GPIB switch, you should turn off the oscilloscope once and turn on again.
- Other specifications of the GPIB comply with the IEEE 488-1978 Standard.

## Chapter 4. FUNCTIONS OF DEVICE

### 4.1 Reading Back of Panel Setting

This function allows you to read back the oscilloscope panel setting with a computer. For example, when you want to know the setting information of CH1 (Channel One), you may send a string "CH1?" from the computer. The oscilloscope will interpret the string and will write the CH1 setting information onto the sending queue. Now you can read back the CH1 setting by designating the IF01-COR to a talker.

### 4.2 Reading Back of Waveform Data

The oscilloscope operating in the Storage Mode stores data of 4096 points per channel. The stored data can be transferred to a computer in a binary format. This function allows you to file waveform data externally without internal Saving Memory of the oscilloscope. Furthermore, by using an application program of the personal computer, you can send waveform data to a printer, plotter, and other devices around the computer.

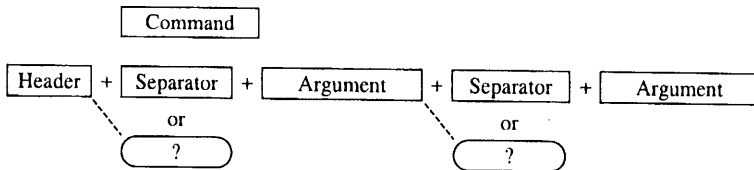
### 4.3 Command and Data Formats

To control the COR5500U series oscilloscope via GPIB, you should send commands from the computer in the following format:



#### (1) Command

A command is an ASCII string and consists of a Header, Arguments, and Separators as illustrated below:

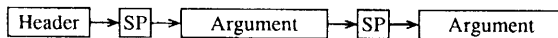


- Header

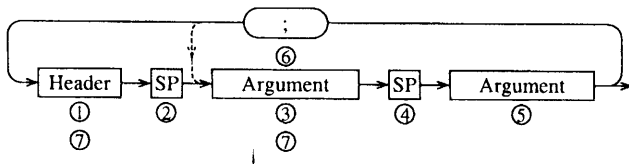
The Header specifies a category of the control or query function, such as CHANNEL1 or WAVE, for example.

- Separator

The Separator has two types; one of them is with two or more space characters, and another is a semicolon (;). The space characters are used for separation between a Header and an Argument or among two Arguments.



The semicolon (;) is used for separation between two commands. However, some commands do not allow a semicolon preceding a Header.



- Argument

There are two types of Arguments, namely, a character type such as “ON” and “AC,” and a numerical type such as “1” and “2.”

- “?” character

This character is used for the suffix of a command string which works as a query command. No characters can follow the “?” character, and you cannot place any blank before the “?” character.

(2) **Waveform Format and Block**

- BYTE Format

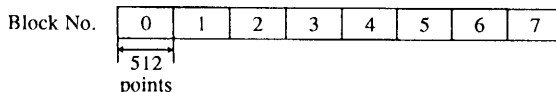
The Byte Format is a numerical sequence as follows:

Numeral Numeral Numeral . . . Numeral Numeral

An EOI signal should be overlaid on the last numeral. Each numeral is an eight bit value—for 0 to 255 and the delimiter is selected to EOI automatically.

It is also possible to read a part of waveform, by separating the waveform data of 4k bytes (4096 bytes) into blocks as shown below.

Address



For example, when you want to read the waveform data between the point 512 through 2047, specify the Start Block "1" and End Block "3" in a "WAVE..." command.

- **HLWORD and LHWORD Format**

These formats are especially provided for recent microprocessors. With these formats, one point of waveform data is converted into two bytes (16 bits) of data. Each point of data can be transferred with a format as shown below:

Format	Even Byte	Odd Byte
HLWORD	High-Byte (Always 0)	Waveform data (00-FF)
LHWORD	Waveform data (00-FF)	High-Byte (Always 0)

Thus, data of each waveform consists of 8192 bytes (4096 words). Blocks can be specified similarly to the BYTE Format.

**NOTE** : The HLWORD supports the 16 bit integer sequence of Motorola family chips such as 68000 or 68020. Whereas, the LHWORD supports the integer sequence of Intel family chips such as 80286 or 386. If the GPIB card of your computer employs the DMA transfer system, waveform data will be transferred very rapidly.

The default format of waveform transfer is set as follows:

```
START 0
      |
END 7
CODE BYTE
```

Refer to the Section 4-4-7 "Waveform Commands."

**(3) Waveform Resolution**

The storage system of COR5500U series employs an 8 bit D/A converter and a 4k byte memory for each channel. Therefore, a waveform on the CRT screen has  $4096 \times 256$  resolution.

Each vertical division has 25 dot points, and the center of the graticule is defined at 128 (80 hex) as a digital waveform data. Thus, 28 (1C hex) is assigned to the lowest line of the graticule and 228 (E4 hex) is assigned to the highest line.

Each horizontal division has 400 address points, however, the starting point of waveform should be aligned with the left end of graticule. Thus, 0 is assigned to the left end and 4000 is assigned to the right end of graticule. Extra 96 points of waveform data overflow rightward the full scale of graticule.

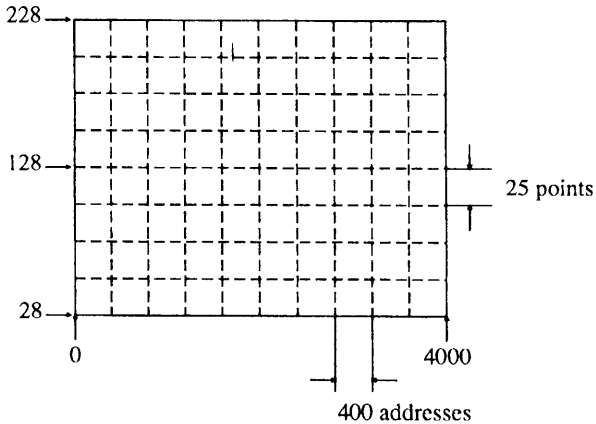


Figure 4-1. Waveform Resolution

**(4) Abbreviations of Commands**

As a general rule, Headers and Arguments may be abbreviated into three-character symbols.

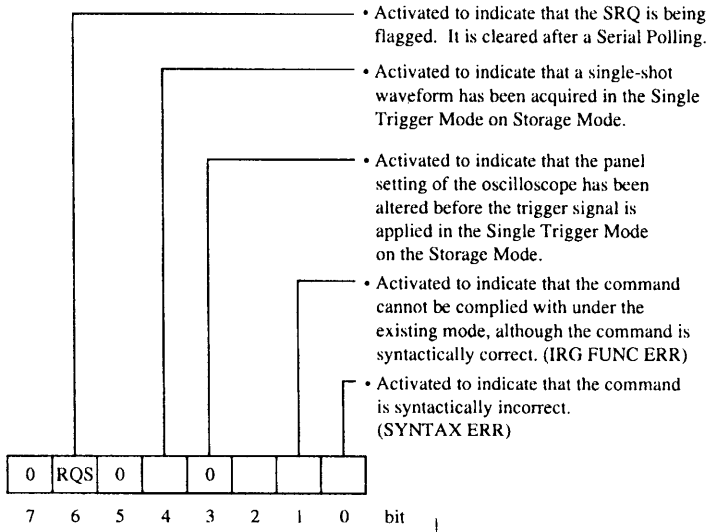
Examples: "ATRIGGER" → "ATR"  
 "CHANNEL1" → "CH1"

The abbreviated forms of Headers and Arguments are shown in the enclosed parentheses in the Command Tables described later.



**(5) SRQ and Status Byte**

The IF01-COR can flag an SRQ (Service Request) to notify the external computer that an event has occurred in the oscilloscope. The Service Request is generated with a Status Byte assignment, whose bits indicate which event has occurred. The corresponding bit will be activated (set to "1") to indicate that the corresponding event has occurred. Thus, you can identify the event type by the Status Byte through the computer. The correspondence between the bits and the events are shown below:



(For the power-on default, all bits of the Status Byte are cleared.)

Figure 4-2. Status Byte Assignment

**NOTE** : If the Status Byte has been updated due to an error (IRG FUNC ERR or SYNTAX ERR) or if you disable Service Request (SRQ OFF), be sure to perform Device Clear function of IEEE-488 after the Serial Polling.

## 4.4 Command Tables

This section provides the command tables for controlling COR5500U series oscilloscope. Each table introduces the function and format of the GPIB command. Programming examples are also introduced later in this section. The rules of the command tables are described below:

### (1) Setting the Oscilloscope

- To reset Single Trigger Mode:

ATRIGGER (ATR)	MODE RESET (MOD RES)	Resets the Single Trigger Mode in the Storage Mode.
-------------------	-------------------------	--

ATRIGGER + SPACE + MODE RESET

"ATRIGGER MODE RESET"

Abbreviation: "ATR MOD RES"

### (2) Reading back of panel setting or measured data

- To read back the deflection factor of CH1:

CHANNEL 1 (CH1)	VOLT? (VOL?)	Returns the CH1 deflection factor.
--------------------	-----------------	------------------------------------

CH1 + SPACE + VOL?

"CH1 VOL?"

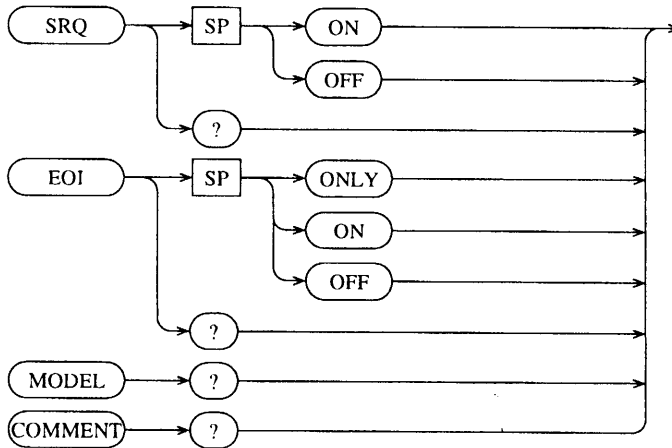
As you have sent a query command, current deflection factor setting of CH1 is written on the sending queue of the oscilloscope. To read back this, the IF01-COR must be designated to a talker.

Assume that an IBM personal computer (or a compatible) is used for the GPIB controller. Since the reading back statement of QuickBASIC is CALL IBRD (bd%, A\$), a program block should be written as follows:

```
A$ = SPACE$ (64)
CALL IBWRT (bd%, "CH1 VOL?")
CALL IBRD (bd%, A$)
```

With the above program block, readback data such as "5V <CR><LF>" or "0.1V <CR><LF>" will be stored onto the variable A\$. If the execution of this command results in IRG FUNC ERROR, a string "ERROR <CR><LF>" will be returned.

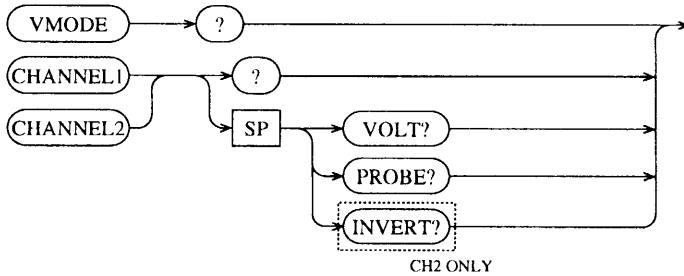
### 4.4.1 System Commands



Header	Argument	Function
SRQ	ON	Enables SRQ. (default)
	OFF	Disables SRQ.
SRQ?		Returns [ON or OFF].
EOI	ONLY (ONL)	Sets the delimiter to EOI for reading back operations and disables CR and LF characters.
	ON	Enables EOI for reading back operations. (default)
	OFF	Disables EOI for reading back operation.
EOI?		Returns [ONLY, ON, or OFF].
MODEL?		Returns the model name. [COR5502U, COR5501U, COR5561U, COR5541U, or COR5521U]
COMMENT? (COM?)		Returns the contents of the current comment text. If the Comment function is turned off, you will get IRG FUNC ERR.

**NOTE** : For delta ( $\Delta$ ), degree ( $^{\circ}$ ) and micro ( $\mu$ ), non-standard ASCII characters used in the comments, ASCII codes 7CH ( ; ), 60H ( ` ) and 5EH ( ^ ) will be returned instead of those graphic characters.

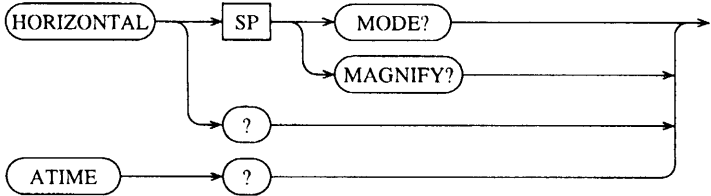
### 4.4.2 Vertical Axis Commands



Header	Argument	Function
VMODE?		Returns the setting of VERT MODE. [CH1, CH2, ADD, or DUAL]
CHANNEL1 (CH1)	VOLT? (VOL?)  PROBE? (PRO?)	Returns the CH1 deflection factor. COR5502U, COR5501U, COR5561U: [5V through 1MV] COR5541U, COR5521U: [10V through 2MV] Returns the CH1 probe scale factor. [X1, X10]
CHANNEL1? (CH1?)		[VOLT (UNCAL)] [PROBE] * See the Note.
CHANNEL2 (CH2)	VOLT? PROBE? INVERT? (INV?)	Returns the CH2 deflection factor. Returns the CH2 probe scale factor. Returns the CH2 polarity. [ON or OFF]
CHANNEL2? (CH2?)		[VOLT (UNCAL)] [PROBE] [INVERT] * See the Note.

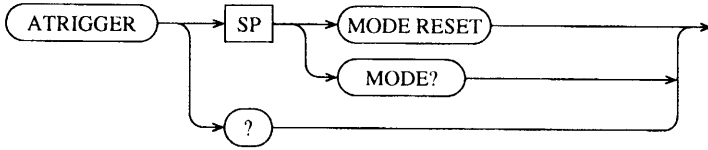
**NOTE** : Returns [OFF] if the channel is not selected.

### 4.4.3 Horizontal Axis Commands



Header	Argument	Function
HORIZONTAL (HOR)	MODE? (MOD?)	Returns the setting of HORIZ MODE. [A or XY]
	MAGNIFY? (MAG?)	Returns the magnification factor. COR5502U, COR5501U, COR5561U: [X1, X5, X10, or X50] COR5541U, COR5521U: [X1, X10, or X20]
HORIZONTAL? (HOR?)		[MODE], [MAG]
ATIME? (ATI?)		Returns the timebase setting. COR5502U, COR5501U: [5S through 20NS (UNCAL)] COR5561U: [5S through 50NS (UNCAL)] COR5541U: [5S through 0.1US (UNCAL)] COR5521U: [5S through 0.2US (UNCAL)]

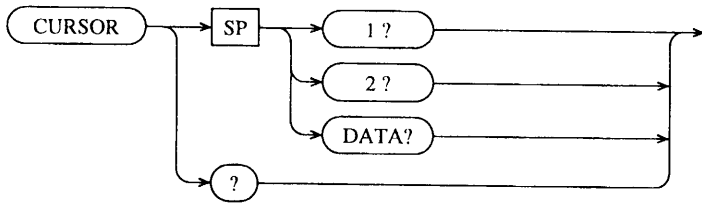
### 4.4.4 Trigger Commands



Header	Argument	Function
ATRIGGER (ATR)	MODERESET (MOD RES)	Resets the Single Trigger Mode in the Storage Mode.
	MODE? (MOD?)	Returns the Trigger Mode setting. [AUTO, NORM, or SINGLE]
ATTRIGGER? (ATR?)		It works similarly as "ATRIGGER MODE?"

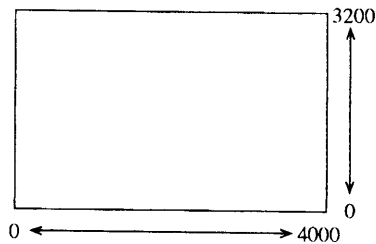
**NOTE** : If you reset the Single Trigger in the Auto or Normal Trigger Mode, a readout message IRG FUNC ERR will appear on the screen.

### 4.4.5 Cursor Commands

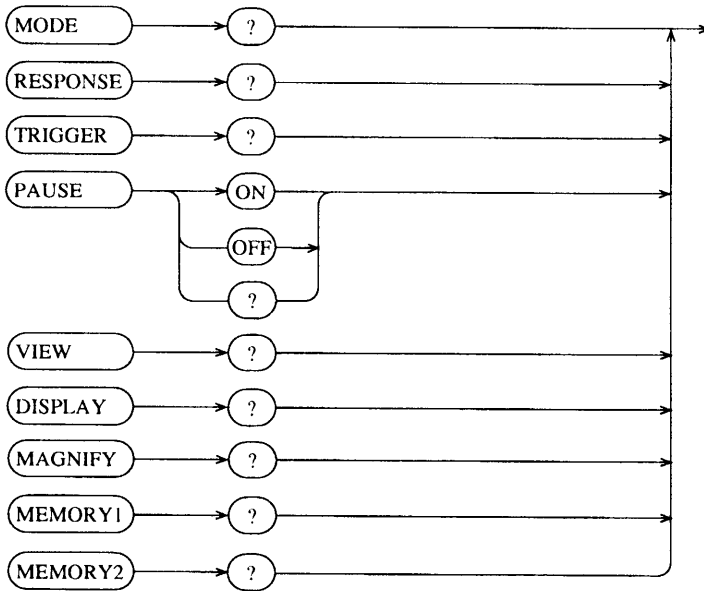


Header	Argument	Function
CURSOR (CUR)	1?	Returns the position of Cursor 1 (C1). [0-4000] (*See the Note.)
	2?	Returns the position of Cursor 2 (C2).
	DATA? (DAT?)	Returns the data measured with the Cursors.
CURSOR? (CUR?)		[OFF, VOLT, TIME, PERTIME, VDIV, TDIV], [1] [2] [DATA]

**NOTE** : The relationships between the CRT screen position data and the cursor positions are as illustrated here. (400 points/DIV)



### 4.4.6 Storage Commands

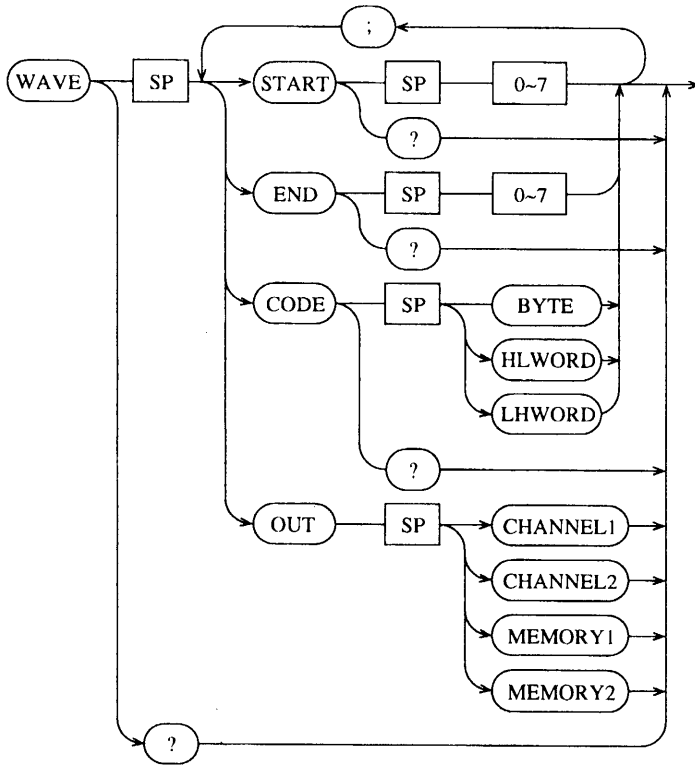




Header	Argument	Function
MODE? (MOD?)		Returns operation mode. [REAL or STORAGE]
RESPONSE? (RES?)		Returns the Interpolation status. [LINEAR or CURVE]
TRIGGER? (TRI?)		Returns the Trigger Point. It is available only when in the Pause Off state. [0, 1, 5, or 9]
PAUSE (PAU)	ON OFF	Sets to the PAUSE state. (See the Note.) Release from the PAUSE state. (See the Note.)
PAUSE? (PAU?)		Returns the Pause status. [ON or OFF]
VIEW? (VIE?)		Returns the View Time status. [ON or OFF]
DISPLAY? (DIS?)		Returns the display mode. [NORMAL, ROLL, REPEAT, or INTERPOLATION] COR5502U, COR5501U and COR5561U only: [REPEAT]
MAGNIFY? (MAG?)		Returns the Magnification point. It is available only when in Pause On state. [0, 1, 5, 9]
MEMORY1? (MEM1?)		Returns ON/OFF of MEMORY1 waveform display. When ON, returns [VOLT] and [TIME] also.
MEMORY2? (MEM2?)		Returns ON/OFF of MEMORY2 waveform display. When ON, returns [VOLT] and [TIME] also.

**NOTE** : The PAUSE ON/OFF commands are available with ROM Version 1.20 and later Versions only.  
With Version 1.10, they result in errors.

### 4.4.7 Waveform Commands



Header	Argument	Argument	Function	
WAVE (WAV)	START (STA)	0 to 7	Specifies the Start Block of waveform transfer. (default = 0)	
	START? (STA?)		Returns the current Start Block. [0 to 7]	
	END	0 to 7	Specifies the End Block of waveform transfer. (default = 7)	
	END?		Returns the current End Block. [0 to 7]	
	CODE (COD)	BYTE (BYT)		Specifies the waveform transfer format to BYTE. (default)
		HLWORD (HLW)		Specifies the waveform transfer format to HLWORD.
		LHWORD (LHW)		Specifies the waveform transfer format to LHWORD.
CODE? (COD?)		Returns the current format of waveform transfer. [BYTE, HLWORD, or LHWORD]		
OUT	CHANNEL1 (CH1)		Reads the CH1 waveform data.	
	CHANNEL2 (CH2)		Reads the CH2 waveform data.	
	MEMORY1 (MEM1)		Reads the MEM1 waveform data.	
	MEMORY2 (MEM2)		Reads the MEM2 waveform data.	
WAVE? (WAV?)			Returns [START] [END] [CODE].	

**NOTE** : In the Roll Mode operation, waveform transfers might not work correctly. Make sure to press PAUSE switch to freeze the acquisition before transfer in the Roll Mode.

## 4.5 Programming Examples

This section introduces programming examples and assumes that you have an IBM personal computer with National Instruments' or equivalent GPIB board. The examples are written in Microsoft QuickBASIC 4.

### (1) Driver Installation

The GPIB board requires you to install the NI-488/DOS handler (GPIB.COM) when booting DOS. Thus, your CONFIG.SYS file must contain the following line:

```
DEVICE=C:\GPIB.COM
```

Here, a driver name "COR5500" is used instead of the default name "DEV2" in the NI-488/DOS handler. Thus, you should modify the GPIB.COM to change the device name. To modify it, execute IBCONF.EXE utility as follows:

```
IBCONF C:\GPIB.COM
```

After that, reboot DOS again. To use GPIB in QuickBASIC, you must prepare a QuickLibrary of GPIB for the QuickBASIC integrated environment. The Microsoft Overlay Linker (LINK.EXE) creates a QuickLibrary (QBIB4.QLB) and Library Manager (LIB.EXE) creates a Run Time Library (QBIB4.LIB) from the QBIB4.OBJ distributed with the GPIB board. Refer to the documents of the GPIB board and QuickBASIC for details.

To start QuickBASIC, type the following line from DOS prompt and, press the ENTER key.

```
QB /L QBIB4.QLB
```

The GPIB address of IF01-COR should be set to "2" in the examples. The GPIB switch on the IF01-COR can change its address. After alternation, you should turn off once and turn on again.

## (2) Example of Panel Readback

```

REM $INCLUDE: 'QBDECL4.BAS'
' *****
'   PANEL READBACK
' *****KIKUSUI**
'
    DIM SHARED kik%
    CALL ibinit
    CLS

    FOR LP% = 1 TO 9
        READ p$, cmdnd$
        DAT$ = SPACE$(20)
        CALL IBWRT(kik%, cmdnd$) 'Sends a command.
        CALL IBRD(kik%, DAT$)   'Receives a readback.
        IF LEFT$(DAT$, 5) = "ERROR" THEN DAT$ = ""
        PRINT p$ + DAT$
    NEXT
    CALL IBCLR(kik%)
END

DATA "Real/Storage mode ...", "MODE?"
DATA "Channell volt/div ...", "CH1 VOLT?"
DATA "Channel2 volt/div ...", "CH2 VOLT?"
DATA "Horizontal Mode.. ...", "HORIZONTAL?"
DATA "Time/div.....", "ATIME?"
DATA "Trigger Mode.....", "ATRIGGER MODE?"
DATA "Display Mode.....", "DISPLAY?"
DATA "Trigger Point.....", "TRIGGER?"
DATA "Cursor data.....", "CURSOR DATA?"
'
'   Initializes the oscilloscope.
'
SUB ibinit
    udname$ = "COR5500"
    CALL IBFIND(udname$, kik%) 'Opens device and gets
                                'unit descriptor.
    CALL IBCLR(kik%)          'Executes the Selected
                                'Device Clear.
END SUB

```

## Summary:

This program reads back the panel settings from the oscilloscope.

## (3) Example of Receiving Waveform data

```

REM $INCLUDE: 'QBDECL4.BAS'
' *****
' RECEIVING WAVEFORM
' *****KIKUSUI**
'
    DIM SHARED wav%(4095)      'Declares waveform area
    DIM SHARED kik%

    CALL ibinit
    CALL wavread
    CALL dispout
END

'
' Waveform Display in CGA (640x200 monochrome)
'
SUB dispout
SCREEN 2                      'Entries Graphics Mode.
WINDOW (0, 0)-(4096, 255) 'Draws the waveform.
PSET (0, wav%(0)), 1
FOR x% = 1 TO 4095
    y% = wav%(x%)
    LINE -(x%, y%), 1
NEXT x%
PRINT "Press any key to text mode."
WHILE INKEY$ = "": WEND
SCREEN 0                      'Returns to Text Mode.
END SUB

'
' Initializes the oscilloscope.
'
SUB ibinit
udname$ = "COR5500"
CALL IBFIND(udname$, kik%) 'Opens device and gets
                           'unit descriptor.
CALL IBCLR(kik%)          'Executes the Selected
                           'Device Clear.
END SUB

'
' Waveform Transfer
'
SUB wavread
CNT% = 4096 * 2
'Specifies a block.
CALL IBWRT(kik%, "WAVE START 0;END 7")
'Specifies the Intel format.
CALL IBWRT(kik%, "WAVE CODE LHWORd")
'Requires the CH1 waveform.
CALL IBWRT(kik%, "WAVE OUT CH1")
'Receives the waveform.
CALL IBRDI(kik%, wav%(), CNT%)
END SUB

```

**Summary:**

This program draws a picture of waveform, which is transferred from the CH1. It assumes that you have a CGA or a compatible video subsystem.

**NOTE** : In the Roll Mode operation, waveform transfers might not work correctly. Make sure to press PAUSE switch to freeze the acquisition before transfer in the Roll Mode.

## (4) Example of Single Trigger by SRQ Processing

```

REM $INCLUDE: 'QBDECL4.BAS'
' *****
' TRIGGER CHECK BY SRQ
' *****KIKUSUI**
'
  DIM SHARED kik%
  CALL ibinit
  ON PEN GOSUB trgin          'Defines trap routine.
  PEN ON
  CALL IBWRT(kik%, "ATRIGGER MODE RESET")

  WHILE 1                    'Infinite loop
  WEND
END
trgin:
  CALL IBRSP(kik%, SPR%)
  SELECT CASE SPR%
    CASE &H50
      PRINT "End of Acquisition"
    CASE &H48
      PRINT "Panel Changed"
  END SELECT
  CALL IBWRT(kik%, "ATRIGGER MODE RESET")
  PEN ON
RETURN
SUB ibinit
  udname$ = "COR5500"
  CALL IBFIND(udname$, kik%) 'Opens device and gets
                             'unit descriptor.
  CALL IBCLR(kik%)          'Executes the Selected
                             'Device Clear.
END SUB

```

## Summary:

This program traps an SRQ generated by an input signal in the Single Trigger of Storage Mode.

**NOTE** : If you use a Mouse driver for the QuickBASIC integrated environment, the Mouse driver must be installed before the NI-488/DOS handler. Otherwise, your program will not be able to trap any SRQ. So, you should use a Mouse driver "MOUSE.SYS" rather than a TSR "MOUSE.COM."



## Chapter 5. PLOT OUT

In the Storage Mode, you can copy a screen data of the oscilloscope directly—without any GPIB controller—onto a GPIB plotter which accepts HP-GL commands. The plotout data includes scale factors, cursor data, and comments, as well as the waveform data.

**NOTE** : The starting position of the plotted out waveform will be at the left end of the graticule irrespective of the horizontal positioning on the oscilloscope.

The following readout message will not appear:

- Pause message
- View Time message ( ← )
- Cursor function mode
- Storage Menu
- Various error messages.

### 5.1 Setup

Before you execute plotout, prepare a setup as follows:

- (1) Turn off the oscilloscope.
- (2) Set the GPIB switch of the IF01-COR to the Talk Only Mode. (See Section 3.3 "Setting of GPIB Switch.")
- (3) Connect a GPIB cable between the IF01-COR and the plotter. Be sure to connect it securely with screws.
- (4) Set the GPIB plotter to the Listen Only Mode.
- (5) Turn on the oscilloscope and the plotter.

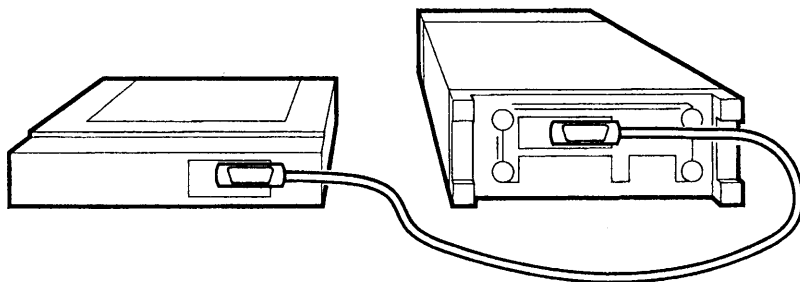


Figure 5-1. Connecting a GPIB Cable

## 5.2 Operation Method

As you press the PLOT switch in the Storage Mode, the waveform acquisition will be interrupted and the plotout operation will start. After the plotting out is over, the oscilloscope resumes the state which existed before the plotout.

### 5.2.1 Plotout Procedure

To execute plotout, proceed as follows:

- (1) Invoke the Storage Menu by the MENU switch, and move down the marker (◀) to the PLOT position.
- (2) Select a printing size and location by the STATUS switch. The printing sizes and locations are denoted by symbols S1 through S4, and N. Each output is illustrated below:

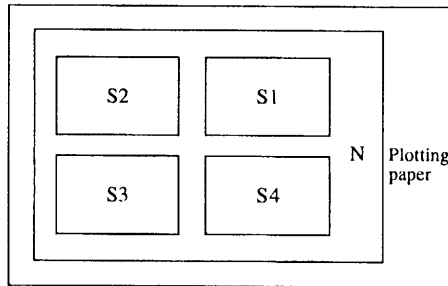


Figure 5-2. Printing Sizes and Locations

- (3) Press the PLOT switch, then plotout will start and a readout message PLOT OUT will appear on the oscilloscope screen. When the plotout is over, a message PLOT END will appear.

**NOTE** : If the IF01-COR is not at the Talk Only, plotout will not start and, the following message will appear on the oscilloscope screen.

CHANGE GP-IB to TALK ONLY

If you see such a message, turn off the oscilloscope once and set the GPIB switch to the Talk Only. After that, turn on the power again. Hereafter, you may perform the above procedure steps (1) through (3).

## Horizontal Magnification

If the oscilloscope is in the Paused State, you can plot out a waveform magnified with the TIME/DIV knob. However, the waveform magnified with the MAG switch is not available. If you attempt a plotout when the MAG switch is set to other than  $\times 1$ , the attempt will be unsuccessful and you will see the following message:

CHANGE HORIZ MAG to X1

If you alter the MAG switch to other than  $\times 1$  position when a plotout is running, the following message will appear to notify you that the waveform on the paper differs from the waveform on the oscilloscope screen:

PANEL SETUP differ with READOUT

## Multi-pen Plotter

If you have a multi-pen plotter, you can get a color copy of the plotout. Each pen is used properly as follows:

- PEN 1: Graticule and Readout
- PEN 2: CH1 and CH2 waveforms
- PEN 3: MEM1 and MEM2 waveforms
- PEN 4: Cursors

### 5.2.2 Aborting the Plotout

To abort the plotout, press the PLOT switch again. The plotout will be aborted and a readout message PLOT ABORT will appear on the screen. If you press the PLOT switch once more, the plotout will start all over again.

**NOTE** : The plotter might not stop immediately as you press the PLOT switch nevertheless the PLOT ABORT message appears on the screen. This is because a certain amount of data has been already sent on the buffer memory of the plotter.

### 5.2.3 Display Center

The vertical positioning of waveform on the paper might not exactly conform with that of waveform on the oscilloscope screen. The cause of this is the terrestrial magnetism. Generally, oscilloscopes and other instruments which employ cathode-ray tubes are affected by disturbances from the terrestrial magnetism. The degree of disturbances depends on the location of the oscilloscope. To compensate for the disturbances by the terrestrial magnetism, the COR5500U series oscilloscope employs a Trace Rotation.

However, the waveform on the paper is not affected by any terrestrial magnetism. It is immutable even if the oscilloscope is placed at any location because only the digital data of waveform are used for plotout. Thus, the relationships between the waveform on the oscilloscope screen and that on the paper will vary with the location of the oscilloscope. The Display Center function is useful to compensate this difference.

#### Procedure for Display Center Adjustment

To adjust the Display Center, proceed as follows:

- (1) Select the single trace operation (CH1) and the Auto Trigger Mode. Next, set the Input Coupling of CH1 to GND.
- (2) Invoke the Storage Menu by the MENU switch and move down the marker (◀) to the PLOT position.
- (3) Select the CTR by the STATUS switch.
- (4) Align the baseline trace to the center of the CRT graticule by the CH1 POSITION knob.
- (5) Press the PLOT switch. Then, the vertical position of CH1 trace will be defined as the Display Center. The defined Display Center is not destroyed even if the oscilloscope is turned off.

**NOTE** : If the waveform you want to plot out is already acquired, store it onto the Saving Memory first, and then adjust the Display Center.

## 5.2.4 Messages

When you use plotout functions, you will see various messages on the oscilloscope screen. This section describes what these messages mean.

### (1) INVALID


This message will appear for about two seconds when you attempt a plotout operation without IF01-COR.

### (2) PLOT OUT

This message will appear while the plotout operation is running. When the plotout is over, this message will be replaced by the PLOT END message.


### (3) PLOT END

This message will appear when the plotout operation is over. The message will remain displayed until you operate one of the following switches:

CH1 VOLTS/DIV, CH2 VOLTS/DIV, TIME/DIV, MENU, STATUS, TRIG PT (MAG PT), LOAD, SAVE (PLOT), PAUSE, CMNT/CUR, MODE, or CURSOR (  ).


### (4) PLOT ABORT

This message will appear when you have pressed while the plotout operation is running. The message will remain displayed until you operate one of the following switches:

CH1 VOLTS/DIV, CH2 VOLTS/DIV, TIME/DIV, MENU, STATUS, TRIG PT (MAG PT), LOAD, SAVE (PLOT), PAUSE, CMNT/CUR, MODE, or CURSOR (  ).

### (5) PLOT ERROR

This message will appear to indicate that the plotout operation is unsuccessful due to some errors. The message will remain displayed until you operate one of the following switches:

CH1 VOLTS/DIV, CH2 VOLTS/DIV, TIME/DIV, MENU, STATUS, TRIG PT (MAG PT), LOAD, SAVE (PLOT), PAUSE, CMNT/CUR, MODE, or CURSOR (  ).

### (6) CAUTION

This message will appear, together with the message of (8) or (9), to notify you that there is a mistake for plotout operation.

**(7) CHANGE GP-IB to TALK ONLY**

This message will appear when you attempt a plotout operation without setting the GPIB switch to the Talk Only Mode.

**(8) CHANGE HORIZ MAG to  $\times 1$**

This message will appear if you attempt a plotout operation when the horizontal MAG switch is placed at other than  $\times 1$ . Then, the plotout operation will not start. As you turn the MAG switch to the  $\times 1$  position, the message will disappear. To resume the plotout operation, place the MAG switch at  $\times 1$  position and press the PLOT switch again.

**(9) PANEL SETUP differ with READOUT**

This message will appear when you turn the horizontal MAG switch to other than  $\times 1$  while a plotout is running. A waveform data magnified by the MAG switch cannot be plotted out anyhow. However, even if you have seen this message, the plotout operation will continue at the  $\times 1$  magnification factor. This message will disappear as you turn the MAG switch to the  $\times 1$  position.

Examples of plotted out waveforms

(By EPSON HI-80 with HP-GL Emulation Set)

PLOT S1~S4

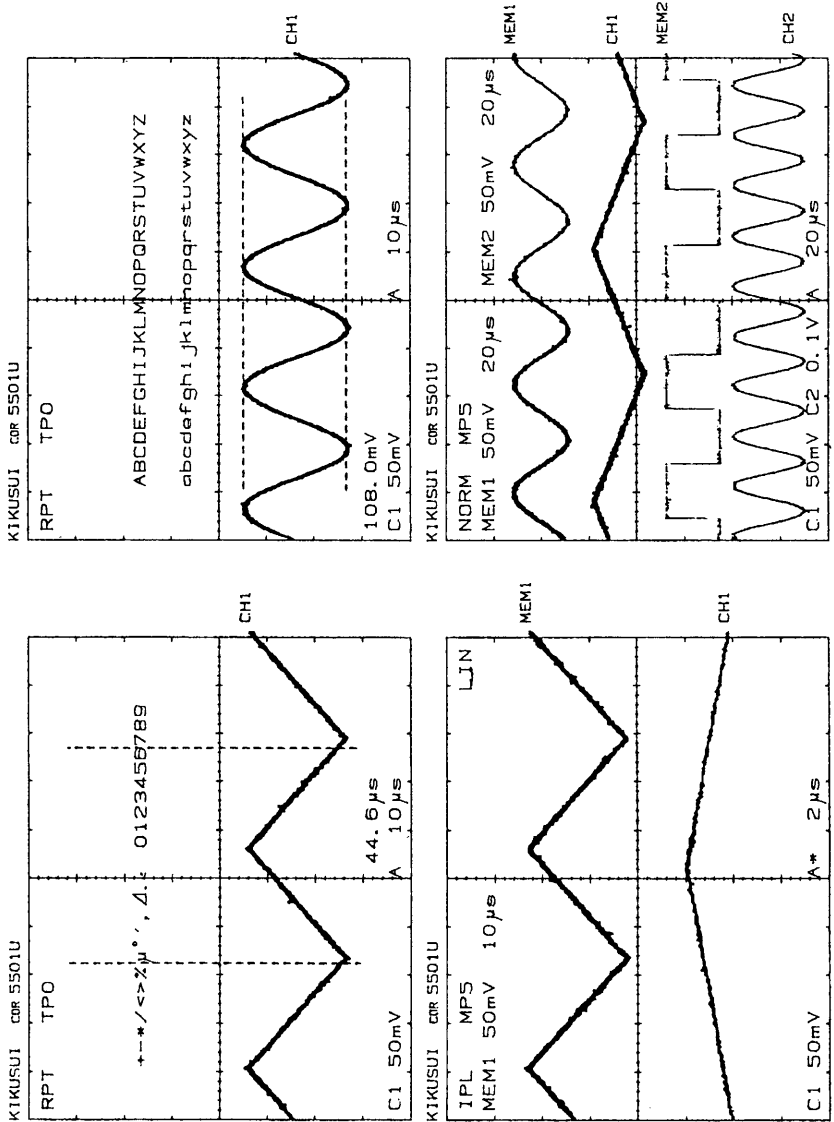


Figure 5-3. Plotted Waveforms (Example 1)

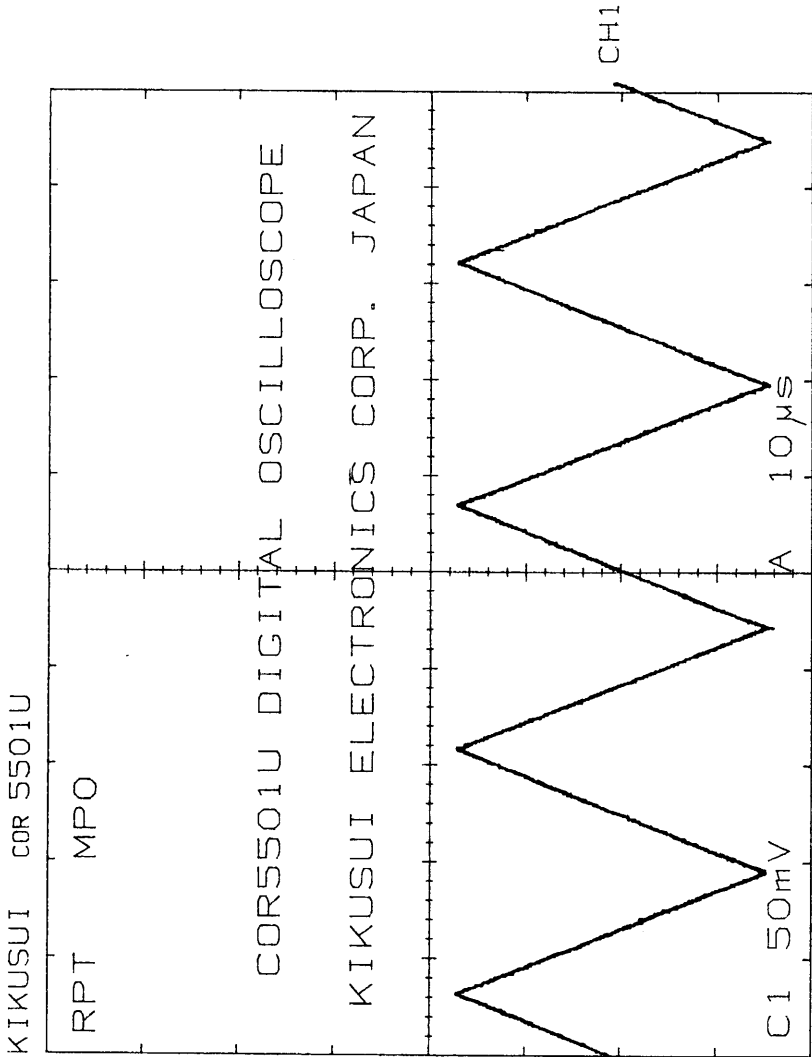


Figure 5-4. Plotted Waveforms (Example 2)



## Chapter 6. SPECIFICATIONS

### (1) Interface Standards

Based on ANSI/IEEE std488 - 1978, and IEC625

### (2) Interface Functions

Code	Functions
SH1	With all source handshake functions
AH1	With all acceptor handshake functions
T5	With talker functions (basic output, serial poll, talk only, and talker release by listener designation)
L4	With listener functions (basic input, and listener release by talker designation)
SR1	With all service request functions
RL0	Without remote/local changing function
PP0	Without parallel polling function
DC1	With all device clear functions
DT0	Without device trigger function
C0	Without control function
E0	Without talker or listener expansion function

### (3) Formats

Device commands : ASCII

Waveform data : Binary (BYTE, LWORD, and HWORD)

### (4) Commands

#### (a) Functions

On/off for SRQ

On/off for EOI

Resetting the Single Trigger operation in Storage Mode.

Start or end block for waveform data transfer

Specifying a format for waveform data transfer

#### (b) Data items readable

Model name

Setting of VERT MODE

Settings of VOLT/DIV (deflection factor)

Setting of HORIZ MODE



**(8) Accessories**

Mounting screws ..... 2

Operation manual .... 1 copy (Z1-000-132)

**(9) Options**

GPIB cable	408J-1P5	50 cm (1.6 ft.)	(89-04-1000)
	408J-101	1 m (3.3 ft.)	(89-04-1010)
	408J-102	2 m (6.6 ft.)	(89-04-1020)
	408J-104	4 m (13.1 ft.)	(89-04-1040)

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