

INSTRUCTION MANUAL

GP-IB INTERFACE UNIT

MODEL IF01-COS

KIKUSUI ELECTRONICS CORPORATION

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TABLE OF CONTENTS

|   | <u>PAGE</u> |
|---|-------------|
| 1. GENERAL .....  | 1           |
| 2. SPECIFICATIONS .....                                 | 1           |
| 3. GENERAL PRECAUTIONS .....                            | 4           |
| 3-1. Unpacking the Interface Unit .....                 | 4           |
| 3-2. Checking the AC Line Voltage .....                 | 4           |
| 3-3. Ambient Conditions .....                           | 4           |
| 3-4. Inter-device Connection Cable (24-pin GP-IB) ..... | 4           |
| 4. PANEL DESCRIPTION AND INTER-DEVICE CONNECTION .....  | 5           |
| 4-1. Description of Front Panel .....                   | 5           |
| 4-2. Description of Rear Panel .....                    | 5           |
| 4-3. Inter-device Connections .....                     | 6           |
| 4-4. Optional Inter-device Connection Cables .....      | 7           |
| 5. OPERATION METHOD .....                               | 8           |
| 5-1. Inter-device Connections and Address Setting ..... | 8           |
| 5-2. Data Format .....                                  | 9           |
| 5-3. Character Codes .....                              | 12          |
| 5-4. Initial Procedure .....                            | 20          |
| 5-5. Operating Procedure .....                          | 21          |
| 5-6. Procedure of Character Transfer from CPU .....     | 23          |

## 1. GENERAL

Kikusui GP-IB Interface Unit, Model IF01-COS, is used to connect Kikusui Programmable Oscilloscope, Model COS5030-PG, to a GP-IB General Purpose Interface Bus of IEEE Specifications 488-1975. By using the interface unit, all functions of the programmable oscilloscope can be controlled from a CPU through a GP-IB cable. By using this system, range setting of the oscilloscope can be rapidly done and, when other measuring devices are used in parallel, the same waveforms can be displayed at different locations.

## 2. SPECIFICATIONS

### o Specifications of Interface Unit

- (1) Electrical specifications: Based on IEEE Specifications 488-1975 and IEC Specifications TC66.
- (2) Mechanical specifications: Meet the requirements of 24-contact connector of IEEE Specifications 488-1975.  
(For connection to a 25-contact connector of IEC Specifications TC66, a conversion connector is used.)

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o Interface functions

| Item | Description                                   |
|------|---|
| SHO  | No sending handshake function                 |
| AH1  | Accepting handshake function                  |
| TO   | No talker function                            |
| L1   | Basic listener function. Listen only function |
| SRO  | No service request function                   |
| RLO  | No remote/local switching function            |
| PRO  | No parallel poll function                     |
| DCO  | No device clear function                      |
| DTO  | No device trigger function                    |
| CO   | No control function                           |

Address designation: With five binary bits (0 - 30)

o Data format

Four alphanumeric characters

|                      |     |     |     |
|----------------------|-----|-----|-----|
| Alphabetic character | (1) | (2) | (3) |
|----------------------|-----|-----|-----|

(1) - (3): Numeric character of 1 - 9

Note: Based on the format recommended by IEEE.

o Interface connector

Based on IEEE Specification 488-1975 (Amphenol 57-Series 24-contact receptacle)

o Ambient temperature and humidity to satisfy performance specifications

5°C to 35°C (41°F to 95°F), up to 85% RH

o Maximum allowable operating ambient temperature and humidity

0°C to 40°C (32°F to 104°F), up to 90%

o External dimensions

Maximum dimensions: 220 W × 85 H × 330 D mm  
(8.66 W × 3.35 H × 12.99 D in.)

Chassis section: 220 W × 70 H × 310 D mm  
(8.66 W × 2.76 H × 12.20 D in.)

o Weight

Approx. 3.5 kg (approx. 1.6 lbs)

o Power requirements

Voltage: 100 V, 115 V, 215 V, or 230 V (±10% of each nominal  
voltage; selectable at rear panel)

Frequency: 50 - 60 Hz

Power consumption: Approx. 15 VA

o Accessories

|                              |                    |   |
|------------------------------|--------------------|---|
| Cable for IEEE-488 .....     | (89-04-1010) ..... | 1 |
| Fuse, 0.2 A, slow blow ..... | (99-02-0112) ..... | 1 |
| Fuse, 0.4 A, slow blow ..... | (99-02-0114) ..... | 1 |
| Instruction manual .....     | ( ) .....          | 1 |

### 3. GENERAL PRECAUTIONS

#### 3-1. Unpacking the Interface Unit

When the Interface Unit is delivered to you, please immediately unpack it and check for any signs of damage which might have been sustained when in transportation. If any sign of damage is found, please immediately notify the bearer and your Kikusui dealer.

#### 3-2. Checking the AC Line Voltage

The Interface Unit can be operated on any one of the AC line voltages shown in the below table, by selecting the voltage with the voltage selector plug on the rear panel. Before connecting the AC power cord of the device to an AC line power receptacle, make it sure that the voltage selector plug is correctly set for the AC line voltage. When changing the AC line voltages, change fuses also as required. Note that, if the device voltage setting does not conform with the AC line voltage, the device may not operate normally or may be damaged.

| Selector position | Nominal voltage | Allowable voltage range | Fuse            |
|-------------------|-----------------|-------------------------|-----------------|
| A                 | 100 V           | 90 V - 110 V            | 0.4A, slow blow |
| B                 | 115 V           | 104 V - 126 V           |                 |
| C                 | 215 V           | 194 V - 236 V           | 0.2A, slow blow |
| D                 | 230 V           | 207 V - 253 V           |                 |

#### 3-3. Ambient Conditions

The maximum allowable operating temperature range of this device is 0°C to 40°C (32°F to 104°F). Note that failures of the device or shortening of life expectancy may be caused if the device is operated or stored in high temperature and high humidity for a long time.

#### 3-4. Inter-device Connection Cable (24-pin GP-IB)

Before connecting or disconnecting the inter-device connection cable, make it sure that the power switches of the devices are turned off. Before turning on the switches, make it sure that the cable is securely connected (make it sure that the cable is securely engaged by the connector lock spring of the main unit side).

#### 4. PANEL DESCRIPTION AND INTER-DEVICE CONNECTION

##### 4-1. Description of Front Panel

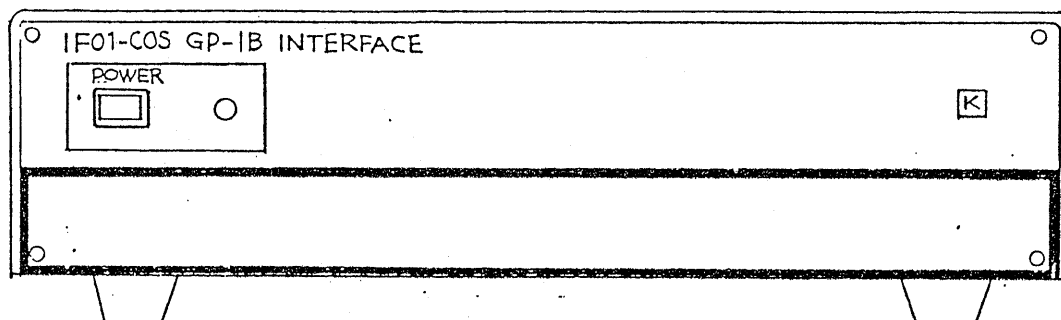


Figure 4-1

**POWER:** As you press this button, the device power is turned on and the power pilot lamp (green LED at the right hand side) lights. As you press the button again, the device power is turned off.

##### 4-2. Description of Rear Panel

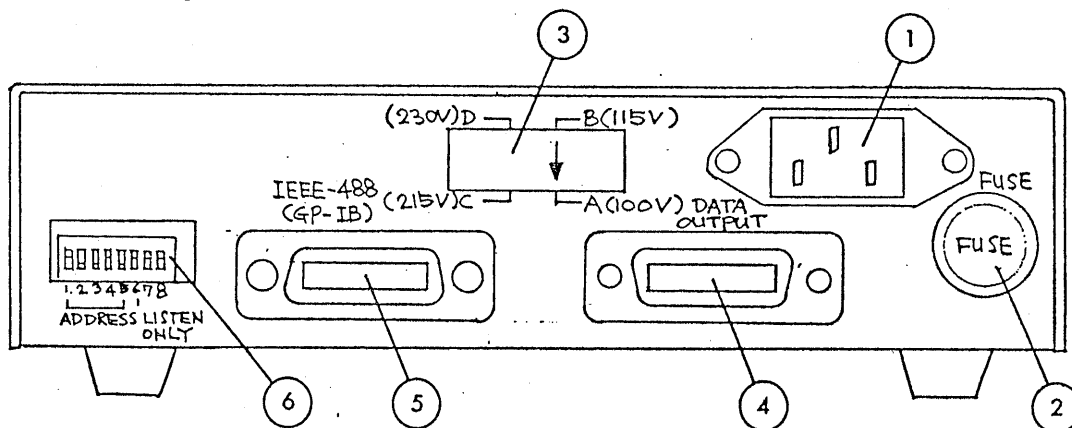


Figure 4-2

- ① **Power connector:** The AC power input connector. Connect the AC power cord (supplied) to this connector.
- ② **FUSE holder:** AC input power fuse holder. To replace the fuse, turn counterclockwise the holder cap.
- ③ **Line voltage selector plug:** Set this plug in conformity with the voltage of the AC line on which the device is to be operated.

- ④ DATA OUTPUT connector: This 24-pin Amphenol 57-Series connector is to connect the device to Programmable Oscilloscope COS5030-PG. Use the 24-pin connector which is supplied accompanying the programmable oscilloscope.
- ⑤ IEEE-488 (GP-IB) connector: This 24-contact Amphenol 57-Series connector is for connection with a GP-IB General Purpose Interface Bus cable of IEEE Specifications 488-1975.
- ⑥ ADDRESS switches: Eight-bit dip switches for address setting and listening. Bits 1 - 5 are for address setting (0 - 30).

4-3. Inter-device Connections

Connect the devices with inter-device connection cables as shown in Figure 4-3.

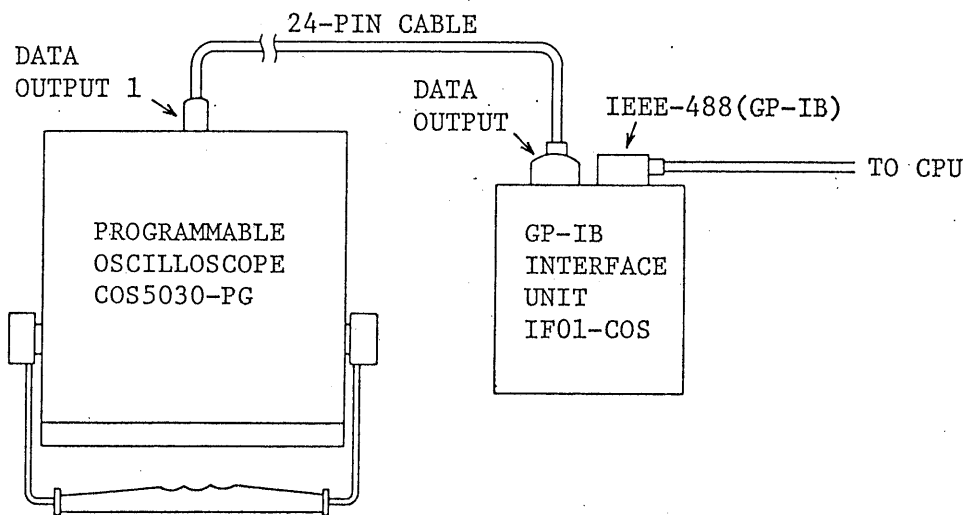


Figure 4-3

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Note: To make use of the external control functions (2) of Programmable Oscilloscope COS5030-PG, connect Step Controller SC02-COS (optional) to the oscilloscope using the 14-pin cable which is supplied accompanying the oscilloscope (connect between the "DATA INPUT 2" connector on the rear panel of Programmable Oscilloscope COS5030-PG and the "OSCILLOSCOPE" connector on the rear panel of Step Controller SC02-COS).

#### 4-4. Optional Inter-device Connection Cables

The standard-length (1 meter long) inter-device connection cables are supplied accompanying the devices. As options, 2-meter-long cables are available. The GP-IB cables are available in 50-cm length and 1-m length.

| Cable                     | Kikusui Code | Length |
|---------------------------|--------------|--------|
| 57 CABLE 24P(O)-1M-24P(O) | 89-04-0130   | 1 m    |
| 57 CABLE 24P(O)-2M-24P(O) | 89-04-0160   | 2 m    |
| 408J-1P5 IEEE-488 50CM    | 89-04-1000   | 50 cm  |
| 408J-101 IEEE-488 1 M     | 89-04-1010   | 1 m    |
| 408J-102 IEEE-488 2 M     | 89-04-1020   | 2 m    |
|                           |              |        |

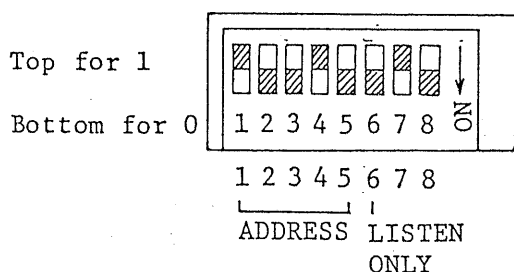
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## 5. OPERATION METHOD

### 5-1. Inter-device Connections and Address Setting

For connection between Programmable Oscilloscope COS5030-PG and GP-IB Interface Unit IF01-COS, see Subsection 4-3. For connection between GP-IB Interface Unit IF01-COS and CPU or other device of GP-IB type, use the GP-IB cable supplied accompanying GP-IB Interface Unit IF01-COS. Other cables which accompany CPU or other device of GP-IB type also may be used for connection to the IEEE-488 (GP-IB) connector on the rear panel of GP-IB Interface Unit IF01-COS, provided that the cables meet the requirements of IEEE Specifications 488-1975. For connection with a piggyback cable for 25-contact connector of IEC Specification TC-66, an IEEE-IEC conversion connector is required. (Such conversion connectors are available from Kikusui Electronics Corporation also.)

Before turning on the power switches of the devices (including CPU), perform address setting of GP-IB Interface Unit IF01-COS. An address can be selected from 31 addresses (within a range of 0 - 31). Select an address which is not duplicatedly selected for other GP-IB devices (including CPU) which are connected to the GP-IB bus line. Address setting can be done with five of the eight binary dip switches located on the rear panel of GP-IB Interface Unit IF01-COS.



The illustration is for an example of address setting at 9.

Figure 5-1

| Address No. | 1 | 2 | 3 | 4 | 5 | Address No. | 1 | 2 | 3 | 4 | 5 |
|-------------|---|---|---|---|---|-------------|---|---|---|---|---|
| 0           | 0 | 0 | 0 | 0 | 0 | 4           | 0 | 0 | 1 | 0 | 0 |
| 1           | 1 | 0 | 0 | 0 | 0 | 5           | 1 | 0 | 1 | 0 | 0 |
| 2           | 0 | 1 | 0 | 0 | 0 | 6           | 0 | 1 | 1 | 0 | 0 |
| 3           | 1 | 1 | 0 | 0 | 0 | 7           | 1 | 1 | 1 | 0 | 0 |

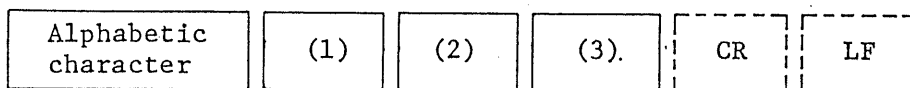
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| Address No. | 1 | 2 | 3 | 4 | 5 | Address No. | 1 | 2 | 3 | 4 | 5 |
|-------------|---|---|---|---|---|-------------|---|---|---|---|---|
| 8           | 0 | 0 | 0 | 1 | 0 | 20          | 0 | 0 | 1 | 0 | 1 |
| 9           | 1 | 0 | 0 | 1 | 0 | 21          | 1 | 0 | 1 | 0 | 1 |
| 10          | 0 | 1 | 0 | 1 | 0 | 22          | 0 | 1 | 1 | 0 | 1 |
| 11          | 1 | 1 | 0 | 1 | 0 | 23          | 1 | 1 | 1 | 0 | 1 |
| 12          | 0 | 0 | 1 | 1 | 0 | 24          | 0 | 0 | 0 | 1 | 1 |
| 13          | 1 | 0 | 1 | 1 | 0 | 25          | 1 | 0 | 0 | 1 | 1 |
| 14          | 0 | 1 | 1 | 1 | 0 | 26          | 0 | 1 | 0 | 1 | 1 |
| 15          | 1 | 1 | 1 | 1 | 0 | 27          | 1 | 1 | 0 | 1 | 1 |
| 16          | 0 | 0 | 0 | 0 | 1 | 28          | 0 | 0 | 1 | 1 | 1 |
| 17          | 1 | 0 | 0 | 0 | 1 | 29          | 1 | 0 | 1 | 1 | 1 |
| 18          | 0 | 1 | 0 | 0 | 1 | 30          | 0 | 1 | 1 | 1 | 1 |
| 19          | 1 | 1 | 0 | 0 | 1 |             |   |   |   |   |   |

The top position of the 6th digit switch is for the LISTEN ONLY mode. However, as there is a possibility of interference by data of other GP-IB devices, set this switch in the bottom position. The 7th and 8th digit switches are unused and may be set either in the top or bottom position.

#### 5-2. Data Format

The format of control data which is sent from CPU via GP-IB Interface Unit to Programmable Oscilloscope COS5030-PG is based on an IEEE-recommended format. It consists of four alphanumeric characters as follows:



(1) - (3): Numeric number of 0 - 9

The alphabetic character represents one of the eight major-classification items of oscilloscope functions, with the capitalized initial letter of the item name. Numeric characters (1) - (3) represent one of the minor-classification items of oscilloscope functions, with a numeric number of 000 - 999. The subsequent four characters [CR] [LF] may be either provided or omitted. The major- and minor-classified items of oscilloscope functions are shown in the following table:

| Major classification |          | Minor classification                    |                                  | Remarks   |
|----------------------|----------|---|----------------------------------|---|
| V                    | VERTICAL | Vertical sensitivity (both CH1 and CH2) | 5 mV - 5 V/DIV                   | 1-2-5 sequence, 10 points                       |
| C                    | COUPLING | Vertical input coupling                 | AC/DC/GND                        |   |
|                      |          | CH1 POSITION                            | 7-point selection                | Approx. 1-DIV steps                             |
|                      |          | CH1 $\times 5$ MAG                      |                                  |   |
| M                    | MODE     | Vertical mode                           | CH1/CH2/DUAL (CHOP, ALT)/ADD/XY  | Note (1)  |
|                      |          | CH2 POSITION                            | 7-point selection                | Approx. 1-DIV steps                             |
|                      |          | CH2 $\times 5$ MAG and INV              |                                  |   |
| D                    | DISPLAY  | Horizontal display                      | A/A INTEN/B                      |   |
|                      |          | Sweep mode                              | AUTO/NORM/SINGLE                 |   |
|                      |          | Horizontal POSITION                     | 7-point selection                | Approx. 1-DIV steps                             |
|                      |          | Horizontal $\times 5$ MAG               |                                  |   |
| A                    | A SWEEP  | A sweep time                            | 0.5 S - 0.2 $\mu$ S/DIV          | 1-2-5 sequence, 20 points                       |
|                      |          | A sweep, VARIABLE                       | 4-point selection, CAL'D - 1/2.5 | Panel indication is for reference only Note (2) |
|                      |          | TV sync separation                      |                                  |   |
| T                    | TRIGGER  | Triggering level                        | 7-point selection                | Approx. 1-DIV steps                             |
|                      |          | Triggering source                       | INT/EXT/LINE                     | Note (1)  |
|                      |          | Triggering signal coupling              | DC/AC/HF REJ                     |   |
|                      |          | Triggering slope                        | +/-                              |   |

| Major classification |           | Minor classification |  | Remarks                   |
|----------------------|-----------|----------------------|--|---------------------------|
| B                    | B SWEEP   | B sweep time         | 0.5 mS - 0.2 $\mu$ S/DIV                     | 1-2-5 sequence, 11 points |
|                      |           | Delay time POSITION  | 8-point selection                            | Approx. 1-DIV steps       |
| Z                    | Z (INTEN) | Z axis               | 4-point selection                            |                           |
|                      |           | CHOP ONLY            |  | Note (3)                  |
|                      |           | EXT SELECTOR         | A: 4-point selection<br>B: 4-point selection | Note (4)                  |

Note (1): When in the single-channel mode (CH1 or CH2), the internal triggering signal sources also are automatically switched as the vertical modes are switched.

| Operation (vertical mode) | Internal triggering signal source |
|---------------------------|-----------------------------------|
| CH1                       | CH1                               |
| CH2                       | CH2                               |
| DUAL, ADD                 | CH1 or CH2 can be selected.       |

Note (2): The continuously-variable adjustment range of A sweep time is 0 to approximately 1/2.5 even when this function is used in conjunction with that of the A SWEEP VARIABLE knob on Programmable Oscilloscope COS5030-PG.

Note (3): If the CHOP ONLY mode is selected, the dual-trace operation is by chopping at all of the sweep time ranges.

Note (4): A signal representing the setting of EXT SELECTOR is provided through the PROBE SELECTOR connector (24-pin Amphenol connector) of Programmable Oscilloscope COS5030-PG.

5-3. Character Codes

The character codes for control data which is sent from CPU to GP-IB Interface Unit IF01-COS in order to control Programmable Oscilloscope COS5030-PG are as shown in the following tables:

VO

|   |          |           |   |          |           |
|---|----------|-----------|---|----------|-----------|
| 0 | VERT CH1 | 5 mV/DIV  | 0 | VERT CH2 | 5 mV/DIV  |
| 1 | " "      | 10 mV/DIV | 1 | " "      | 10 mV/DIV |
| 2 | " "      | 20 mV/DIV | 2 | " "      | 20 mV/DIV |
| 3 | " "      | 50 mV/DIV | 3 | " "      | 50 mV/DIV |
| 4 | " "      | 0.1 V/DIV | 4 | " "      | 0.1 V/DIV |
| 5 | " "      | 0.2 V/DIV | 5 | " "      | 0.2 V/DIV |
| 6 | " "      | 0.5 V/DIV | 6 | " "      | 0.5 V/DIV |
| 7 | " "      | 1 V/DIV   | 7 | " "      | 1 V/DIV   |
| 8 | " "      | 2 V/DIV   | 8 | " "      | 2 V/DIV   |
| 9 | " "      | 5 V/DIV   | 9 | " "      | 5 V/DIV   |

Legend: The quotation mark (") in these tables mean 'same as above.'

Example: To set CH1 vertical sensitivity at 20 mV/DIV and CH2 vertical sensitivity at 1 V/DIV, send a 'V027' code.

Note: Be sure to send a 'Q' character as the second character of a code of V classification.

C

|   |                 |        |
|---|-----------------|--------|
| 0 | CH1 SENSITIVITY | NORM   |
| 1 | CH1 SENSITIVITY | ×5 MAG |

|   |          | CH1 | CH2 |
|---|----------|-----|-----|
| 0 | COUPLING | AC  | AC  |
| 1 | "        | AC  | DC  |
| 2 | "        | AC  | GND |
| 3 | "        | DC  | AC  |
| 4 | "        | DC  | DC  |
| 5 | "        | DC  | GND |
| 6 | "        | GND | AC  |
| 7 | "        | GND | DC  |
| 8 | "        | GND | GND |

|   |              |    |
|---|--------------|----|
| 0 | CH1 POSITION | +3 |
| 1 | "            | +2 |
| 2 | "            | +1 |
| 3 | "            | 0  |
| 4 | "            | -1 |
| 5 | "            | -2 |
| 6 | "            | -3 |

M

| CODE | SENSITIVITY AND POLARITY | ×5 MAG | INV  |
|------|--------------------------|--------|------|
| 0    | CH2                      | NORM   | NORM |
| 1    | "                        | "      | INV  |
| 2    | "                        | ×5 MAG | NORM |
| 3    | "                        | "      | INV  |

| CODE | VERT MODE | OPERATION | TRIG |
|------|-----------|-----------|------|
| 0    | "         | CH1       | CH1  |
| 1    | "         | DUAL      | CH1  |
| 2    | "         | "         | CH2  |
| 3    | "         | CH2       | CH2  |
| 4    | "         | ADD       | CH1  |
| 5    | "         | "         | CH2  |
| 6    | "         | XY        | ---  |

| CODE | CH2 POSITION |    |
|------|--------------|----|
| 0    | CH2 POSITION | +3 |
| 1    | "            | +2 |
| 2    | "            | +1 |
| 3    | "            | 0  |
| 4    | "            | -1 |
| 5    | "            | -2 |
| 6    | "            | -3 |



D

|   |            |         | MAGNIFICATION |
|---|------------|---------|---------------|
| 0 | H. DISPLAY | A       | NORM          |
| 1 | "          | "       | ×5 MAG        |
| 2 | "          | A INTEN | NORM          |
| 3 | "          | "       | ×5 MAG        |
| 4 | "          | B       | NORM          |
| 5 | "          | "       | ×5 MAG        |

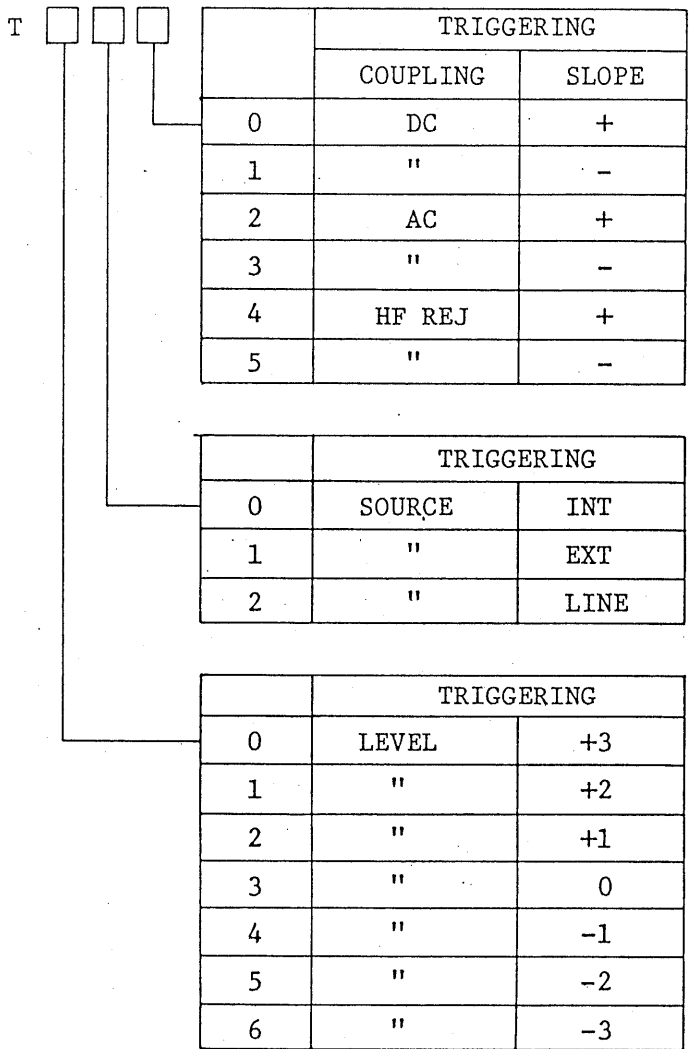
|   |            |        |
|---|------------|--------|
| 0 | SWEEP MODE | AUTO   |
| 1 | "          | NORM   |
| 2 | "          | SINGLE |

|   |             |    |
|---|-------------|----|
| 0 | H. POSITION | +3 |
| 1 | "           | +2 |
| 2 | "           | +1 |
| 3 | "           | 0  |
| 4 | "           | -1 |
| 5 | "           | -2 |
| 6 | "           | -3 |

A

| CODE | A SWEEP TIME VARIABLE |                  | TV SYNC |
|------|-----------------------|------------------|---------|
| 0    | A SWEEP               | CAL'D            | NORM    |
| 1    | "                     | "                | TV      |
| 2    | "                     | Approx.<br>1/1.5 | NORM    |
| 3    | "                     | "                | TV      |
| 4    | "                     | Approx.<br>1/2   | NORM    |
| 5    | "                     | "                | TV      |
| 6    | "                     | Approx.<br>1/2.5 | NORM    |
| 7    | "                     | "                | TV      |

|    |              |   |           |
|----|--------------|---|-----------|
| 00 | A SWEEP TIME |   | 0.5 S/DIV |
| 01 | "            | " | 0.2 "     |
| 02 | "            | " | 0.1 "     |
| 03 | "            | " | 50 mS/DIV |
| 04 | "            | " | 20 "      |
| 05 | "            | " | 10 "      |
| 06 | "            | " | 5 "       |
| 07 | "            | " | 2 "       |
| 08 | "            | " | 1 "       |
| 09 | "            | " | 0.5 "     |
| 10 | "            | " | 0.2 "     |
| 11 | "            | " | 0.1 "     |
| 12 | "            | " | 50 μS/DIV |
| 13 | "            | " | 20 "      |
| 14 | "            | " | 10 "      |
| 15 | "            | " | 5 "       |
| 16 | "            | " | 2 "       |
| 17 | "            | " | 1 "       |
| 18 | "            | " | 0.5 "     |
| 19 | "            | " | 0.2 "     |

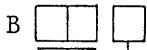


| TRIGGERING |          |       |
|------------|----------|-------|
|            | COUPLING | SLOPE |
| 0          | DC       | +     |
| 1          | "        | -     |
| 2          | AC       | +     |
| 3          | "        | -     |
| 4          | HF REJ   | +     |
| 5          | "        | -     |

| TRIGGERING |        |      |
|------------|--------|------|
|            | SOURCE | INT  |
| 0          | SOURCE | INT  |
| 1          | "      | EXT  |
| 2          | "      | LINE |

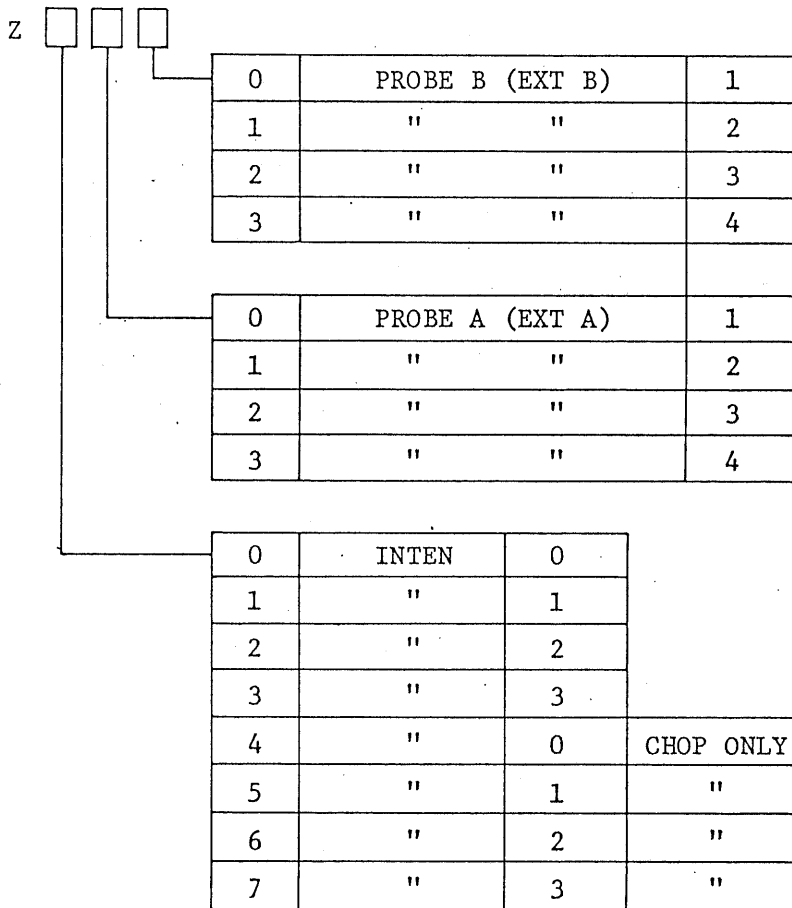
| TRIGGERING |       |    |
|------------|-------|----|
|            | LEVEL |    |
| 0          | LEVEL | +3 |
| 1          | "     | +2 |
| 2          | "     | +1 |
| 3          | "     | 0  |
| 4          | "     | -1 |
| 5          | "     | -2 |
| 6          | "     | -3 |

822266



|   |                     |   |
|---|---------------------|---|
| 0 | DELAY TIME POSITION | 0 |
| 1 | "                   | 1 |
| 2 | "                   | 2 |
| 3 | "                   | 3 |
| 4 | "                   | 4 |
| 5 | "                   | 5 |
| 6 | "                   | 6 |
| 7 | "                   | 7 |

|    |              |                |
|----|--------------|----------------|
| 00 | B SWEEP TIME | 0.5 mS/DIV     |
| 01 | "            | 0.2 "          |
| 02 | "            | 0.1 "          |
| 03 | "            | 50 $\mu$ S/DIV |
| 04 | "            | 20 "           |
| 05 | "            | 10 "           |
| 06 | "            | 5 "            |
| 07 | "            | 2 "            |
| 08 | "            | 1 "            |
| 09 | "            | 0.5 "          |
| 10 | "            | 0.2 "          |



822268

5-4. Initial Procedure

Be sure to check the AC line voltage before turning on the power switch of the device.

This device and Programmable Oscilloscope COS5030-PG have no initialization setting function and no device clear function from CPU when their powers are turned on. Therefore, be sure to send initialization data from CPU. The values of data may be any values as required by the control program. Examples are shown in the following table.

|      |                                |                                    |
|------|--------------------------------|------------------------------------|
| V000 | Vertical sensitivity           | 5 mV/DIV, both CH1 and CH2         |
| C380 | Vertical input coupling        | GND, both CH1 and CH2              |
|      | CH1 POSITION                   | 0 (center of graticule)            |
|      | CH1 $\times 5$ MAG             | NORM (NOT $\times 5$ MAG)          |
| M300 | Vertical mode                  | CH1 (INT TRIG = CH1)               |
|      | CH2 POSITION                   | 0 (center of graticule)            |
|      | CH2 $\times 5$ MAG and INV     | NORM (NOT $\times 5$ MAG, NOT INV) |
| D300 | Horizontal display             | A (A sweep)                        |
|      | Sweep mode                     | AUTO (FREE RUN)                    |
|      | Horizontal POSITION            | 0                                  |
|      | Horizontal $\times 5$ MAG      | NORM (NOT $\times 5$ MAG)          |
| A080 | A sweep time                   | 1 mS/DIV                           |
|      | A sweep, continuously variable | CAL'D                              |
|      | TV sync separation             | NORM                               |
| T300 | Triggering level               | 0                                  |
|      | Triggering source              | INT (CH1)                          |
|      | Triggering coupling            | DC                                 |
|      | Triggering slope               | +                                  |
| B024 | B sweep time                   | 0.1 mS/DIV                         |
|      | Delay time POSITION            | 4 (delay time = 5 mS)              |
| Z100 | Z axis (intensity)             | 1                                  |
|      | CHOP ONLY                      | NORM (NOT CHOP ONLY)               |
|      | EXT SELECTOR                   | 1, both A and B                    |

822269

Be sure to send initialization data for these items, even when some of them may not be used. (For instance, even when the horizontal display is in the A sweep mode as in the above example, be sure to send data for B sweep time also.)

5-5. Operating Procedure (Example)

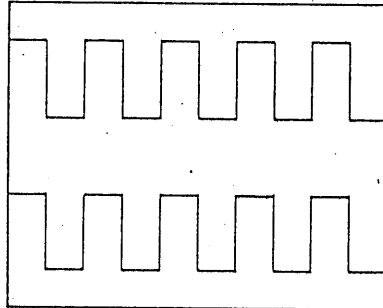
The operating procedure here is explained for the dual-trace mode and ADD mode of operation with the calibration signal available from the CAL 1 Vp-p output terminal on the front panel of Programmable Oscilloscope COS5030-PG.

- (1) Connect the 960BNC probes to the CH1 and CH2 input terminals of Programmable Oscilloscope COS5030-PG and connect the probe tips to the calibration signal output terminal. (Set the attenuation ratios of the probes at 1:1.)
- (2) Send setting data of Programmable Oscilloscope COS5030-PG from CPU to GP-IB Interface Unit IF01-COS.

| Setting data | Contents   |
|--------------|--|
| V066         | Input sensitivity 0.5 V/DIV, both CH1 and CH2                                |
| V140         | CH1: P = +2; Input coupling: DC, both CH1 and CH2;<br>CH1: Not x5 MAG        |
| M510         | CH2: P = -2; Vert mode: DUAL; CH2: Not x5 MAG,<br>not INV                    |
| D300         | Horiz: P = 0; Sweep mode: AUTO; H. display: A;<br>Horiz: Not x5 MAG          |
| A090         | A sweep: 0.5 mS/DIV; A sweep VAR: CAL'D; Mode:<br>Not TV                     |
| T302         | T. level: 0; T. source: INT; T. coupling: AC;<br>T. slope: +                 |
| B024         | Not required to be sent, provided that the devices<br>have been initialized. |
| Z100         | INTEN: 0; CHOP ONLY: OFF, etc.   |

822210

- (3) When the above data is sent, the oscilloscope will display dual-trace waveforms as shown in Figure 5-2.



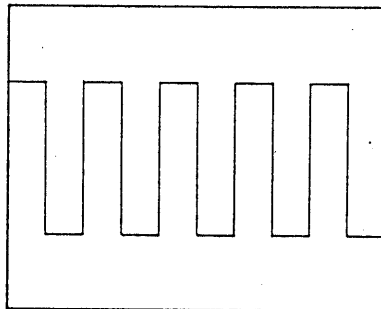
Fual-trace operation

Figure 5-2

- (4) Pull out the INTEN knob of Programmable Oscilloscope and adjust it, together with the FOCUS control knob, so that the displayed trace images becomes sharpest.
- (5) Pull out the CH1 and CH2 position knobs and H POSITION knobs of Programmable Oscilloscope COS5030-PG, adjust them so that the displayed waveforms are aligned with graticule, and determine the voltage ( $V_{p-p}$ ) and period (T sec).
- (6) Send the ADD operation setting data from CPU.

| Setting data | Contents  |
|--------------|---|
| M541         | CH2: P = -2; vert mode: ADD;<br>CH2: Not $\times 5$ MAG; CH2: INV |

- (7) When the above data is sent, the oscilloscope will display an ADD waveform as shown in Figure 5-3.



ADD operation

Figure 5-3

822271



5-6. Procedure of Character Transfer from CPU

The procedure of transfer of characters (ASCII codes) to GP-IB Interface Unit IF01-COS with BASIC programs of CPU is explained here. Frequently used commands are PRINT, OUTPUT, etc., as shown in the following examples.

(1) COMMODORE CBM 3032  
10 OPEN 2, 10  
20 PRINT #2, "A080"  
30 CLOSE 2

Note: Transferred data is A080.

(2) TEKTRONIX 4052  
10 PRINT @10: "A080"

(3) YHP 9845, 9835, 85  
10 IMAGE 4(B)  
20 OUTPUT 701; "A080"  
30 OUTPUT 701 USING 10; 65,48,56,48

(4) YHP 9830  
10 FORMAT 4B  
20 WRITE (13,\*)"A080"  
30 OUTPUT (13,10) 65;48;56;48

(5) YHP 9825  
1 WRT 701, "A080"

(6) PANAFACOM C15  
10 OPEN IEC  
20 CONNECT 30=1  
30 TALK 1 "A080"  
40 CLOSE IEC

(7) NEC PC8001+PC8011  
10 DEFUSR0=&H6000  
20 A=USR 0(1)  
30 I SET IFC  
40 PRINT 1;"A080"

(8) ANRITSU DDC-7705A

1. FORMAT"4B"

2. CMD #1, ?P1";"A080"

3 WRITE #101:1,65,48,56,48

822273