

INSTRUCTION MANUAL

GP-IB INTERFACE

MODEL DPO 200

KIKUSUI ELECTRONICS CORPORATION

182.6.30

# Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.

(Revision should be applied to items indicated by a check mark )

Input voltage

The input voltage of this product is \_\_\_\_\_ VAC,  
and the voltage range is \_\_\_\_\_ to \_\_\_\_\_ VAC. Use the product within this range only.

Input fuse

The rating of this product's input fuse is \_\_\_\_\_ A, \_\_\_\_\_ VAC, and \_\_\_\_\_.

### WARNING

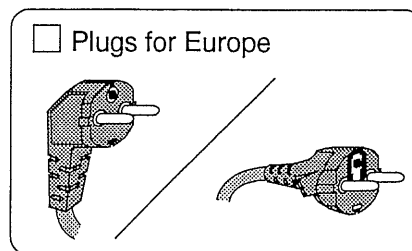
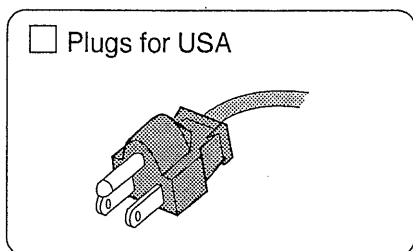
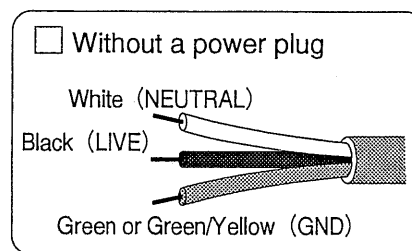
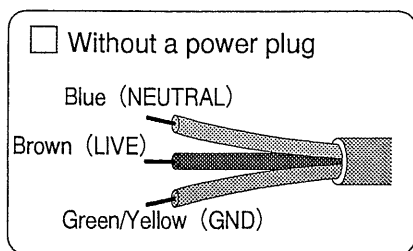
- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

AC power cable

The product is provided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

### WARNING

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.



Provided by Kikusui agents  
Kikusui agents can provide you with suitable AC power cable.  
For further information, contact your Kikusui agent.

Another Cable \_\_\_\_\_

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### SECTION 1: General

#### 1-1. Description

The DPO 200 GP-IB interface is one of the digital programming options in the Kikusui DPO series, and is designed to connect the Kikusui regulated DC power supply and electronic loads with a GP-IB bus (IEEE-488-1975). Furthermore, it is also used in connection with our D/A converters (DPO 208 and DPO 212) and the GP-IB expansion unit (DPO 290).

\* Before operating this unit, please refer to the instruction manuals for the DPO 208, DPO 212, or the DPO 290 and the instruction manuals for the power supplies and electronic loads to be connected.

SECTION 2: Specifications

Specifications		
	Model	DPO 200
1. Input	Conformity Standard Interface Function Code Input Connector Address Settings Length of Bus Cable	IEEE-488-1975 Refer to Table 2-2 ASCII code Anphenolic 24P 0-30 Length of entire bus cable= less than (number of units connected to bus) × (2m) ≤ 20m
2. Output	Data  Strobe  Acknowledge  Connector	8 bit parallel, open collector, negative logic  1 bit, open collector, negative logic  1 bit, TTL level, negative logic  34P flat cable connector
3. Input Power Requirement		AC 10V ±10% (center tap) (10V-0-10V)
4. Operating Ambient Temperature and Humidity Range		0°C - 40°C, 10% - 90% RH
5. Insulation from Ground		DC 500V 30MΩ or above (case to terminal)
6. Dimensions		W 140mm × H 26mm × D 110mm (case dimensions)
7. Weight		Approx. 400gm
8. Accessories		Flat cable with 34P connectors at both ends (length: 7cm)

Table 2-1

		Function and Explanation
SH	0	Source handshake function--None
AH	1	Acceptor handshake function--Has function capability
T	0	Talker function--None
L	1	Basic listener function--Has listen-only mode capability
SR	0	Service requirement function--None
RL	0	Remote-local function--None
PP	0	Parallel pole function--None
DC	0	Device clear function--None
DT	0	Device trigger function--None
C	0	Control function--None

Table 2-2

## SECTION 3: Operating Instructions

### 3-1. Precaution for Operation

#### (1) Ambient Temperature

The temperature range satisfactory for this unit's operation is 0 - 40°C. Generally, semiconductor life is highly affected by ambient temperature; it is considered that parts will deteriorate exponentially with increasing ambient temperature.

#### (2) Mounting Position

In some cases, this unit is installed on the backboard of the PAD-L. Keep this unit about 20 cm or more away from the wall so that hot air from the fan does not accumulate. Do not operate any equipment sensitive to heat near this unit.

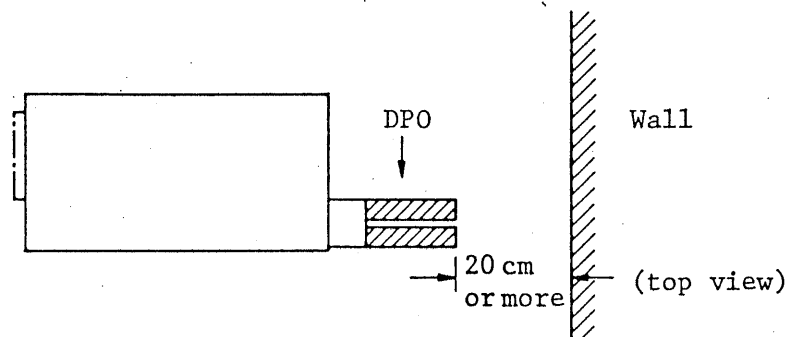


Figure 3-1

\* The mounting position of the DPO varies depending on the unit.

Do not use this unit in a place with excessive dust or moisture. Place this unit in a relatively vibration-free location.

#### (3) Transfer

This unit can be mounted on the backboard of the PAD-L, thereby making transfer easy. However, in this case care must be exercised to prevent DPO breakage when transferring the PAD-L main unit with the DPO attached.

3-2. Explanation of Controls and Connectors

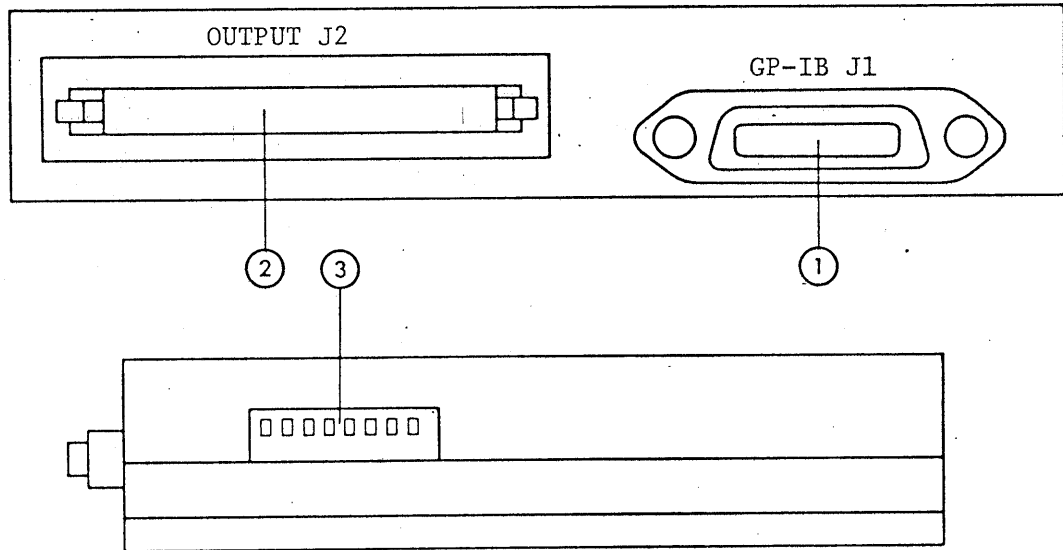


Figure 3-2

(1) GP-IB Input Connector J1 (GP-IB J1)

-Anphenolic type 24 pin connector according to GP-IB connector IEEE-488-1975 specifications. The GP-IB bus cable from the computer is connected here. When using an IEC standard connector, an IEC-IEEE conversion connector should be utilized. (Refer to Fig. 3-7)

(2) Output Connector J2 (OUTPUT J2)

-34 pin flat cable connector (manufactured by KEL Co., Ltd.) for connecting the D/A converter (DPO 208/DPO 212) or the GP-IB expansion unit (DPO 290) via a 34 wire flat cable.

(3) Address Setting Switch

-8 pole dipswitch for freely setting the DPO 200 address from 0 to 30. Can also be set in a LISTEN ONLY mode.

### 3-3. Operating Method

#### (1) Connection of the Unit to the Computer

-Connect the GP-IB connector on the computer to the GP-IB input connector J1 using the GP-IB bus cable.

\*CAUTION: Never connect or disconnect the connectors with the DPO power supply on, or while the GP-IB bus is in operation, as it will cause the unit to function improperly.

\*CAUTION: Be sure to secure the connector on the GP-IB bus cable to the connector on this unit with a screw.

#### (2) Connection of the Unit to the DPO 208, DPO 212, or DPO 290

-Utilize a 34 wire flat cable to connect this unit with any of the above units.

-A standard 7 cm long cable is included as an accessory.

If the units are to be placed a long distance apart, the DPO 208 and the DPO 212 can be extended up to 50 m.

-The ▼ marks on the cable should correspond with the ▼ mark on the output connector J2 and the ▼ mark on each of the units to be connected.

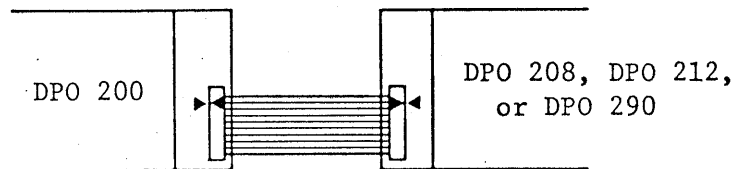


Figure 3-3

#### (3) Setting the Address

-The address for this unit from the GP-IB bus is set by using the address setting switch. The address setting switch is an 8 pole dipswitch. Poles 1-5 are used to set the address for this unit.



The address number is set using a binary code, and settings from 0-30 can be freely made. An example is shown in Fig. 3-4, where the binary code is "10101", making the address for the unit "21".

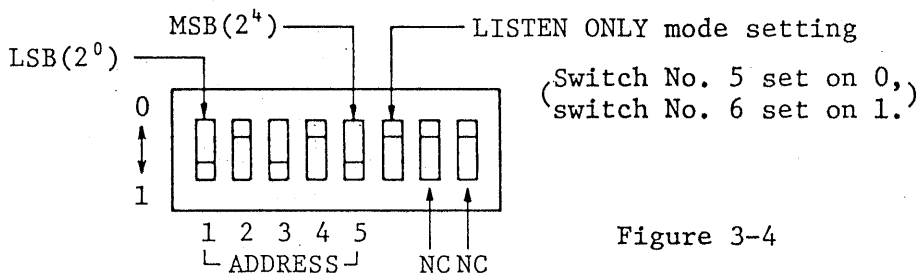


Figure 3-4

-When switch No. 6 is set on "0" the address of the unit will be in effect. When switch No. 6 is set on "1" and switch No. 5 is set on "0", the unit is in a LISTEN ONLY mode and will take up data from the GP-IB bus irrespective of the address. This setting is used to check system operations.

-Switch No. 7 and switch No. 8 are non-functional in this unit.

(4) Basic Listener Format

This unit has a listener function, but the data from the computer is sent according to the specific format outlined below.

A. System Configuration When the System is Composed of this Unit and the DPO 208 or DPO 212:

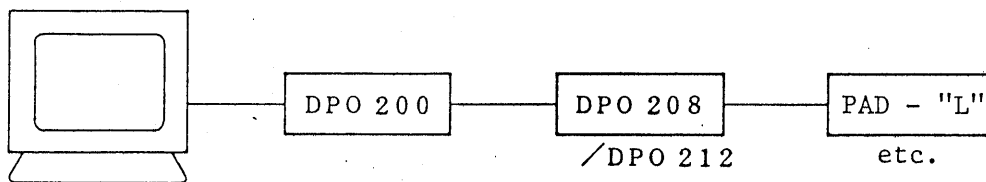


Figure 3-5

-When the voltage is to be controlled: \*1 (Output voltage of the power supply to be controlled)

"K    V"  
   └─┬─┘  
   data

-When the current is to be controlled: \*1 (Output current of the power supply, current of the electronic load, or frequency is to be controlled)

"K    A"  
           └data┘

\*1 When this unit is connected to the DPO 208 the data range is 000-255; when connected to the DPO 212 the data range is 000-999. Since the delimiter will be set at either (CR) or (CR) / (LF), be sure to output the delimiter from the computer at either (CR) or (CR) / (LF).

\* "K", "A", and "V" in CAPS.

B. System Configuration When the System Includes the GP-IB Expansion Unit (DPO 290):

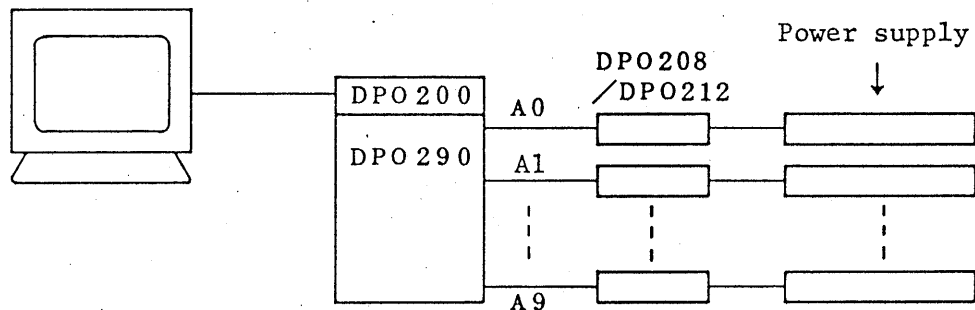


Figure 3-6

With this configuration up to 10 D/A converters can be controlled through one GP-IB bus connector.

-When the output voltage of the power supply is to be controlled.

"EA  K    VE" \*  
   subaddress ↑     └data┘

\*Single digit subaddress (0-9)

\*The subaddress is specified on the DPO 290 output connector and indicates the address of the D/A converter connected there.

-When the output current of the power supply, current of the electronic load, or frequency is to be controlled:

"EA  K    AE" \*                      \*Single digit subaddress (0-9)  
subaddress                       [data]

\* When connected to the DPO 208 the data range is 000-255;  
when connected to the DPO 212 the data range is 000-999.

\* "A", "K", "V", and "E" in CAPS. The "E" at the end of a word may be omitted.

DPO 200 Layout of terminals

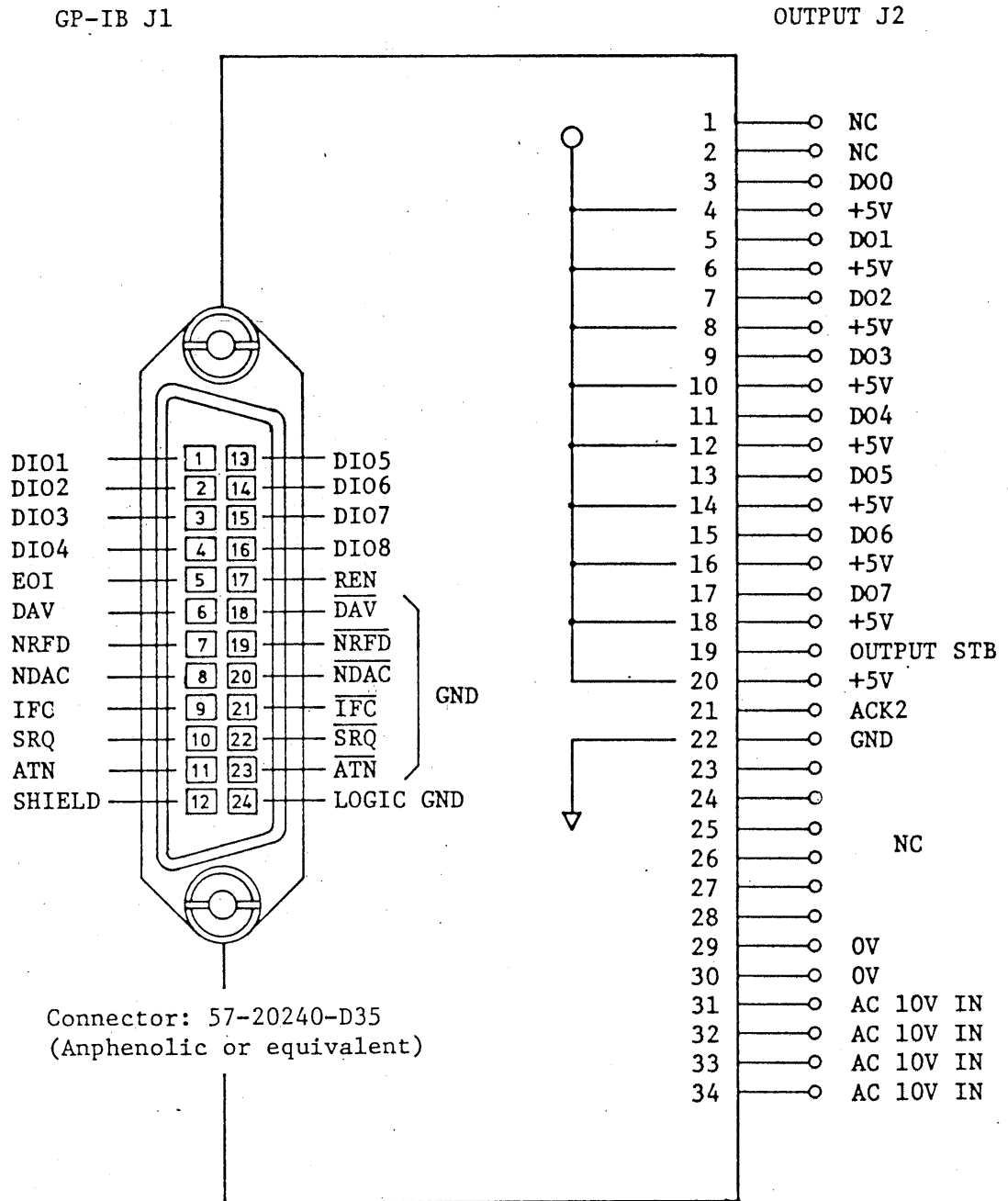


Figure 3-7

## SECTION 4: Sample Programs

### 4-1. Precaution For Programing

#### (1) Precautions Regarding Program Format (Interface Listener Format)

- a. Always enter the data in the format entry as a 3 digit integer as shown in Table 4-1. If the input does not consist of 3 digits, the output will not change. (Refer to program examples)

Desired Output Data	Required Input Data
0	000
9	009
99	099
255	255
999	999

Table 4-1

- b. When the input data exceeds the maximum value (maximum data value of the D/A converter), the output from the D/A converter will be zero.
  - c. If letters other than "E" in the format entry are mistakenly entered or omitted, the output will not change. (The letter "E" should be used when utilizing the DPO 290.)
- (2) Power Supply Rise Time and Fall Time

When the output voltage of the PAD-L series (DC stabilization power supply) is programmed externally using a device such as this unit and the D/A converter, the rise time of the D/A converter is approximately 1 ms, but the rise time of the PAD-L series is relatively slower, being 100-200 ms. Furthermore, the rise time will vary depending on the load conditions, but is usually slower, being approx. 200 ms. There is also a general tendency for these values to be higher as the load volume increases. In other words, even if high-speed external programming is attempted, one is limited by the

rise time and fall time characteristics of the power supply. Therefore, it is necessary to consider the rise time and fall time, and allow for sufficient waiting time when programming.

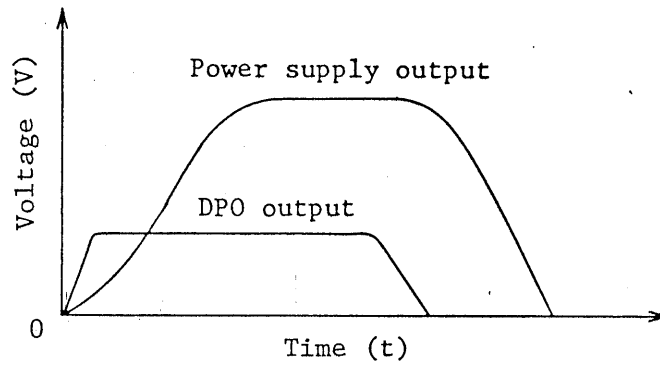


Figure 4-1

#### 4-2. Basic Program Example

-Method for programming data where the data required for output has already been calculated and the program is entered using that data:

A. To program the following combination:

DPO 200 + DPO 208 + PAD 35-10L

```
10 '**DPO200+DPO208+PAD35-10L **
20 '** Operations Program **
30 A$="000" : 'SET OUTPUT 0V
40 B$="255" : 'SET OUTPUT 35V
50 C$="127" : 'SET OUTPUT 17.5V
60 PRINT@8;"K"+A$+"V" ----- Print output
70 GOSUB 200
80 PRINT@8;"K"+B$+"V" ----- Print output
90 GOSUB 200
100 PRINT@8;"K"+C$+"V" ----- Print output
110 GOSUB 200
120 END
200 FOR A=0 TO 400 : NEXT A ----- Waiting time
210 RETURN
```

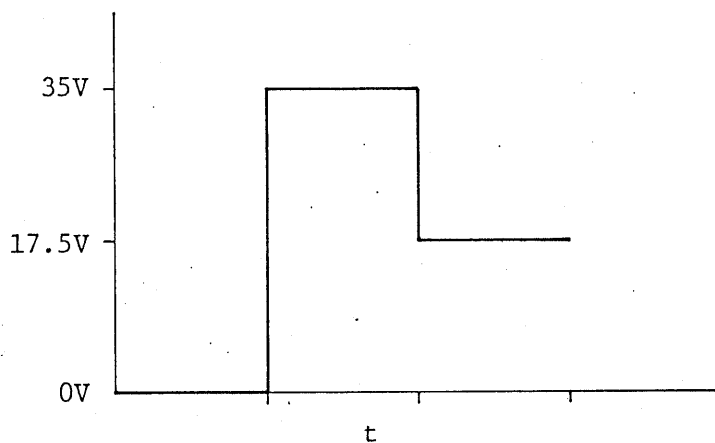


Figure 4-2

\* This program utilizes PC 8001 + PC 8011 and omits the IEEE initial settings (delimiter specifications, etc.)

B. Example of a program using the GP-IB expansion unit

To program the following combination:

DPO 200 + DPO 290 + DPO 208 3 + PAD 35-10L 3

```
10  '**DPO200+DPO290+DPO208×3+PAD35-10L**
20  '**      Operations Program **
30  A$="000"  :'OUTPUT  0V
40  B$="255"  :'OUTPUT  35V
50  C$="127"  :'OUTPUT  17.5V
60  PRINT@8;"EA0K"+A$+"VE"  ----- A0 Print output
70  GOSUB 200
80  PRINT@8;"EA2K"+B$+"VE"  ----- A2 Print output
90  GOSUB 200
100 PRINT@8;"EA3K"+C$+"VE"  ----- A3 Print output
110 GCSUB 200
120 END
200 FOR A=0 TO 400 :NEXT A  ----- Waiting time
210 RETURN
```

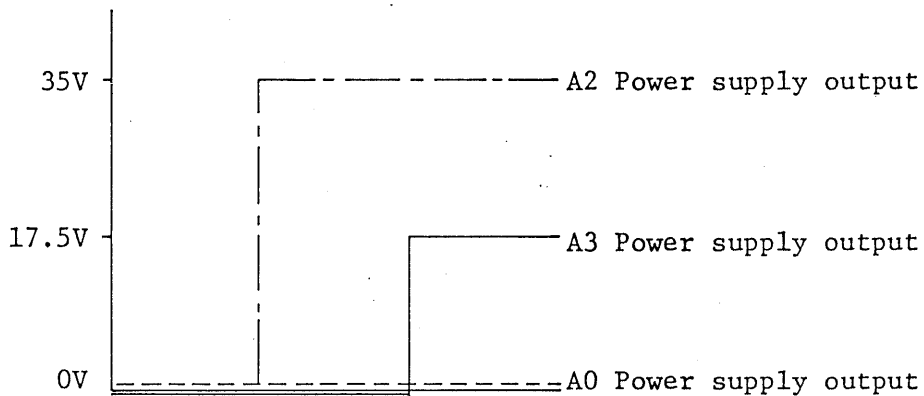


Figure 4-3

\* This program utilizes PC 8001 + PC 8011 (IEEE-488 ROM built-in) and omits the IEEE initial settings (delimiter specifications, etc.)



C. Example of an output data calculation program using the DPO 208.

```
10 INPUT "MAX OUTPUT ";A
20 INPUT "OUTPUT";C
30 E=INT(255/A×C+.5)
40 G=A×E/255
50 H=(G-C)/A×100
60 PRINT C;TAB(7);E;TAB(12);G;TAB(24);H ----- Output to display
70 LPRINT C;TAB(7);E;TAB(12);G;TAB(24);H ----- Output to printer
80 GOTO 20
```

Explanation of each variable:

- A: Maximum output voltage or current (maximum output when maximum data value is 255)
- C: Required output
- E: Data to be sought ----- 0-255
- G: Actual output (calculated value)
- H: Margin of error (%) with respect to maximum output

\* When utilizing the DPO 212, change 255 to 999 in lines 30 and 40 of the above program.

4-3. Applied Program Example

Utilizing PC 8001 + PC 8011 computers (IEEE-488 ROM built-in)

A. Formula to be included in program.

```

10 REM** MAX OUTPUT VOLTAGE=35.0V **
20 REM** 0V - 35.0V STEP 0.1V **
30 ISET IFC ← Clear interface
40 ISET REN ← Set remote ENABLE
50 CMD DELIM=0 ← Set delimiter to CR/LF
60 FOR X=0 TO 35 STEP .1
70 E=INT(X*255/35+.5)
80 IF E<=99 THEN E$="K0" +STR$(E)+"V"
90 IF E<=9 THEN E$="K00"+STR$(E)+"V"
100 IF E>=100 THEN E$="K" +STR$(E)+"V"
110 PRINT@7;E$
120 NEXT X
130 END

```

\* Print output (when the GP-IB address is set at 7)

\* Program to ensure 3 digits input

\* Formula

If the maximum voltage is 35V (maximum data value 255):

-The output voltage for each step is  $35/255 \approx 137$  (mV)

-Input data  $E = \text{INT}(X \times \frac{255}{35} + 0.5)X$  : desired voltage

In this case, the setting sensitivity of the output is approximately 0.4%. (DPO margin of error 0.2% together with the rounding error (1/2 · LSB))

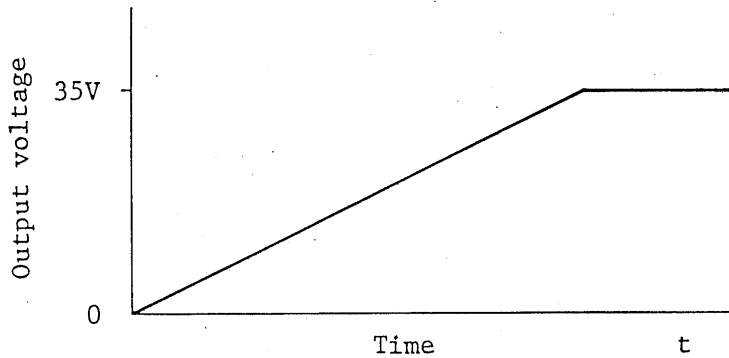


Figure 4-5

B. Set to the same output as the maximum data value.

```
10 REM** MAX OUTPUT VOLTAGE=25.5V **
20 REM** 0V -25.5V STEP 0.1V **
30 ISET IFC ← Clear interface
40 ISET REN ← Set REMOTE ENABLE
50 CMD DELIM=0 ← Set delimiter to CR/LF
60 FOR E=0 TO 255 STEP 1
70 IF E<=99 THEN E$="KO" +STR$(E)+"V" }
80 IF E<=9 THEN E$="KOO"+STR$(E)+"V" } Program to ensure
90 IF E>=100 THEN E$="K" +STR$(E)+"V" } 3 digits output
100 PRINT@7;E$
110 NEXT E
120 END
```

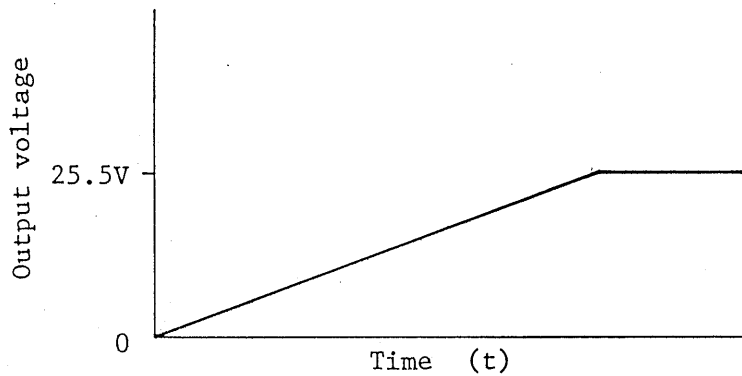
\* Print output

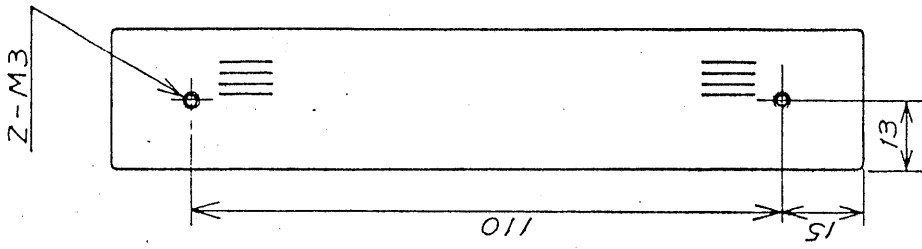
When using the DPO 208 (maximum data value 255):

- If the maximum is 2.55V(A), each step is 10 mV(mA)
- " 25.5V(A), " 100 mV(mA)
- " 255V(A), " 1 V(A)

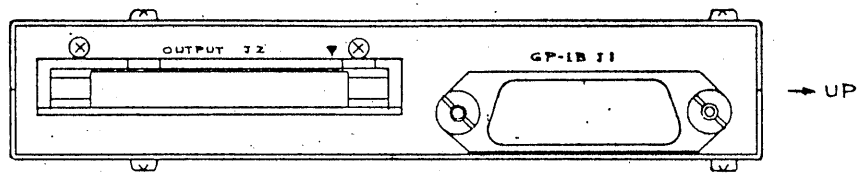
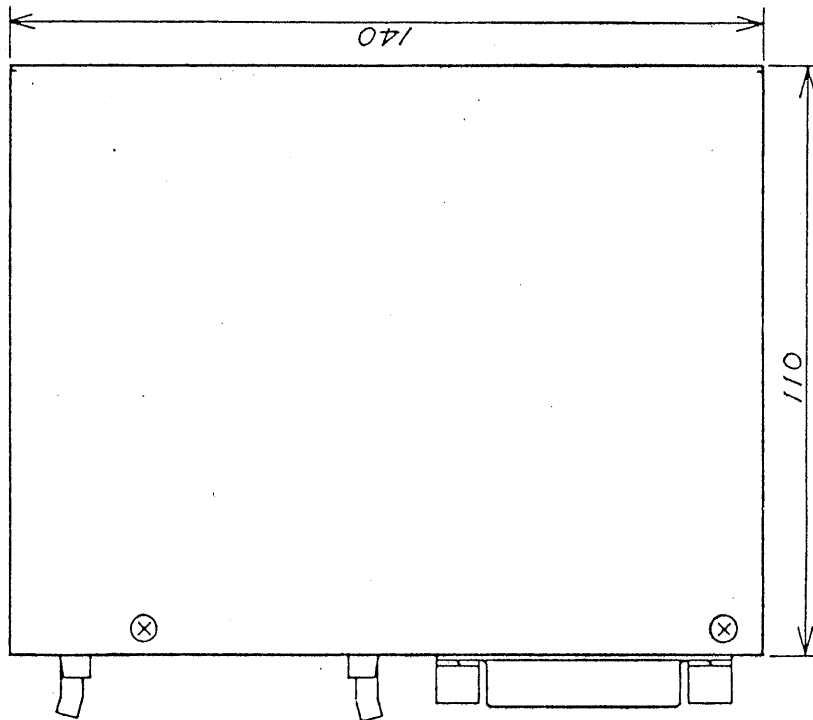
producing an easily understood program.

In this case, the setting sensitivity is 0.2%.





Unit : mm



DPO 200

Mechanical outline drawing