INSTRUCTION MANUAL

GP-IB EXPANSION UNIT

MODEL DPO 290

'82.7.6

KIKUSUI ELECTRONICS CORPORATION

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.

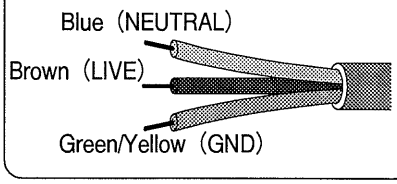
☐ AC power cable

The product is porvided 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.

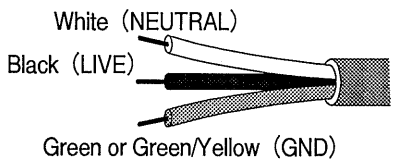
WARNING

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

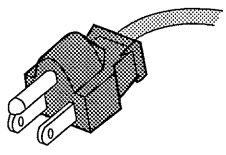
☐ Without a power plug



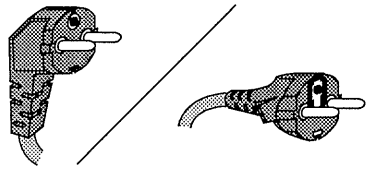
☐ Without a power plug



☐ Plugs for USA



☐ Plugs for Europe



☐ Provided by Kikusui agents

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

☐ Another Cable _____

 Kikusui Part No. Z9-000-027 IB001681

KIKUSUI

Table of Contents

SECTION 1: General

1-1. Description

The DPO 290 GP-IB expansion unit is one of the digital programming options in the Kikusui DPO series, and, when used with the DPO 200 (GP-IB interface), can be connected to the GP-IB bus, allowing control of up to 10 D/A converters with the GP-IB bus.

* Before operating this unit, please refer to the instruction manuals for the DPO 200, the D/A converter to be utilized, and the power supplies and electronic loads to be connected.

SECTION 2: Specifications

Specifications		
1. Input	Data	8 bit parallel, ASCII code, TTL level, negative logic
	Strobe	1 bit, TTL level negative logic
	Acknowledge	1 bit, TTL level negative logic
	Connector	34 pin flat cable connector (manufactured by KEL Co., Ltd. 6000-034-600-015AB)
2. Output (per one cannel)		10 channels
	Data	8 bit parallel, open collector, neg. logic
	Strobe	1 bit, open collector
	Acknowledge	1 bit, TTL level, negative logic
	Connector	34 pin flat cable connector (manufactured by KEL Co., Ltd. 6010-034-255)
3. Input Power Requirement		AC 100 V ±10% 50Hz/60Hz 1ϕ
4. Operating Ambient Temperature and Humidity Range		0°C - 40°C 10% - 90% RH
5. Insulation from Ground		DC 500 V, more than 30MΩ (case to terminal)
6. Dimensions		W 430mm × H 88mm × D 240mm (case dimensions)
7. Weight		Approx. 5.6kg
8. Accessories		DPO 200 installation hardware (packaging)
9. Other		Rack mount bracket (sold separately)

Table 2-1

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

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

(3) Transfer

Because connectors on the rear panel protrude, care must be exercised to prevent damage to them when transferring the unit.

3-2. Explanation of Controls and Connectors

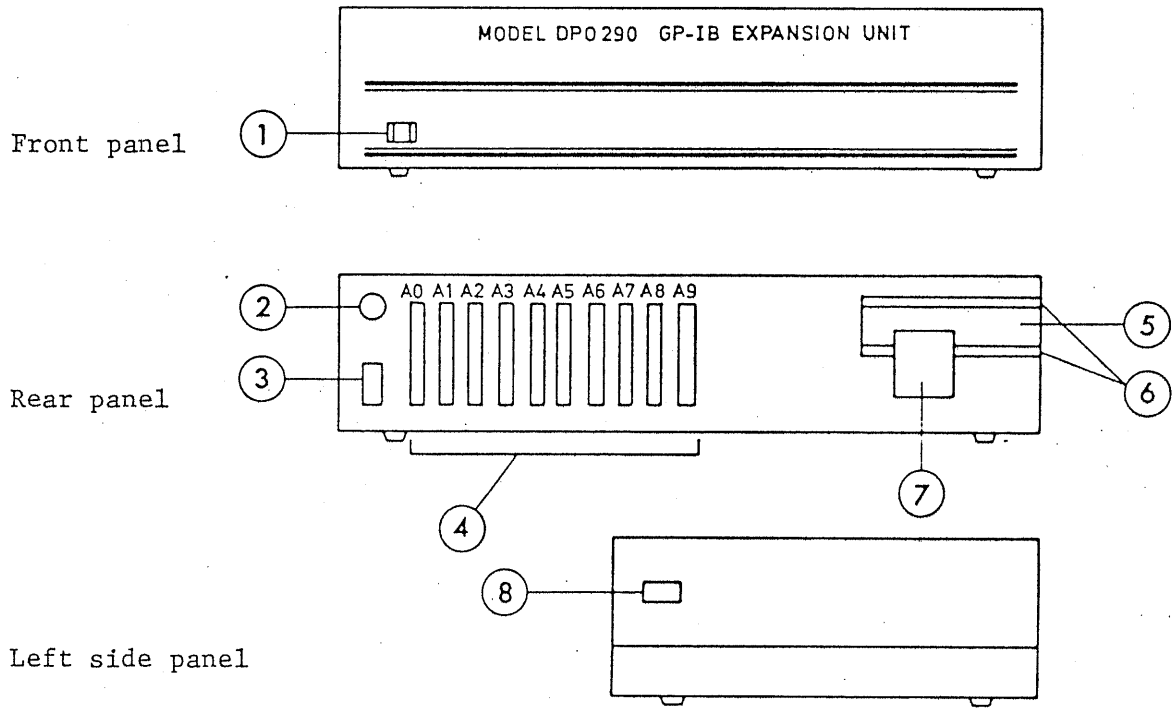


Figure 3-1

(1) Power Switch (POWER)

Push once for ON, once again for OFF.

(2) Fuse

Input power supply fuse. 2A

(3) Input Terminal

AC 100 V 50/60Hz is connected at the power supply input terminal. GND must be grounded for safety.

(4) Output Connector (OUTPUT)

D/A converters are connected at connectors A0 - A9 (Subaddress). Manufactured by KEL Co., Ltd. (6010-034-255).

(5) DPO 200 Installation Space

For installation of the DPO 200 (GP-IB interface). See Fig. 3-3 for installation method.

(6) Bracket

For use when the DPO 200 is to be installed in the unit. Detach before use. (See Fig. 3-3)

(7) Connecting Cable

For connection of the unit to the DPO 200.

(8) Address

For setting the address of the installed DPO 200, this is the window for the address setting switch.

3-3. Operating Method

(1) System Configuration

The basic system configuration is shown in Fig. 3-2.

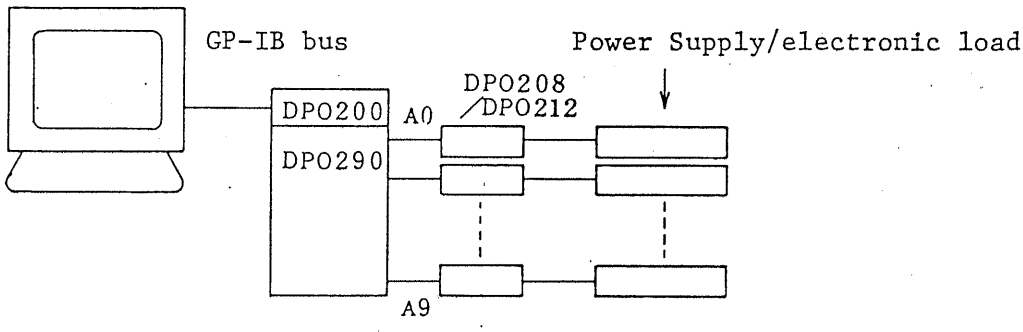


Figure 3-2

* With this system configuration, 10 D/A converters can be controlled by one GP-IB address.

(2) Method of Packaging the DPO 200 (GP-IB Interface) in the Unit

1. After removing the bracket, attach it to the DPO 200 and install the DPO 200 in the unit.
2. Connect the connecting cable to the DPO 200 OUTPUT J2

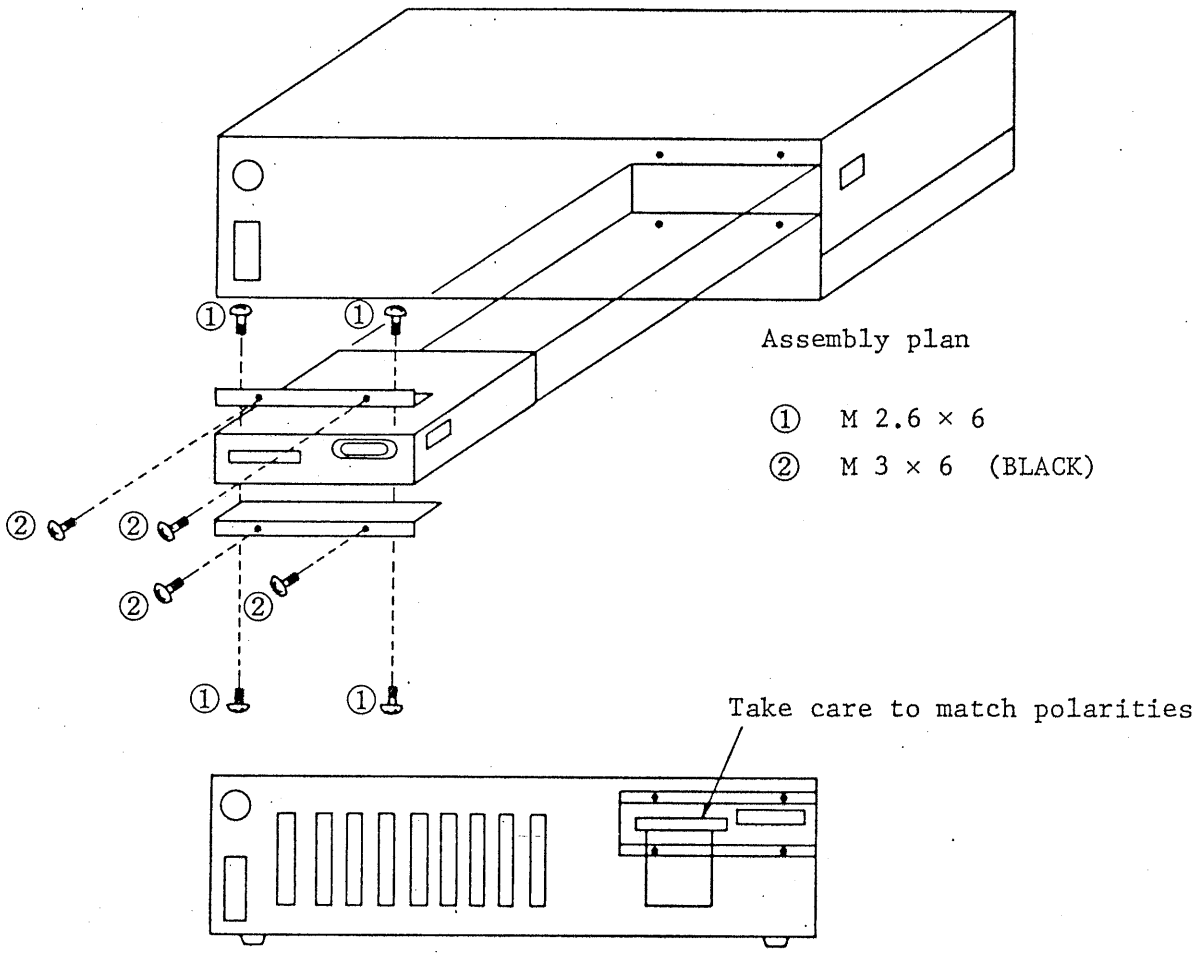


Figure 3-3

(3) Connection of the Unit to the DPO 208/DPO 212 (D/A Converter)

The output connector of this unit and the INPUT J1 of the D/A converter are connected by a 34 wire flat cable.*

* The output connectors of this unit are numbered A0 - A9 and the number of the connector which connects to the D/A converter becomes the subaddress of the D/A converter.

The ▼ mark on the output connector of this unit should correspond with the ▼ marks on the D/A converter and cable.

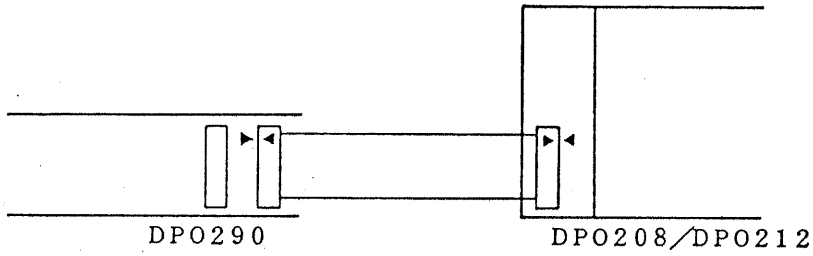


Figure 3-4

The wiring of the D/A converter output connector (OUTPUT J2) is as shown in Fig. 3-5.

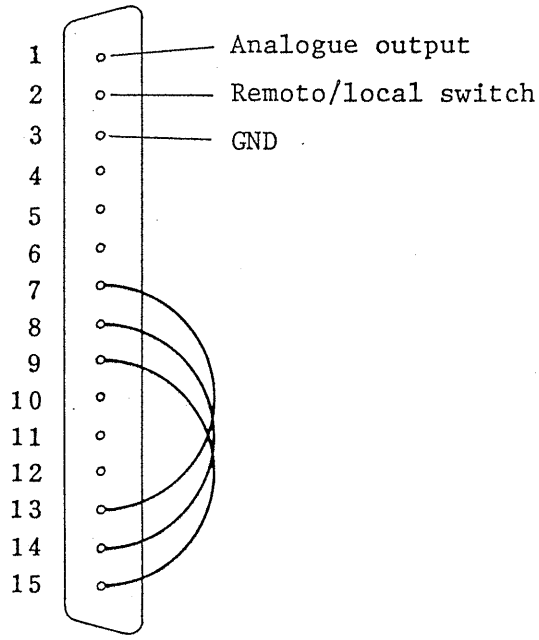
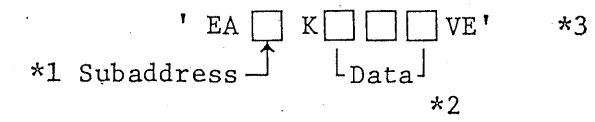


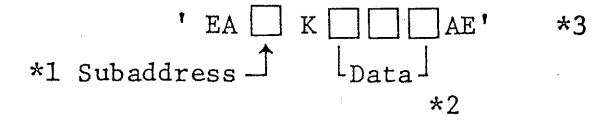
Figure 3-5

(4) Listener Format

When the power supply output voltage is to be controlled.



When the current is to be controlled (output current of the power supply, current of the electronic load, or frequency of A.C. power supply).



*1 Subaddress is from 0 - 9 (single digit)
The subaddress is shown on the DPO 290 output connector, and indicates the address of the D/A converter connected there.

*2 Data range: 000 - 255 when the DPO 208 is connected,
000 - 999 when the DPO 212 is connected (3 digit integer)

*3 "A", "K", "V", and "E" in CAPS.
The delimiter is (CR) or (CR) / (LE).
The "E" at the end of a word may be omitted.

SECTION 4: Sample Programs

4-1. Precaution for Program

(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.

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 of the D/A converter will be zero.

c. If the letters of the format statement are incorrectly entered, an erroneous operation may occur.

(2) Power Supply Rise Time and Fall Time

When the output voltage of the PAD-L series (Regulated DC 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.

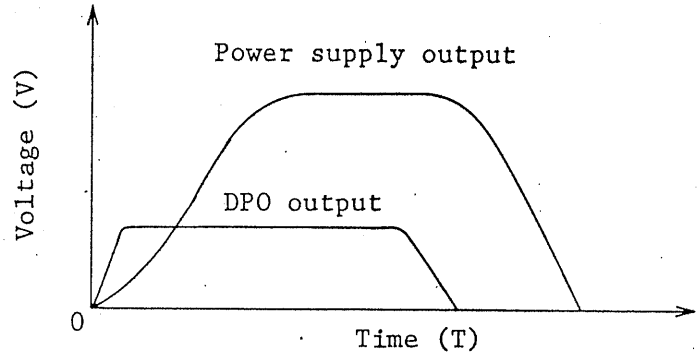


Figure 4-1

4-2. Basic Program Example

Method for programming data where the data required for outpu already been calculated and the program is entered using that

a. 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 Output statement
70  GOSUB 200
80  PRINT@8;"EA2K"+B$+"VE"    ------------ A2 Output statement
90  GOSUB 200
100 PRINT@8;"EA3K"+C$+"VE"    ------------ A3 Output statement
110 GOSUB 200
120 END
200 FOR A=0 TO 400 :NEXT A    ------------ Waiting time
210 RETURN
```

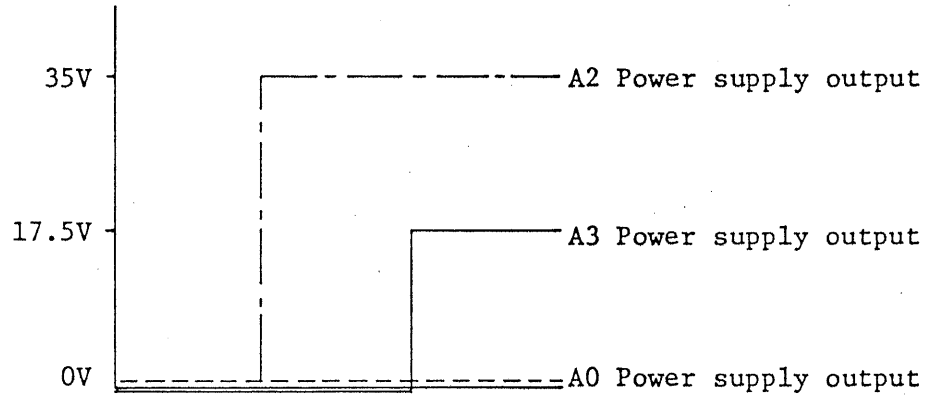


Figure 4-2

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

b. When data is to be transfered at the same time:

```
10  '**DPO200+DPO290+DPO208×3+PAD35-10L×3**
20        Operations Program **
30  PRINT@8;"EA023K000VE"
40  GOSUB 200
50  PRINT@8;"EA023K255VE"
60  GOSUB 200
70  PRINT@8;"EA023K127VE"
80  GOSUB 200
90  END
200 FOR A=0 TO 400 :NEXT A
210 RETURN
```

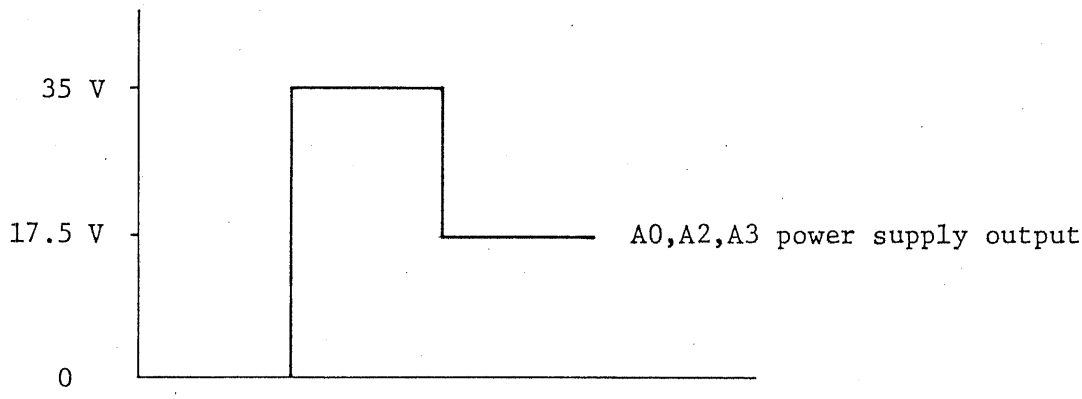


Figure 4-3

* As in the above program example, data can be transfered to each D/A converter by successively writing the subaddress.
* Up to 10 converters can be assigned at the same time.

4-3. Applied Program Example

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

A. Programming the A1 D/A converter, and entering a formula.

```
10  REM** MAX OUTPUT VOLTAGE=35.0V **
20  REM** 0V - 35.5V 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 X=0 TO 35 STEP .1
70  E=INT(X×255/35+.5)
80  IF E<=99  THEN E$="EA1K0" +STR$(E)+"VE"
90  IF E<=9   THEN E$="EA1K00"+STR$(E)+"VE"
100 IF E>=100 THEN E$="EA1K"  +STR$(E)+"VE"
110 PRINT@7;E$
120 NEXT X
130 END
```

* Output statement (when the GP-IB address is set at 7)

* Program to ensure 3 digit input

* Formula

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

-The output voltage for each step is 35/255=137 (mV)

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

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

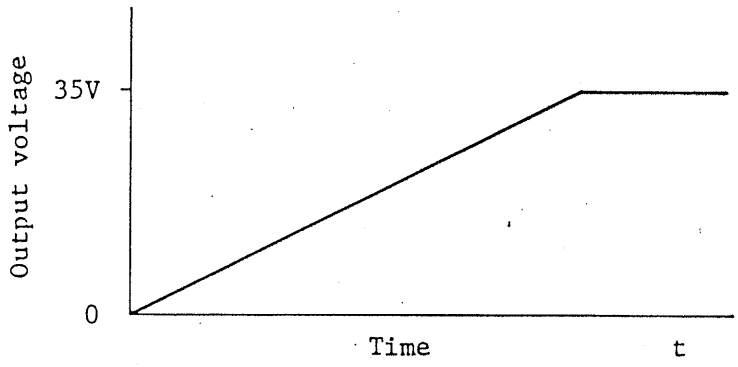


Figure 4-4

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
40  ISET REN
50  CMD DELIM=0
60  FOR E=0 TO 255 STEP 1
70  IF E<=99  THEN E$="EA1K0" +STR$(E)+"EV"
80  IF E<=9   THEN E$="EA1K00"+STR$(E)+"EV"
90  IF E>=100 THEN E$="EA1K"  +STR$(E)+"EV"
100 PRINT@7;E$
110 NEXT E
120 END
```

Program to ensure 3 digit input

* Output statement

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(mA)

producing an easily understood program.

In this case, the setting accuracy is 0.2%

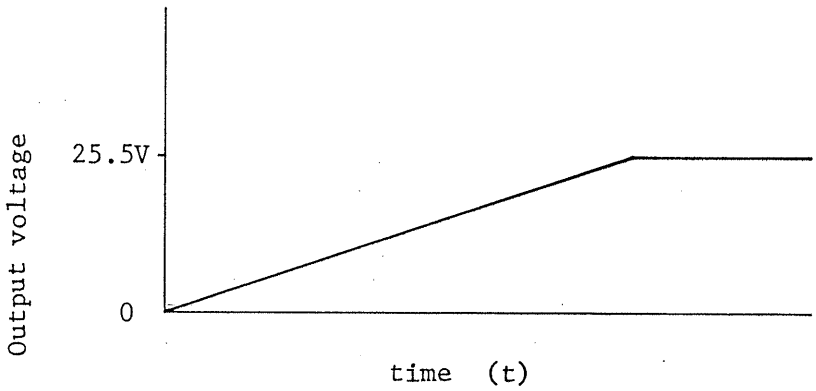


Figure 4-5

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)

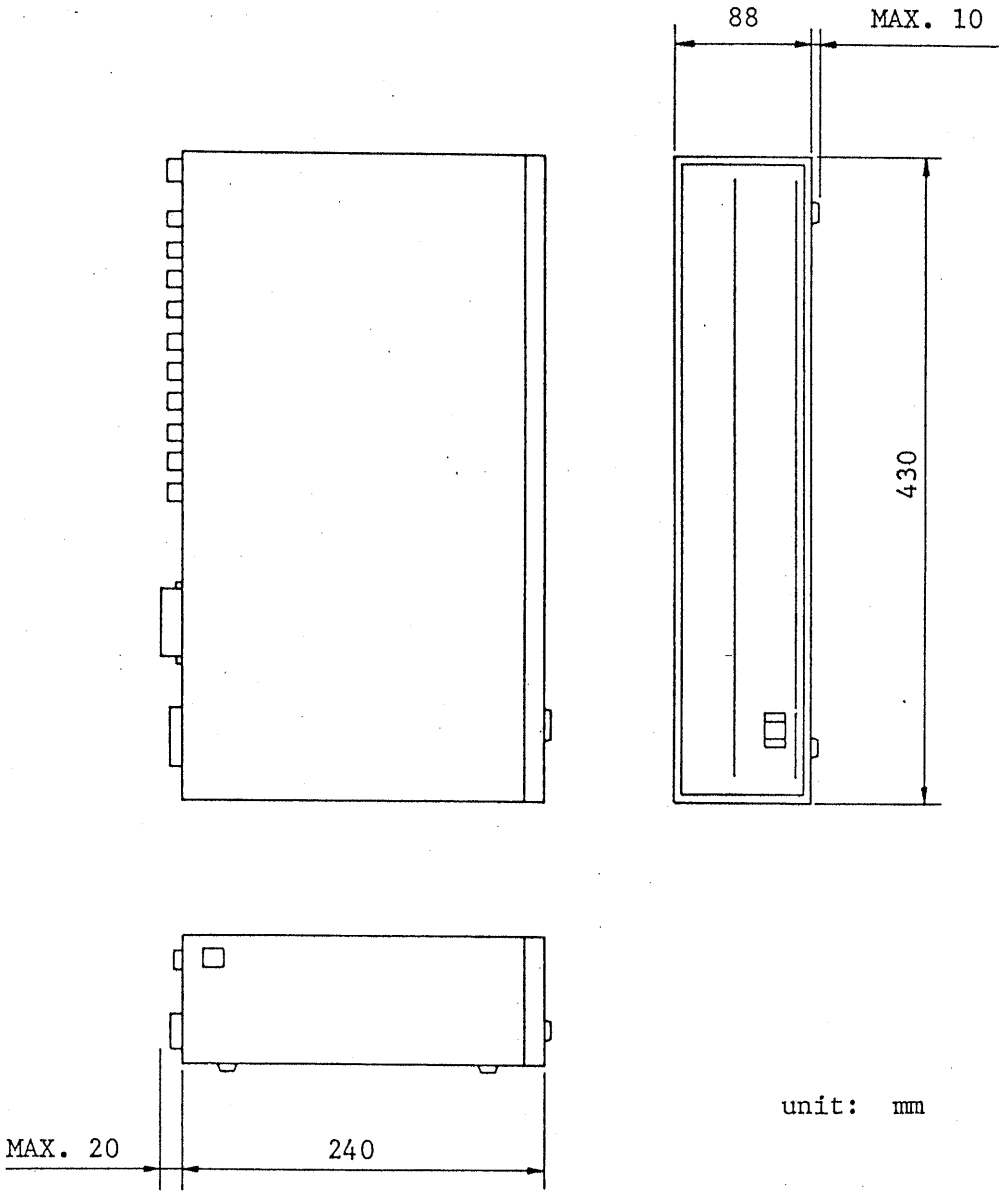
C: Required output

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.



unit: mm

Mechanical Outline Drawing