INSTRUCTION MANUAL

D/A CONVERTER

MODEL DPO212A

KIKUSUI ELECTRONICS CORPORATION

TABLE OF CONTENTS

SECTION 1. GENERAL

1-1. Description

Model DPO212A D/A Converter is one of Kikusui's DPO Series Digital
Programming Options. It is capable of digitally controlling both
voltage and frequency of the output of a Kikusui's regulated DC
power supply by converting into an analog signal the digital signal
which is received through a GP-IB interface.

The input and output of the Converter are mutually isolated and the
Converter can be conveniently used for system expansion with a
computer.

*: The Converter normally is used in conjunction with Model DPO200
    GP-IB Interface Unit or Model DPO290 GP-IB Expansion Unit. When
    using the Converter, please be sure to use the instruction
    manual for the unit used in conjunction.

*: This instruction manual explains the operation method of the
    Converter primarily for the case it is used in conjunction with
    the PAD-L Series Regulated DC Power Supply. When using the
    Converter with other instruments, refer to the instruction
    manuals for respective instruments.

- 1 -

SECTION 2. SPECIFICATIONS

Item		Specification	
Model		DPO212A	
1. Input	Input signal	ASCII Codes (8-bit parallel)	
	Input system	30-mA current loop (34-wire flat cable connector)	
	Logic	Negative logic (negative when current flows)	
2. Control signals		Strobe: 1 bit (30-mA current loop, negative logic) Acknowledge: 1 bit (open collector, negative logic, TTL level)	
3. Output		Voltage output	Current output
	Output voltage	10 V or 9 V nominal (*1)	−
	Output current	−	1 mA or 0.5 mA nominal (*1)
	Resolution	0.1% (*4)	0.1% (*5)
	Accuracy	0.05% (*4)	0.05% (*5)
	Output ripples	50 μV (0 − 500 kHz)	0.5 μA
	Line regulation (*2)	0.005% + 1 mV	0.005% + 0.01 μA
	Load regulation (*3)	0.005% + 1 mV	0.005% + 0.01 μA
	Temperature coefficient	500 ppm/°C typical	50 ppm/°C typical
	Maximum output current	2 mA	−
	Maximum output voltage	−	2 V
4. Optional function		Remote/Local selecting function	
5. Input power		10 V ±10%, AC. center tapped	
6. Ambient temperature and humidity		0 to 40°C (32 to 104°F), 10% − 90% RH	

Item	Specification
7. Isolation between input and output	500 V AC, 1 minute
8. Insulation resistance between input/output and case	30 MΩ (with 500 V AC)
9. Dimensions (case)	140 W × 26 H × 125 D mm (5.51 W × 1.02 H × 4.92 D in.)
10. Weight	Approx.
11. Accessory	20-pin output connector

*1: When input data is maximum. The converter is delivered being set for the voltage of the instrument to be used in conjunction.

*2: For ±10% change of line voltage.

*3: For 0% - 100% change of load.

*4: For the maximum output voltage (the output voltage when the data is maximum).

*5: For the maximum output current (the output current when the data is maximum).

SECTION 3. OPERATION METHOD

3-1. General Precautions

   (1) Ambient Temperature

      o The ambient temperature range to satisfy the specification
performances is 0 to 40°C (32 to 104°F). Please operate the
instrument within this temperature range. Note that the lives
of semiconductor devices are adversely affected by high tempera-
ture. (Typically, there are exponential relationships between
the lives and temperature.)

   (2) Place of Installation

      o The Converter may be used being installed on the back of a PAD-L
Series instrument. In such a case, allow a clearance of 20 cm
(7.9 in.) or over between the Converter and the wall so that hot
air coming out of the ventilation fan outlet does not remain
stagnant around the Converter. Do not place near the instrument
any objects which are not heat resistant.

DPO   WALL

20 cm   (TOP VIEW)
OR
OVER

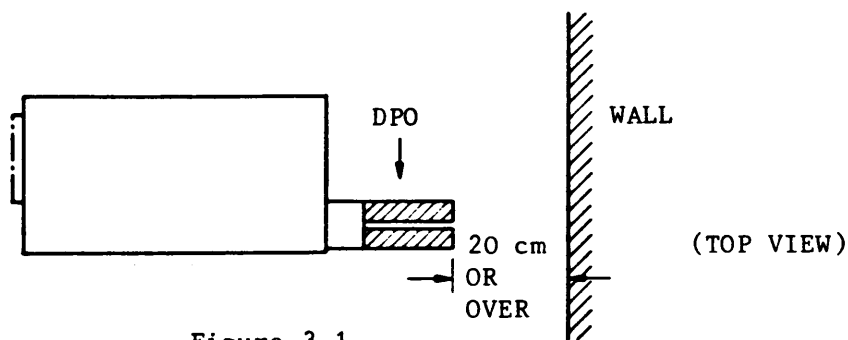Figure 3-1

     * Note that the mounting position of the Converter may
differ by instruments.

      o Avoid using the Converter in a highly humid or dusty atmosphere
since such will cause troubles.

      o Install the instruments in a place reasonably free from vibration.

(3) Note for Moving the Instruments

The Converter can be moved in the state that it is installed on the back of a PAD-L Series instrument. Exercise care, however, when moving the instruments so that the Converter which is extruded out from the back of the PAD-L Series instrument is not hit against other objects.

3-2. Description of Panel Items
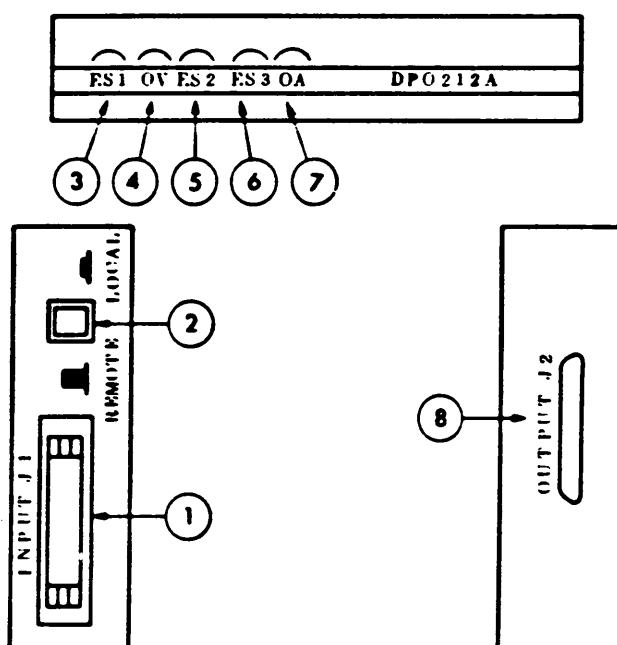
Figure 3-2

① Input connector J1 (INPUT J1):

To connect the output of DPO200 GP-IB Interface Unit or DPO290 GP-IB Expansion Unit, using a 34-wire flat cable connector (Type 6010-034-255 manufactured by KEL Co.). (For pin layout, see Figure 3-11.)

② Remote/local selector switch (REMOTE/LOCAL):

The pushbutton switch for selection between REMOTE and LOCAL mode. The pushed-up state is for the REMOTE mode and the pushed-in state is for the LOCAL mode. When output connector ⑧ is connected to the power supply and the switch is set to

the REMOTE state, the output of the Converter is connected to
the power supply and the output of the power supply can be
controlled with the digital input of the Converter. When the
switch is set to the LOCAL state, the power supply can be cont-
rolled with its front panel controls.

③ Full-scale voltage control potentiometer I (FS1):

For fine adjustment of the output voltage for 10-V output or
9-V output. (When the instrument is shipped from the factory,
it is set for the 10-V output or 9-V output.)

④ Offset voltage control potentiometer (OV):

To adjust the offset voltage in conjunction with ③.

⑤ Full-scale current control potentiometer II (FS2):

For fine adjustment of the output current for 1-mA output.
This control remains ineffective when in the 0.5-mA output.
(When the instrument is shipped from the factory, it is set
for the 1-mA or 0.5-mA output.)

⑥ Full-scale current control potentiometer III (FS3):

For fine adjustment of the output current for 0.5-mA output.
This control remains ineffective when in the 1-mA output.
(When the instrument is shipped from the factory, it is set
for the 1-mA or 0.5-mA output.)

⑦ Offset current control potentiometer (OA):

This control is used for fine adjustment of offset current,
in conjunction with 5 and 6 .

⑧ Output connector J2 (OUTPUT J2):

The 20-pin output connector for connection to the power supply.
The connector has REMOTE/LOCAL selector terminals, Interface
power and D/A Converter input terminals, etc. (See Figure 3-4.)

3-3. Operation Method

(1) Connection Between Converter and DPO200/DPO290

o For connection between the Converter and a DPO instrument, use a 34-wire flat cable. For the DPO200, a 7-cm-long (2.7-in-long) flat cable is supplied as a standard accessory. When a longer cable is needed for the DPO290, cables of up to 50 m (164 ft) are available as options.

o Be sure to let coincide the Δ mark of the input connector J1 (INPUT J1) with that of the output connector of the instrument to be connected and that of the cable to be connected.
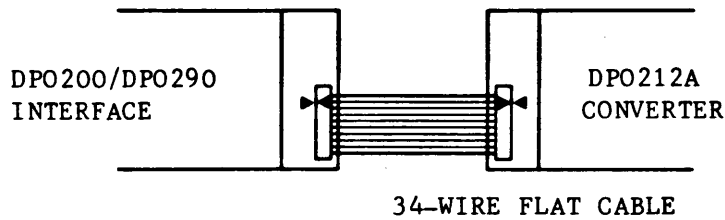

34-WIRE FLAT CABLE

Figure 3-3

o Allow a stabilization period of approximately 30 minutes to let the output stabilize after turning on the instrument power.

(2) Connection Between Output Connector (OUTPUT J2) and Power
    Supply

The Converter is connected to the power supply at the factory
before shipment. For your information, the connections are as
follows:

```
  1 | · |←  CURRENT OUTPUT TERMINAL
  2 | · |←  REMOTE/LOCAL SELECTOR TERMINAL A
  3 | · |←  VOLTAGE OUTPUT TERMINAL
  4 | · |←  REMOTE/LOCAL SELECTOR TERMINAL B
  5 | · |←  REMOTE/LOCAL SELECTOR TERMINAL C
  6 | · |
  7 | · |
  8 | · |
  9 | · |←  10 V AC  ⎫   POWER INPUT TERMINALS FOR
 10 | · |←  0 V       ⎬   DPO212A
 11 | · |←  10 V AC  ⎭
 12 | · |
 13 | · |
 14 | · |←  10 V AC  ⎫   POWER INPUT TERMINALS FOR
 15 | · |←  0 V       ⎬   DPO200
 16 | · |←  10 V AC  ⎭
 17 | · |
 18 | · |
 19 | · |
 20 | · |
```
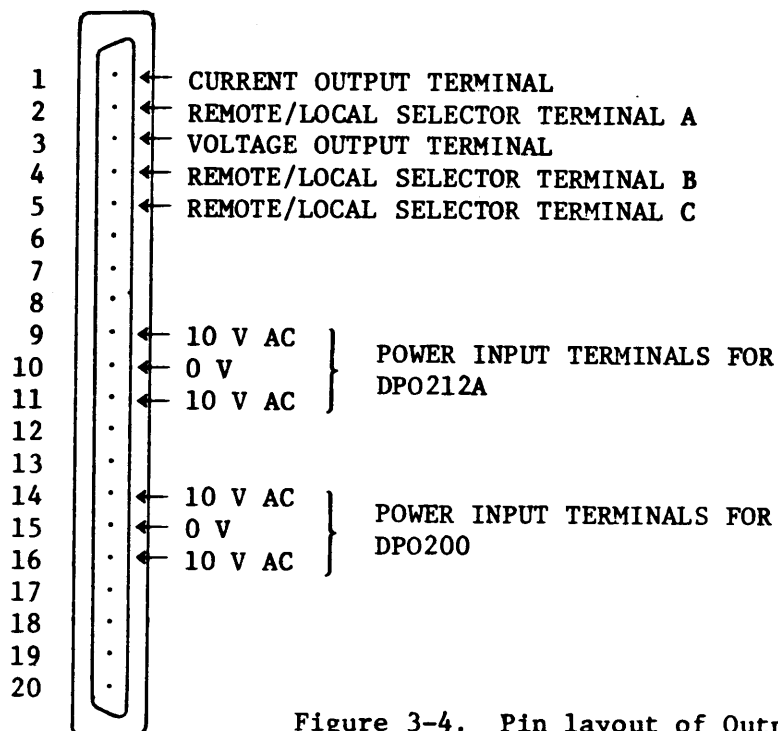
Figure 3-4. Pin layout of Output Connector J2

o Current output terminal:

This terminal is for the analog output current converted from the
digital signal. It is used to control the output current of the
power supply.

The operating principle is as shown in Figure 3-5. A constant
current is fed to the constant-current control (potentiometer) on
the front panel. The voltage developed accross the potentiometer
is used as a reference for the output current.

For details of connections to the power supply, refer to the
instruction manual of the power supply. (See Figure 3-8.)

CONSTANT CURRENT
CONTROL POTENTIOMETER

DETECTING
RESISTOR

DPO212A
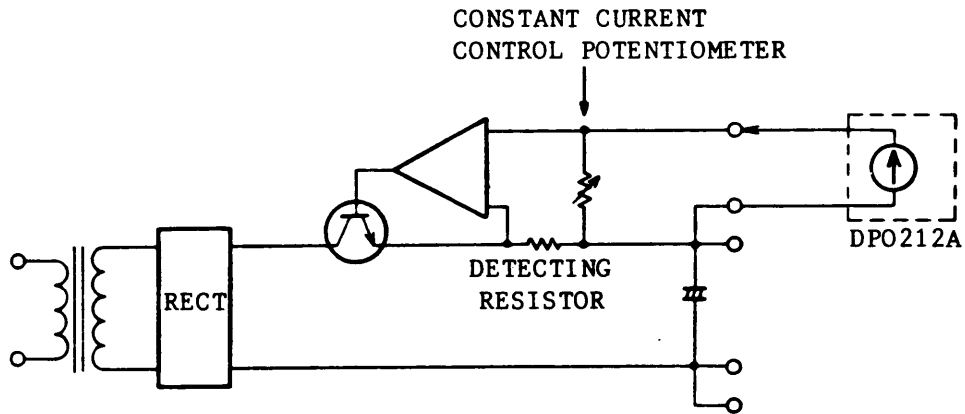
Figure 3-5

o Voltage output terminal:

This terminal is for the analog output voltage converted from the
digital signal. It is used to control the output voltage of the
power supply. Connect it as described in "Remote Control of
Output Voltage by Voltage Signal" of the instruction manual for
the power supply.

o GND terminal:

The common terminal for both current output terminal and voltage
output terminal. To be connected to the +S terminal of the power
supply.

o REMOTE/LOCAL selector terminals:

The output circuit of the Converter is as shown in Figure 3-6.
The circuitry of the power supply for connection with the Converter
may be modified as required at the factory before shipment.

- 9 -

DPO212A - - - - - - -┐

```
                         ○→  (REMOTE/LOCAL SELECTOR
                               TERMINAL A)

                         ○→  (VOLTAGE OUTPUT TERMINAL)

                         ┌┐ LOCAL ←→ REMOTE

                         ○→  (REMOTE/LOCAL SELECTOR TERMINAL B)
                         ○→  (REMOTE/LOCAL SELECTOR TERMINAL C)
                         ○→  (CURRENT OUTPUT TERMINAL)
```

VOLTAGE OUTPUT
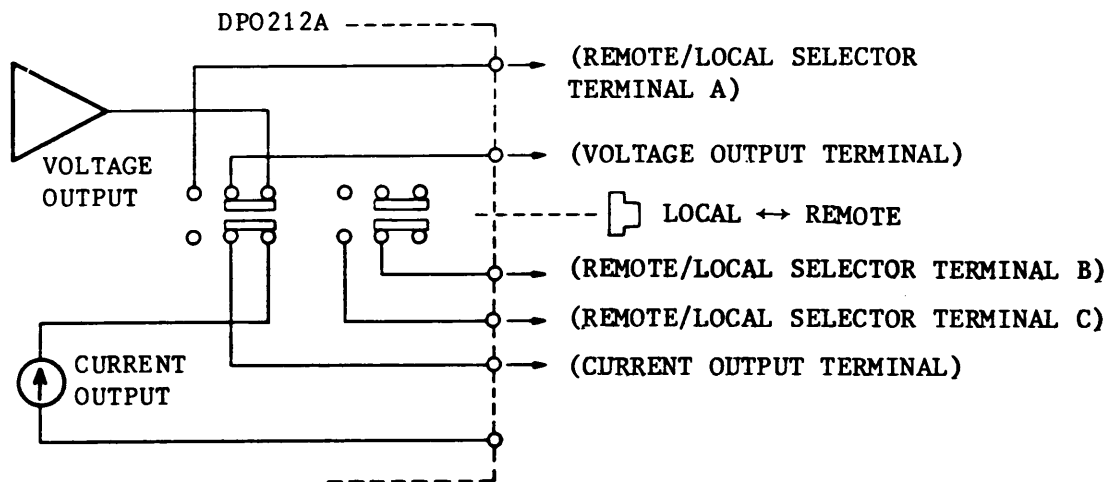
CURRENT OUTPUT

Figure 3-6

Terminal A is connected in parallel with the selector switch of "Control of Output Current with Voltage Signal" of the instruction manual for the power supply. The functions of the two provisions are identical. When the Converter is connected, switching by the selector switch of the power supply is not needed.

The terminals B and C are connected to the terminals of the opposite side of the voltage input terminals from which the jumper is disconnected as mentioned in "Control of Output Voltage by Voltage Signal" of the instruction manual for the power supply. That is, the same function as connecting/disconnecting the jumper can be accomplished with the remote/local selector switch.

o Power input terminals:

The Converter has two set of power input
terminal: One is for the Converter itself
and the other is for the DPO200 GP-IB
Interface Unit. Both are for 10 V AC,
center tapped, 300 mA.

The power is supplied from the PAD-L
Series instrument main unit, power unit,
or DPO290.

When the DPO290 is used, power for the
DPO212A is supplied from the DPO290. For
this setup, make connections as shown in
the following.

Figure 3-7

REAR TERMINAL
BOARD OF PAD-L
SERIES TYPE I_2

NOTE 1

TO
INTERNAL
PCB

DPO212A

12
11
10
9
8
7
6
5
+S
+
-S
-

NOTE 1   NOTE 2

TO
INTERNAL
WIRING
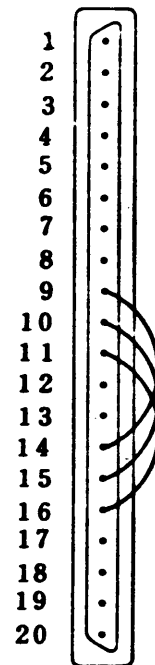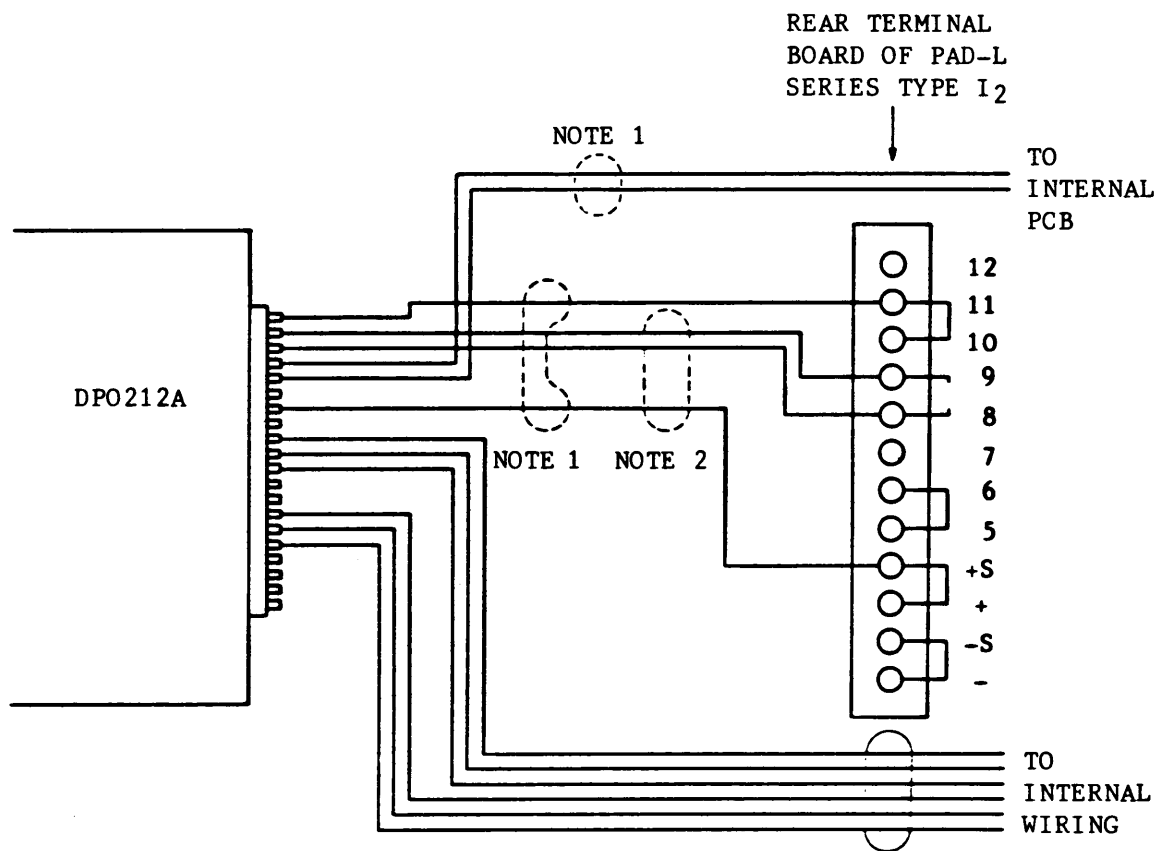
Note 1: Use a 2-conductor shielded cable. Connect the shielding
wire to the +S terminal of power supply.

Note 2: Use a 3-conductor shielded cable. Connect the shielding
wire to the +S terminal of power supply.

Figure 3-8. Example of connections between the
Converter and the PAD-L Series,
Type I_2.

(3) Basic Listener Formats

The Converter is capable of controlling both output voltage and current of a regulated DC power supply. Therefore, data for both voltage control and current control must be fed to the Converter.

A. For system structured by using Converter and DPO208 or DPO212
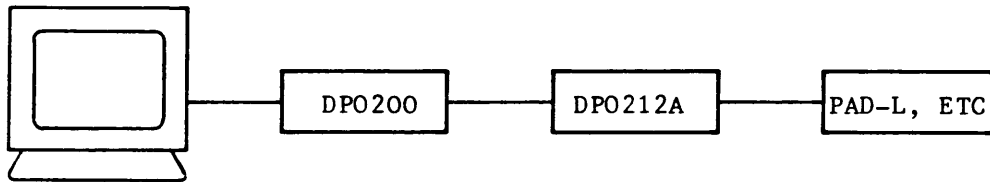
Figure 3-9

o For voltage control *1 (To control the output voltage of power supply)

```
"K☐☐☐V"
  └Data┘
```

o For current control *1 (To control the output current of power supply)

```
"K ☐☐☐A"
   └Data┘
```

*1: o For data, use a 3-digit number of 000 - 999.

o For delimiter, use (CR) or (CR)/(LF). Be sure to send (CR) or (CR)/(LF) delimiters from the computer.

*: Write K, A, and V in the upper-case letters.

B. For system structured by using GP-IB Expansion Unit

Figure 3-10

*: With this system structure, up to ten
units of Converters can be controlled
through a single connector of GP-IB bus.

o To control the output voltage of power supply

"EA□K□□□VE" *
Subaddress↑ ⌊Data⌋

* For subaddress, use a number of 0 - 9.

* The subaddress for each instrument is indicated
on the output connector of the DPO290. The
address number denotes that of the corresponding
Converter connected.

o To control the output current of power supply

"EA□K□□□AE" *
Subaddress↑ ⌊Data⌋

* For subaddress, use a number of 0 - 9.

* For data, use a 3-digit number of 000 - 999.

Write characters A, K, V, and E in the upper-case
letters. Character E at the end may be omitted.

(4) Offset Adjustment

The Converter is adjusted so that the output voltage and current
is zero when the input data is zero. For fine zero adjustment,
use the offset voltage control potentiometer for constant-voltage
output or the offset current control potentiometer for constant-
current output. (See Figure 3-2.)

(5) Full-scale Output Adjustment

The Converter is adjusted so that the full-scale output voltage
or current of the power supply as required by the customer is
delivered. For fine full-scale-value adjustment, use the full-
scale voltage control potentiometer I for constant-voltage output,
and the full-scale current control potentiometer II or the full-
scale control potentiometer III for constant current control.
(See Figure 3-2.)

LAYOUT OF TERMINAL PINS

INPUT J1   OUTPUT J2

▶ NC	1			1	CURRENT OUT
NC	2			2	REMOTE/LOCAL A
DI0	3			3	VOLTAGE OUT
(LSB) +5V	4			4	REMOTE/LOCAL B
DI1	5			5	REMOTE/LOCAL C
+5V	6			6	NC
DI2	7			7	GND
+5V	8			8	NC
DI3	9			9	AC 10V IN
+5V	10			10	0V
DI4	11			11	AC 10V IN
+5V	12			12	NC
DI5	13			13	NC
+5V	14			14	AC 10V IN
DI6	15			15	0V
+5V	16			16	AC 10V IN
(MSB) DI7	17			17	NC
+5V	18			18	NC
STB	19			19	NC
+5V	20			20	NC
ACK	21				
GND	22				
NC {	23				
	24				
	25				
	26				
	27				
	28				
0V	29				
0V	30				
AC 10V OUT	31				
AC 10V OUT	32				
AC 10V OUT	33				
AC 10V OUT	34				

Abbreviated front
view of 34-pin
connector

•33   • •3 •1
•34   • •4 •2

▼ mark denotes Pin No. 1

Figure 3-11

MECHANICAL OUTLINE DRAWING