WARRANTY

Tektronix warrants that this product will be free from detects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; or c) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

THIS WARRANTY IS GIVEN BY TEKTRONIX WITH RESPECT TO THIS PRODUCT IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX' RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

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This instruction manual contains the following sections:

- Before You Begin introduces the PS281/282 Power Supply and provides safety information. It also provides instructions for replacing the fuse and using the correct line voltage setting.
- At A Glance provides a full description of the PS281/282 and its controls.
- Operations In Detail provides step-by-step procedures for using advanced PS281/282 functions.
- Troubleshooting helps solve common problems you may encounter. It also provides information on how to send your instrument to Tektronix for servicing.
- Specifications contains specifications for the PS281/282.
- Accessories describes the standard and optional accessories available for the PS281/282.

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This section contains descriptive and safety information you should know before using your PS281/282.

About the Power Supply

The Tektronix PS281/282 is a 90 W, single output, DC power supply with a 3.5-digit digital readout. The PS281 can produce up to a 30 V, 3 A signal. The PS282 can produce up to 18 V and 5 A. Both power supplies have the following features.

- adjustable voltage and current limits
- overload and overvoltage protections
- constant voltage/constant current operation
- serial or parallel hookup to other PS281/282 power supplies
- remote control of either voltage or current output

The instrument comes with a power cord and an instruction manual.

NOTE

The only difference between the PS281 and 282 power supplies is that the PS281 output is rated up to 30 V and 3 A, while the PS282 output is rated up to 18 V and 5 A. This affects the fuse ratings as well. In all other respects, the two power supplies are identical.

If you need more information about your Tektronix PS281/282 DC Power Supply or other Tektronix products, contact the nearest Tektronix sales office or distributor, consult the Tektronix product catalog, or, in the U. S., call the Tektronix National Marketing Center toll-free at 1–800–426–2200.

Safety

You may be eager to begin using your Tektronix PS281/282, but please take a moment to review these safety precautions. We provide them to protect both you and the instrument. This safety information applies to all operators and service personnel.

Symbols and Terms

These two terms appear in manuals:

- statements identify conditions or practices that could result in damage to equipment.
- warning statements identify conditions or practices that could result in personal injury or loss of life.

These two terms appear on equipment:

- CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking or a hazard to property including the equipment itself.
- DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

This symbol appears in manuals:



Static-Sensitive Devices

These symbols appear on equipment:



DANGER High Voltage



Protective Ground (Earth) Terminal



ATTENTION Refer to manual

REV APR 1992

Specific Precautions

Observe all of these precautions to ensure your personal safety and to prevent damage to the PS281/282 or connected equipment.

Power Source—The PS281/282 power source must not apply more than 250 V rms between the supply conductors or between either supply conductor and ground. A protective ground connection, through the grounding conductor in the power cord, is essential for safe system operation.

Ventilation—The PS281/282 needs proper ventilation space to operate. Provide at least 10 cm of space between the instrument and the wall to ensure good ventilation.

Grounding the Power Supply—The PS281/282 is grounded through the power cord. To avoid electric shock, plug the power cord into a properly wired receptacle where a qualified service person has verified earth ground. Do this before making connections to the input terminals of the PS281/282.

Without the protective ground connection, all parts of the PS281/282 are potential shock hazards. This includes knobs and controls that may appear to be insulators.

Use the Proper Power Cord—Use only the power cord and connector specified for your product. Use only a power cord that is in good condition.

Use the Proper Fuse—To avoid fire hazard, use only the fuse specified for your product or one that is identical in type, voltage rating, and current rating.

Do Not Remove Covers or Panels—To avoid personal injury, do not operate the PS281/282 without the panels or covers.

Do Not Operate in Explosive Atmospheres—The PS281/282 provides no explosion protection from static discharges or arcing components. Do not operate the PS281/282 in an atmosphere of explosive gasses.

REV MAY 1992

Electric Overload—Never apply a voltage to a connector on the PS281/282 that is outside the range specified for that connector.

Selecting the Line Voltage

The voltage switches on the rear panel of the instrument allow proper line voltage selection. The PS281/282 can operate with line voltages of 100, 120, 220, or 240 VAC.



To avoid damaging the PS281/282, ensure that it is set to operate on the correct line voltage for your area. The power source must not supply more than 250 V rms between the supply conductors or between either supply conductor and ground.

Determine the voltage that is available from your main power source and set the switches as shown in Table 1.

Table 1: Line Voltage Switch Selections

Line Voltage		100 V		120 V		220 V		240 V
Top Switch	*		•		•		•	
Bottom Switch	•		•		•		•	

Selecting the Fuse

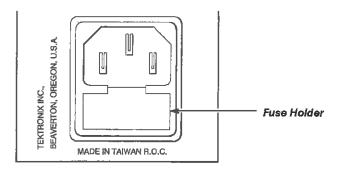
Because of their different voltage and current ratings, the PS281 and the PS282 require slightly different fuses. They both require an MDL 2.5 A, 250 V slow-blow fuse if operated with a line voltage of 100 V or 120 V, and an MDL 1.25 A, 250 V slow-blow fuse if operated with a line voltage of 220 V or 240 V.

However, the fuse requirements differ as follows.

- The PS281 fuse must be rated at 160 W and 200 VA at 50/60 Hz.
- The PS282 fuse must be rated at 188 W and 231 VA at 50/60 Hz.



To avoid damaging the PS281/282, ensure that it has the correct fuse for the selected line voltage.



To ensure that the PS281/282 has the proper fuse or to replace the fuse, follow these steps.

Step 1: Remove the power cord.

Step 2: Insert a small screwdriver into the ridge on the top of the fuse holder and slide the fuse holder out of the instrument.

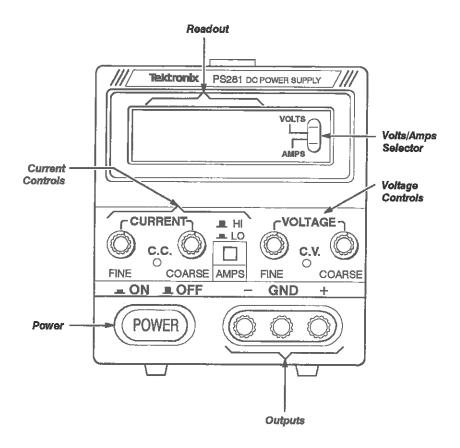
Step 3: Examine the fuse to ensure that it is appropriate for your line voltage. Replace it with an appropriate one if it is not.

Step 4: Insert the fuse holder in its niche and push it in until it is firmly seated.



This section describes the controls on the front and rear panels of the PS281/282 Power Supply.

Front Panel



The Power button toggles the instrument power on and off.

The **Readout** is a four-digit display which shows the output of the PS281/282 in either volts or amperes.

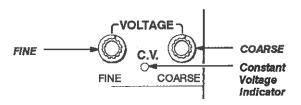
The VOLTS/AMPS Selector controls which unit the readout displays (volts or amperes). An LED will light next to the unit presently being displayed. This selector affects only the display; it does not in any way control the PS281/282 output.

The Voltage Controls regulate the PS281/282 voltage output when in constant voltage mode. See below for details on the voltage controls.

The Current Controls regulate the PS281/282 current output when in constant current mode. See page 9 for details on the current controls.

The Outputs accept banana-plug leads that carry the PS281/282 output to a test load. See page 9 for details on the outputs.

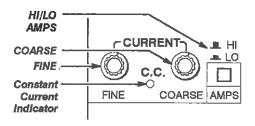
The Voltage Controls



The FINE and COARSE voltage knobs control the voltage output of the PS281/282 when it is in constant voltage mode.

The Constant Voltage Indicator lights when the PS281/282 is in constant voltage mode. This occurs before the output reaches the current limit of the test load. For information on setting the current limit, see page 13.

The Current Controls

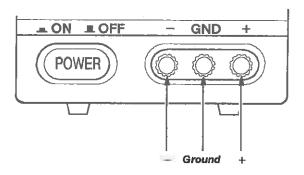


The HI/LO AMPS button toggles between high and low current mode. When in low current mode, the instrument will not supply current in excess of 2 A. You must use high current mode to achieve outputs between 2 A and the maximum rated output of the power supply.

The **COARSE** and **FINE** current knobs control the current output of the PS281/282 when it is in constant current mode.

The **Constant Current Indicator** lights when the PS281/282 is in constant current mode. This occurs after the output reaches the current limit of the test load. For information on setting the current limit, see page 13.

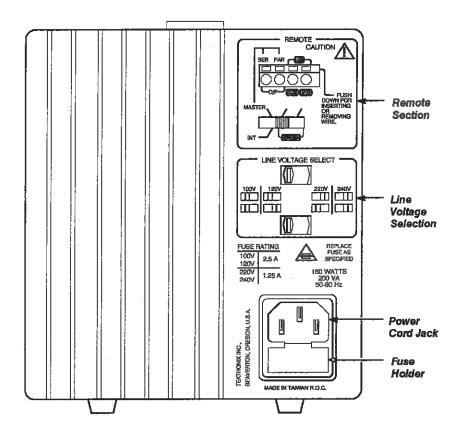
The Outputs



The + and - outputs supply just that, positive (red) and negative (black) polarity output.

The Ground output (green) is connected to earth and chassis ground.

Rear Panel



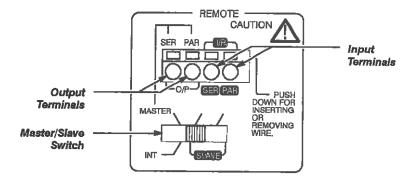
The **Remote Section** is a grouping of controls used for chaining power supplies and remote operations. For more information on these controls see page 11. For details on remote operations see page 17.

The **Line Voltage Selection** switches configure the PS281/282 to accept different line voltage inputs. See page 4 for details on setting the proper line voltage.

The Power Cord Jack accepts line voltage input.

The **Fuse Holder** holds the instrument fuse in place and also contains an additional replacement fuse.

Remote Controls



The **Input Terminals** accept signals from a "master" power supply when the instrument is set in "slave" mode. Use the **I/P-SER** terminal for connection in series; use the **I/P-PAR** terminal for connection in parallel. These terminals accept any small-gauge wire for connections. See page 17 for remote operation procedures.

The **Output Terminals** send signals to a "slave" power supply when the instrument is set in "master" mode. Use the **O/P-SER** terminal for connection in series; use the **O/P-PAR** output terminal for connection in parallel. These terminals accept any small-gauge wire for connections. See page 17 for remote operation procedures.

The **Master/Slave Switch** determines if the PS281/282 is in "master" or "slave" mode. The switch has three possible settings.

The MASTER setting places the instrument in "master" mode. In this mode it can send signals to "slave" power supplies.

NOTE

Use the **MASTER** setting for normal, single power supply operations.

The **SLAVE**—**SER** setting places the instrument in "slave" mode and activates the **I/P-SER** terminal. Use this setting when connecting power supplies in series.

The SLAVE—PAR setting places the instrument in "slave" mode and activates the I/P-PAR terminal. Use this setting when connecting power supplies in parallel.



Operations in Detail

This section provides procedures for using some of the advanced functions of the PS281/282

Setting the Current Limit

Use	this procedure to set a current limit for a given test load.
	Step 1: Determine the maximum safe current for your test load.
	Step 2: Connect the red test lead to the + output and the black test lead to the - output.
	Step 3: Short the red and black test leads together.
	Step 4: Turn the power supply on.
	Step 5: Turn the COARSE voltage knob clockwise until the C.C. indicator lights.
	Step 6: Set the AMPS/VOLTS switch to amps.
	Step 7: Adjust the current controls until the display shows your desired current limit. The current limit is now set. Do not change the current control settings after this step.
	Step 8: Disconnect the red lead from the black lead and hook them up to your test load.
will read drop	are now operating in constant voltage mode. The output voltage remain constant as the load increases until the current limit is shed. Then the current will remain constant and the voltage will on proportion to further increases in load. The C.V. indicator will off and the C.C. indicator will light when the current limit is reached.

Connecting Two Supplies for Higher Output

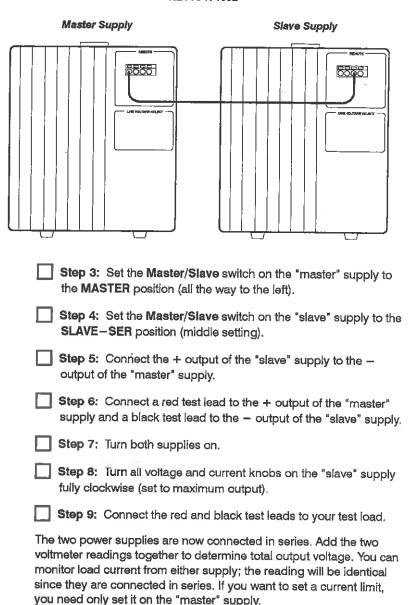
You can connect two PS281/282 power supplies together to increase either voltage or current output. Connecting the supplies in series allows a higher voltage output; connecting them in parallel allows a higher current output.



When a PS281 is connected to a PS282 the PS282 must be the "master," and the PS281 must be the "slave." If you connect the PS281 as a "master," it may damage the PS282 when the output voltage exceeds 36V (series) or 18V (parallel).

Connecting Supplies in Series

this procedure to connect two power supplies in series for a ner voltage output.
Step 1: Turn both supplies off and set them side by side with the rear panels facing you.
Step 2: Using a small-gauge wire, connect the O/P-SER terminal on the "master" supply to the I/P-SER terminal on the "slave" supply.



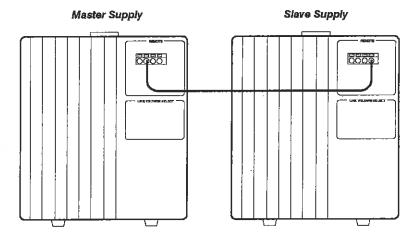
Connecting Supplies in Parallel

Use this procedure to connect two power supplies in parallel for a higher current output.

NOTE

The CC LED indicator of a parallel "slave" is always on.

- Step 1: Turn both supplies off and set them side by side with the rear panels facing you.
- Step 2: Using a small-gauge wire, connect the O/P-PAR terminal on the "master" supply to the I/P-PAR terminal on the "slave" supply.

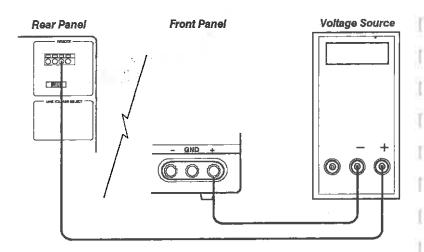


- Step 3: Set the Master/Slave switch on the "master" supply to the MASTER position (all the way to the left).
- Step 4: Set the Master/Slave switch on the "slave" supply to the SLAVE-PAR position (all the way to the right).
- Step 5: Connect the "slave" outputs to the "master" outputs (+ to +, to -).

	Step 6: Connect a red test lead to the + output of the "master" supply and a black test lead to the - output of the "master" supply.
	Step 7: Turn both supplies on.
	Step 8: Turn all voltage and current knobs on the "slave" supply fully clockwise (set to maximum output).
	Step 9: Set the output voltage of the "master" supply 0.5 V lower than the "slave." output voltage
	Step 10: Connect the red and black test leads to your test load.
amı moi sind	two power supplies are now connected in parallel. Add the two meter readings together to determine total output current. You can nitor load voltage from either supply; the reading will be identical to they are connected in parallel. If you want to set a current limit, need only set it on the "master" supply.
Remote (Control Operations
con to th	n the output voltage and output current of the PS281/282 can be trolled remotely by connecting a stable, low-noise voltage source he remote terminals on the rear panel. Use the following process to conduct remote control operations.
	WARNING
	Do not connect signals in excess of 10 V to the remote terminals.
Re	mote Control of Output Voltage
	this procedure to remotely control the output voltage of a 81/282.
	Step 1: With the power off, turn all voltage and control knobs on the PS281/282 fully clockwise (set to maximum).

Step 2: Connect the negative (-) output of a stable, low-noise
voltage source to the positive (+) output terminal of the
PS281/282.

Step 3: Connect the positive (+) output of the voltage source to the I/P-SER terminal of the PS281/282.



- Step 4: Set the Master/Slave switch to the SLAVE-SER position (middle setting).
- Step 5: Set the output of the voltage source to 0 V.
- Step 6: Turn on the PS281/282 and connect it to your test load.

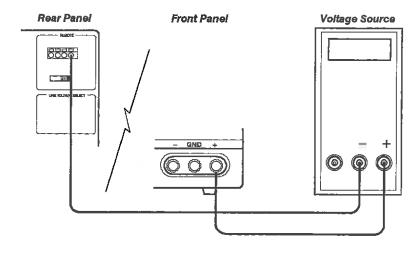
You can now control the output voltage of the PS281/282 by varying the output of the voltage source from 0 to 10 V. The resulting output voltage will be (voltage source output \div 10 V) \times maximum rated voltage of the PS281/282.

For example, if you are using a PS281, and the voltage source output is set at 3.5 V, the resulting output of the PS281 will be $(3.5 \div 10) \times 30 = 10.5$ V.

Remote Control of Output Current

Use this procedure to remotely control the output current of a PS281/282.

- Step 1: With the power off, turn all voltage and control knobs on the PS281/282 fully clockwise (set to maximum).
- Step 2: Connect the negative (-) output of a stable, low-noise voltage source to the I/P-PAR terminal of the PS281/282.
- Step 3: Connect the positive (+) output of the voltage source to the positive (+) output terminal of the PS281/282.



- Step 4: Set the Master/Slave switch to the SLAVE-PAR position (all the way to the right).
 - Step 5: Set the output of the voltage source to 0 V.
- Step 6: Turn on the PS281/282 and connect it to your test load.

You can now control the output current of the PS281/282 by varying the output of the voltage source from 0 to 10 V. The resulting output current will be (voltage source output \div 10 V) \times maximum rated current of the PS281/282.

For example, if you are using a PS282, and the voltage source output is set at 6.4 V, the resulting output of the PS282 will be $(6.4 \div 10) \times 5 = 3.2$ A.



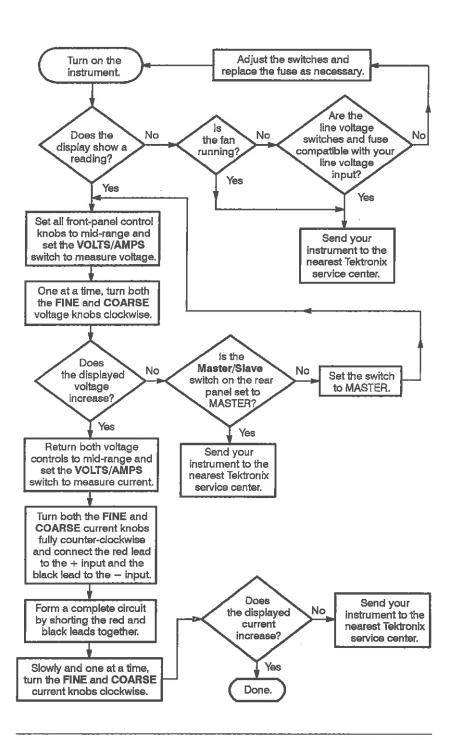
This section contains a basic troubleshooting diagram and repackaging information.

Troubleshooting Diagram

The following diagram will help you identify basic problems with your instrument setup. It will not provide instructions for or recommend instrument disassembly. If this diagram fails to solve your problem, send your instrument to the nearest Tektronix service outlet.

NOTE

This troubleshooting diagram assumes that any other test equipment you use (oscilloscope, test load, calibration generator, and so on) is operating properly. Before you assume a problem exists with the PS281/282, check all other test equipment.



Repackaging for Shipment

We recommend that you save the original carton and packing material in case you must return your instrument for repair or service. If the original materials are unfit or unavailable, then repackage the instrument in the following manner:

- Use a corrugated cardboard shipping carton with a test strength
 of at least 125 kg (275 lbs) and an interior size at least 15 cm (6 in)
 greater than the instrument size in all dimensions. See Specifications for instrument dimensions.
- 2. Enclose the following information:
 - the owner's name and address
 - the name and phone number of a contact person
 - the serial number of the instrument
 - the reason for returning the instrument
 - a complete description of the service required
- Completely wrap the instrument with polyethylene sheeting or its equivalent to protect the outside finish and keep harmful substances out of the instrument.
- Cushion the instrument on all sides with three inches of padding material or urethane foam, tightly packed between the carton and the instrument.
- Seal the shipping carton with an industrial stapler or strapping tape.
- Mark the address of your local Tektronix service center and your return address on the shipping carton.



Specifications

This section contains a table of PS281/282 warranted characteristics and a dimensional drawing.

Warranted Characteristics

Table 2 shows characteristics of the PS281/282 that are guaranteed by warranty.

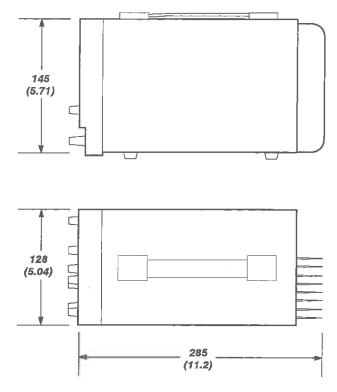
Table 2: Warranted Characteristics

Characteristic	Measurement			
Voltage Output Specifications				
Rating	PS281: 30 V PS282: 18 V			
Line Regulation	≤0.01% + 3 mV			
Load Regulation (CV)	PS281: ≤0.01% + 3 mV PS282 (≤3 A): ≤0.01% + 3 mV PS282 (> 3 A): ≤0.01% + 5 mV			
Recovery Time	≤100 µs (50% load change, minimum load 0.5A)			
Ripple and Noise (CV)	PS281: \leq 0.5 mV _{rms} (5 Hz to 1 MHz) PS282 (\leq 3 A): \leq 0.5 mV _{rms} (5 Hz to 1 MHz) PS282 ($>$ 3 A): \leq 1.0 mV _{rms} (5 Hz to 1 MHz)			
Temperature Coefficient	≤300 PPM/° C			
Current Output Specifications				
Current	PS281: 3 A PS282: 5 A			
Line Regulation (CC)	≤0.2% + 3 mA			
Load Regulation (CC)	≤0.2% + 3 mA			

Table 2: Warranted Characteristics (Cont.)

Characteristic	Measurement
Ripple and Noise (CC)	≤ 3 mA _{rms}
	Display
Accuracy	± (0.5% of reading +2 digits)
	Tracking Mode
Tracking Error (Series Mode)	≤± 500 mV
	Power
Line Voltage Range	Selectable ranges at 50 Hz to 60 Hz
	90 VAC to 110 VAC
	108 VAC to 132 VAC
	198 VAC to 242 VAC
	216 VAC to 250 VAC
Power Consumption	PS281: 200 VA, 160 W maximum PS282: 231 VA, 188 W maximum
	Insulation
Between Chassis and Output Terminal	20 MΩ or above (500 VDC)
Between Chassis and AC Cord	$30~\text{M}\Omega$ or above (500 VDC)
710 0014	Environmental
	Environmenta:
Operating Temperature	+0° C to +40° C, < 80% relative humidity
Storage Temperature	-10° C to $+70^{\circ}$ C, $< 70\%$ relative humidity

PS281/282 Dimensions



Dimensions are in mm (Inches) PS281: 5.0 kg (11 lb) PS282: 5.5 kg (12 lb)



Standard accessories come with the PS281/282. If you wish to purchase additional accessories, either optional or standard, see a Tektronix products catalog, contact your local Tektronix field representative, or, in the U. S., call the Tektronix National Marketing Center toll-free at 1–800–426–2200.

Standard Accessories

- PS281/282 DC Power Supply Instruction Manual (Tektronix part number 070-8580-00).
- Power cord Option A0 North American 120 V/6 A, 60 Hz (Tektronix part number 161-0248-00). See the next page for other power cords, which can be ordered optionally.
- Two test leads, red and black (Tektronix part number 196—3384—00).

Power Cord Options

In addition, you may wish to order other power cords. Table 3 illustrates power cord options.

Table 3: Voltage, Fuse, and Power-Cord Data

Plug Configuration	Category	Power Cord and Setting	Frequency Setting/ Voitage Range	Tektronix Part Number
	U.S. Domestic Standard	U.S. 120 V 15 A	60 Hz 90 V to 132 V	161-0248-00
	Option A1	EURO 240 V 10-16 A	50 Hz 180 V to 250 V	161-0104-06

Certificate of the Manufacturer/Importer

Ve hereby certify that the	
PS281/282 DC Power Supply	

complies with the RF Interference Suppression requirements of Amtsbl.-Vfg 1046/1984.

The German Postal Service was notified that the equipment is being marketed.

The German Postal Service has the right to re-test the series and to verify that it complies.

TEKTRONIX

Bescheinigung des Herstellers/Importeurs

Hiermit wird bescheinigt, daß der/die/das	
PS281/282 DC Power Supply	

in Übereinstimmung mit den Bestimmungen der Aamtsblatt-Verfugüng 1046/1984 funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprufüng der Serie auf Einhalten der Bestimmungen eingeräumt.

TEKTRONIX

www.valuetronics.com

NOTICE to the user/operator:

The German Postal Service requires that Systems assembled by the operator/user of this instrument must also comply with Postal Regulation, Vfg. 1046/1984, Par. 2, Sect. 1.

HINWEIS für den Benutzer/Betreiber:

Die vom Betreiber zusammengestellte Anlage, innerhalb derer dies Gerät eingesetzt wird, muß ebenfalls den Voraussetzungen nach Par. 2, Ziff. 1 der Vfg. 1046/1984 genugen.

NOTICE to the user/operator:

The German Postal Service requires that this equipment, when used in a test setup, may only be operated if the requirements of Postal Regulation, Vfg. 1046/1984, Par. 2, Sect. 1.7.1 are compled with.

HINWEIS für den Benutzer/Betreiber:

Dies Gerät darf in Meßaufbauten nur betrieben werden, wenn die Voraussetzungen des Par. 2, Ziff. 1.7.1 der Vfg. 1046/1984 eingehalten werden.

Canadian Regulatory Warnings and Information

THIS DIGITAL APPARATUS DOES NOT EXCEED THE CLASS A/CLASS B (WHICHEVER IS APPLICABLE) LIMITS FOR RADIO NOISE EMISSIONS FROM DIGITAL APPARATUS AS SET OUT IN THE RADIO INTERFERENCE REGULATIONS OF THE CANADIAN DEPARTMENT OF COMMUNICATIONS.

LE PRESENT APPAREIL NUMERIQUE N'EMET PAS DU BRUITS RADIOELECTRIQUES DEPASSENT LES LIMITES APPLICABLES AUX APPAREILS NUMERIQUES DE CLASSE A/DE CLASSE B (SELON LE CAS) PRESCRITES DANS LE REGLEMENT SUE LE BROUILLAGE RADIOELECTRIQUE EDICTE PAR LE MINISTERE DES COMMUNICATIONS DU CANADA.

