Instruction Manual

Power Supply

HC302 Series

for

HAMAMATSU Deuterium Lamp

- Those who are engaged in operation and maintenance of this power supply should read this instruction manual thoroughly before initiating operation or maintenance.
- Do not operate the power supply or perform maintenance unless this manual has been fully understood.
- Operating the power supply in any way other than described in this manual may result in a serious accident.
- The operator or person responsible for the power supply must not let anyone operate the power supply who does not have full understanding of the power supply.
- Keep this manual readily accessible so that it can be consulted at any time.
- Should this manual be lost or ruined, order it from us directly or from our sales office.
- When transferring this power supply to another owner, be sure to attach this manual to the power supply.

The 1st issued on April. '99

HAMAMATSU

Safety Precautions

Make sure to read these "Safety Precautions" carefully before starting to use the power suuply and observe them during operation.

1-1.Classification of Warning Instructions

Warning instructions in this manual and on labels are classified as described below. As each word and symbol carry special meanings, familiarize yourself with them and observe the instructions.

 **DANGER**	This means that there is a high risk of death or serious injury to the operator if these instructions are ignored or the power supply handled incorrectly.
 **WARNING**	This means that possible death or serious injury to the operator may result if these instructions are ignored and the power supply handled incorrectly.
 **CAUTION**	This means that injury to the operator and damage to the power supply may result if these instructions are ignored or the power supply handled incorrectly.
	This symbol means that the instruction describes the special care required when handling the product. Read it carefully and use the product safely.
	This symbol means that the instruction describes prohibited item or action. Read it carefully and never attempt a prohibited action.
	This symbol means that the instruction describes an action that must be performed. Read it carefully and be sure to perform as instructed.

Safety Precautions

WARNING

● Vibration and Impacts

Handle the unit with care. Sharp impact or strong vibration can break the power supply or disrupt the precise adjustment of internal mechanisms.

● Removal of Covers

The internal components of this unit have been precisely adjusted. Changing the adjustments or renovating the power supply can cause problems with the unit, and can cause fire and electrical shock.

● Abnormal Condition

Should an abnormal condition is found such as smoking, abnormal smell or noise, turn off the power immediately and then disconnect the DC input. Use of the power supply with any abnormal condition left as it is may cause a fire, electric shock and other troubles.

● Power Connection

To prevent electrical shock, always ground this power supply using the grounding terminal on the 8-position screw terminal block.

Never make grounding to the gas pipe.
It is very dangerous and may cause a fire.

Make sure that the power voltage in use complies with specification.
Using the power supply at any other voltage may cause a fire, electric shock and other troubles.

Safety Precautions

WARNING

● High-Voltage Trigger

With an open circuit, the trigger voltage of approximately 600V peak as well as approximately 160Vdc are present at the output. Cable insulation should be carefully considered to prevent the danger of shocks.

CAUTION

● Installation Position and Ventilation

Put the fuse (M type) just between heater lead (blue or black) of lamp and 8-position screw terminal #3, to avoid breakage of the power supply in case of short circuit by accident. Fuse is determined by heater rating as the table below.

The power supply should not be operated in poorly ventilated or high humid locations. A built-in resistor compensates for the negative resistance characteristics of the deuterium lamp.

Ventilate the air in the room while the lamps are on.
Some lamps, depending on types, produce harmful ozone while they are on.

Install the main unit on its legs on a level surface.
Use of the equipment in an unstable place or unlevel condition may cause it to malfunction or to fall when an earthquake occurs or some impact is applied.

Power Supply Part Number	Applicable Fuse
HC302-2510	5A
HC302-2517	5A
HC302-3000	6A
HC302-1035	1A
HC302-1070	1.5A
HC302-1555	1A

We recommend M type 125V fuse.
In case of employing other lamp than HAMAMATSU, check the heater voltage and current rating as well as lamp's anode voltage and current rating carefully though out of warranty.

● Warranty

The power supply has received through testing to assure that it means published specifications before shipping to you.
Should a defect be found in workmanship or materials or damage in transit be discovered, notice should be given to HAMAMATSU. The warranty period for this power supply is for one year from the date of purchase from HAMAMATSU or a representative of HAMAMATSU and is limited to repair or replacement at our expense of this power supply for cases in which the defect is clearly the responsibility of HAMAMATSU.
Power supply failures caused by failure to follow the operating instructions included in this document, by lack of operator attention to proper procedures, by modifications to this power supply or by natural calamity or disasters are not covered under this warranty.

● Specifications

✓ Input Specifications

- Power sources must be isolated secondary source insulated from AC mains by reinforced insulation. (Agency approved power supplies)
- 24 volts DC, 2 amps, regulated. (Consumes<45 watts)
- 5 volts DC (TTL) disable input. (also resets heater warm-up time)

✓ Output Specifications

- Anode : 60 to 100 VDC / 30 watt max.
- Trigger pulse : 600±50 V peak continuous (Anode VDC included)
- Heater warm-up : 30 seconds
- Heater voltage : Warm-up volts DC, Operating volts DC

✓ Environmental Specifications

- Temperature : 0 to 40 ℃
- Humidity : ≦ 95%
- Cooling : 20 CFM of forced air across the component side of the power supply board from any direction.

✓ Mechanical Specifications

- HC302 is mounted with a standard thread size of 6-32.
- The deuterium lamp power supply is a component and should be mounted in a metal enclosure.

✓ Safety - UL, TUV, and CE guidelines

- Power supply must be installed in such a way as to be inaccessible to the operator.
- Power supply should be mounted in a metal case.
- Power sources must be an isolated secondary source insulated from AC mains by reinforced insulation. (Agency approved power supplies)

✓ Power Supply Connections

PIN #	FUNCTION	Lamp Color Code (in some cases)
1	Anode Output	Red
2	Aperture Output	Yellow (not used on 3 leads lamps)
3	Heater Output	Blue or Black
4	Heater Return (GND)	Black
5	+24VDC Input (Supply)	N/A
6	+24VDC Return (GND)	N/A
7	+5VDC Disable Input	N/A
8	+5VDC Return (GND)	N/A

1.0 Introduction

The deuterium lamp power supply is a low cost, compact, highly reliable switching power supply which promotes extended lamp life. The HC302 series are reliably designed to provide a long service life with no required maintenance. The small size facilitates integration of the power supply and lamp in a compact system for flexibility and reduced cost.

2.0 Electrical Characteristics

2.1 Input Specifications

2.1.1 Power source : Regulated 24 VDC± 10% with minimum rating of 2 amps.
2.1.2 Input power : < 45 watt
2.1.3 Input current : < 2 amps
2.1.4 Main fusing : Single internal 2 amps, 250V

2.2 Anode Output Specifications

2.2.1 Operating voltage : 80±20 VDC
2.2.2 Output current : 300 mAdc±10%
2.2.3 Output regulation : Current control mode
2.2.4 Current fluctuation (ripple) : < 0.5%p-p maximum
2.2.5 Anode voltage minimum : > 160 VDC
2.2.6 Current drift over time @ fixed temp : <±0.1%/hour
2.2.7 Current drift with temperature @ 0 to 40 degrees C : < ±0.5%
2.2.8 Current drift with +24 VDC supply @ ±10% : < ±0.05%
2.2.9 Current drift with load @ 60 to 100VDC : <±0.5%

2.3 Heater Output Specifications

2.3.1 Operating voltage options : ±5%

Suffix Number	Warm-up	Operating
-2510	2.5V	1.0V
-2517	2.5V	1.7V
-3000	3.0V	0V
-1035	10V	3.5V
-1070	10V	7V
-1555	15V	5.5V

2.3.2 Warm-up time period : 30±5 seconds

2.4 Trigger Output Specifications

2.4.1 Output voltage : 600±50 vpeak continuous
(Anode VDC included / Aperture connected)
2.4.2 Maximum anode level maintained for : > 100 msec

3.0 Environmental Characteristics

3.1 Operating Specifications

3.1.1 Temperature range : 0 to 40 degrees C, ambient
3.1.2 Humidity : < 95% non-condensing
3.1.3 Altitude : 0 to 3,000 meters

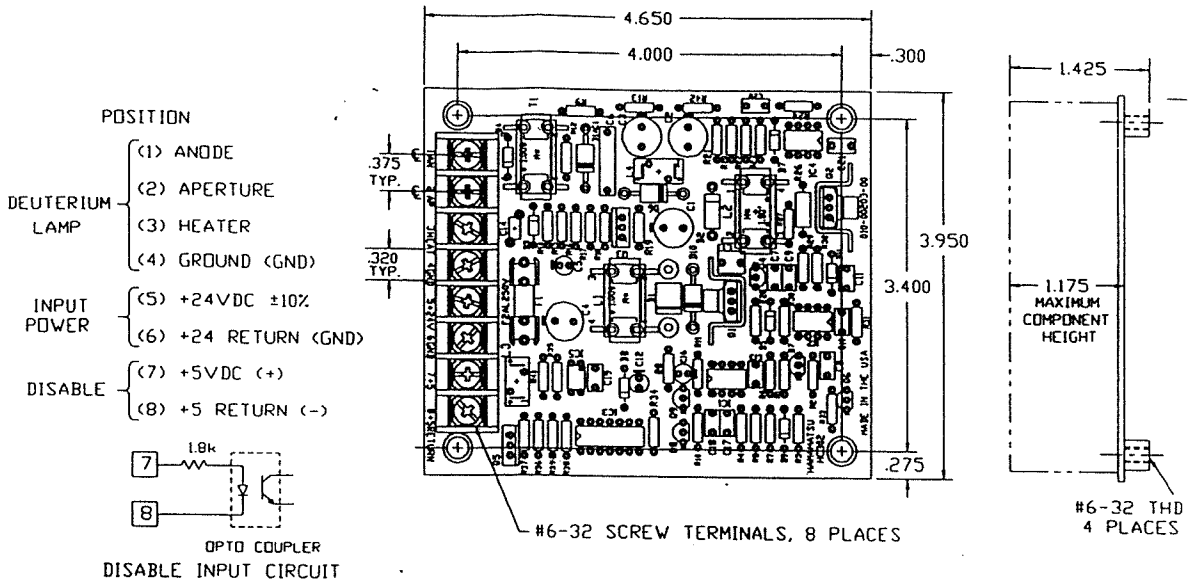
3.2 Storage Specifications

3.2.1 Temperature range : -40 to 60 degrees C
3.2.2 Humidity : < 95% non-condensing
3.2.3 Altitude : < 12,000 meters

3.2 Cooing Requirements

3.3.1 20 CFM of forced air across the component side of board from any direction.

4.0 Mechanical Characteristics



DISABLE FUNCTION
DISABLE = +5V BETWEEN PINS 7 & 8 POLARITY AS INDICATED, LOAD = 2mA.
ENABLE = 0.0V BETWEEN PINS 7 & 8 OR PINS 7 & 8 OPEN.

(inch)

4.1 Mechanical Specifications

4.1.1 Outside dimensions : 100(W)×118(H)×36(D) (mm)

4.1.2 Weight : 170g
4.1.3 Mounting threads : Standard #6-32

4.2 Electrical Connections

4.2.1 Board Connector : 8-position screw terminal block

5.0 Interface Specifications

5.1 Connector

5.1.1 Connector type : 8-position screw terminal block that accepts spade or ring terminals
5.1.2 Interface connections :

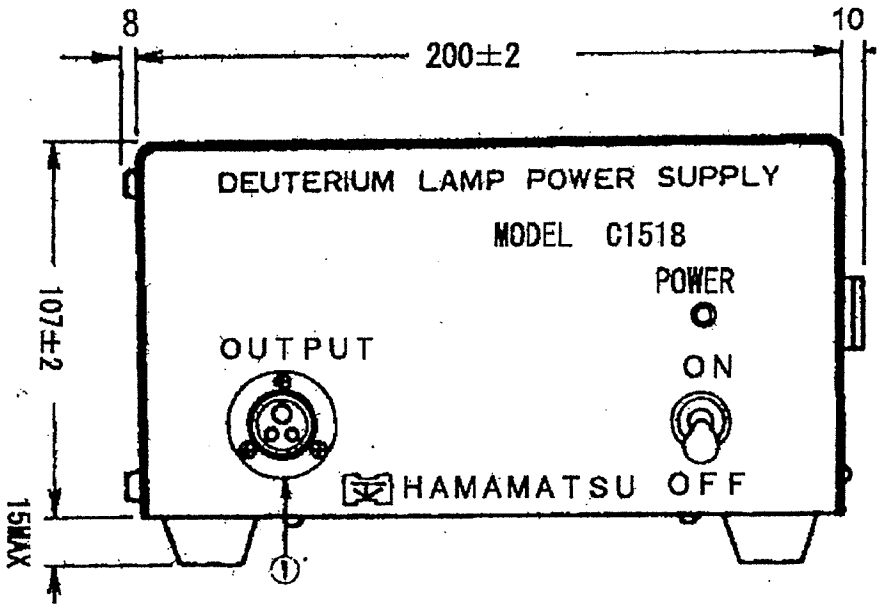
Pin 1 Anode
Pin 2 Aperture
Pin 3 Heater
Pin 4 Ground
Pin 5 +24 VDC Input
Pin 6 Ground
Pin 7 +5 VDC Disable input (shutdown of lamp when applied)
Pin 8 +5 VDC Disable Return

6.0 Lamp Operation Sequence

6.1 When an external 24 volts is connected to the deuterium lamp power supply, the heater output warms the deuterium lamp for approximately 30 seconds, ensuring proper preheating of the lamp prior to lighting.
6.2 After the warm period, the heater voltage drops to the operating voltage.
6.3 During the same time period, the anode output increases to 160 vdc. Then a trigger pulse of 600 vpk is added to light the lamp. The anode voltage decreases to 80 vdc and is regulated to 300 madc during operation.
6.4 Optional disable control is available by applying an external 5 vdc to the disable input.

NAMES AND FUNCTIONS OF POWER SUPPLY CONTROLS AND CONNECTIONS

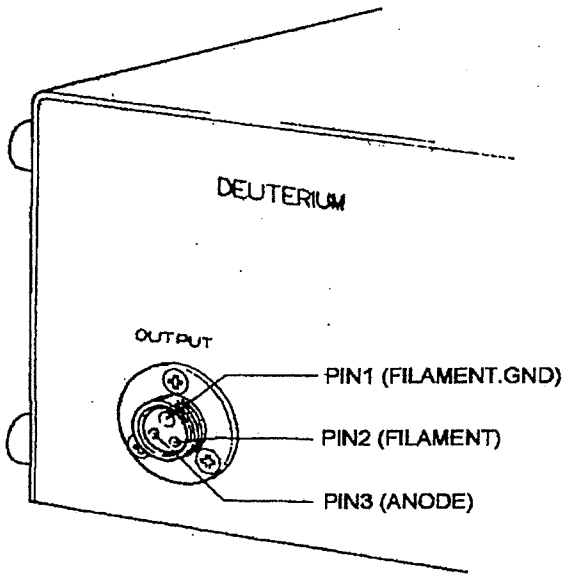
Fig.1 Front panel (dimensions in mm)



① Output Connector

This 3-pin circular connector enables interconnections to the lamp anode (pin 3), filament (pin 2) and ground (pin 1). The connector used is type NCS163RF manufactured by Nanaboshi Electric Mfg. Co., (JAPAN).

Fig. 2 Output connector



Subject: Re: A question about the deuterium lamp power supply.
Date: Fri, 2 Mar 2001 11:57:10 -0500
From: stsuzuki@hamamatsu.com
To: Carl Zorn <zorn@jlab.org>

Dear Mr. Carl Zorn

As our conversation, I let you know how to change the resistor of HC302-2510 using A3485 (C1518 cable: the 2m wire with male connector)
Because there is possibility to drop the heater voltage when you use A3485 with HC302. So you need to increase the heater rating.

To modify HC302-2510 from standard using A3485.
1) Change R5 from 40.2k ohm to 33.2k ohm.
2) Change R6 form 53.6k ohm to 60.4k ohm.
We recommend the resistor is 1/4W and 1% value.

Warranty:
If it has a trouble after changing the resistor, please send it to me.
When we find the poor soldering, we will not guarantee. If good, we will guarantee.

I am sending 2 pcs of the female connector. Please wait.

If you have any questions, please feel free to call me.

Best regards,

Steve Tsuzuki
(Applications Engineer)
Hamamatsu Corporation
360 Foothill Road
Bridgewater, NJ 08807
TEL: (908)231-0960 ex.2403
FAX: (908)231-1539
stsuzuki@hamamatsu.com
http://www.hamamatsu.com

Carl Zorn <zorn@jlab.org> on 02/28/2001 03:45:59 PM