

# HVP

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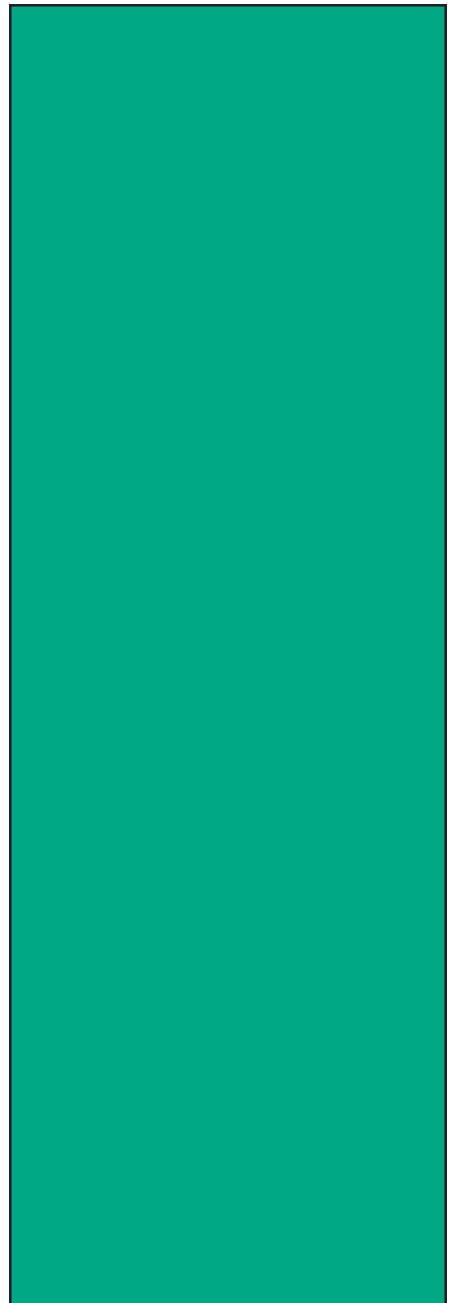
## OPERATION MANUAL

### VOLTAGE MULTIPLIERS, INC.

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## *Certificate of Conformance*

Voltage Multipliers, Inc. certifies that this power supply was tested and calibrated and meets the specifications in effect at the time of inspection.

Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Date Code: \_\_\_\_\_

Inspector: \_\_\_\_\_

Date: \_\_\_\_\_

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## 1.0 General Specifications:

- Input 115 /230Vrms, 60Hz
- Polarity Positive or Negative
- Maximum Output Voltage
  - HVP050 50kV
  - HVP080 80kV
  - HVP125 125kV
- Maximum Output Current
  - HVP050 5.0mA
  - HVP080 3.0mA
  - HVP125 2.0mA
- Ripple <1% of maximum output voltage
- Voltage Regulation <0.5% of output voltage
- Current Regulation <0.5% of output current (from 20% to 100% rated voltage)
- Ambient Temperature 0°C to 50°C (operating)  
-20°C to 70°C (storage)
- Fuse 5A, time delay, 1/4 " x 1 1/4" (MDL-5 or equivalent)

## 2.0 Standard Features:

- Constant current or constant voltage regulation
- NEMA enclosure
- mounting feet with 90 degree incremental positioning
- Safety interlock
- Remote or local voltage programming
- Remote or local current programming
- Remote and local voltage monitoring
- Remote and local current monitoring
- Short circuit protection
- Over-voltage/over-current protection
- Power supply fault (8 arc events in less than 20 seconds)
- Physical (*reference Figure 1, section 9*)

### 3.0 Safety Precautions:

## **WARNING!**

**Read and fully understand these instructions before applying power to this unit.**

**Never operate this equipment without first providing a good earth ground connected to the ground stud located below the HV connector. The ground wire of the input power connection must also be properly grounded.**

**Voltages used in and the output from this supply are dangerous and can be lethal. Extreme caution must be exercised when working with this equipment.**

**Do not handle or attempt to handle the high voltage load or any exposed high voltage connections. Do not attempt to make or remove any connections to the supply until the load has been properly discharged or grounded.**

**Always make sure the load return is connected to the ground stud located below the HV connector (or is otherwise similarly grounded).**

- The input power supply ground connection must remain intact for a minimum of 2 minutes after disabling the HV output to allow sufficient time to fully discharge the supply.
- Even with the remote or local current or voltage program signals set to minimum, the HV output can regulate up to 1% of the rated output when the supply is enabled.
- At no time should the internal control panel be removed. There are no user adjustable elements or user interfaces below this cover. Additionally, the supply warranty can become void due to unauthorized removal of the control panel.

## 4.0 Connections:

This equipment is supplied with three connectors and a ground stud. These connectors are as follows:

- **HV Out:** The high voltage output cable is connected to this connector. It has 1 1/8" - 18 threads and leads to a 0.55" nominal inside diameter tube that is terminated to the supply high voltage output via a banana jack located 14.6" nominally from the end of this connector.
- **Input Power:** The input power is connected to the (Thomas and Betts, P/N MS206 insert in PB306 base, or similar) power connector via a customer wired mating connector (Thomas and Betts, P/N FS106 insert in THF06 hood, or similar). **See Figure 2, section 9 for pin identification.**
- **Interface:** The interface connector (Thomas and Betts, P/N FS116A insert in PB316A base, or similar) provides all the necessary connections for complete local and/or remote control of output programming, output monitoring, interlock and HV enable functions. **See Figure 3, section 9 for specific pin identification.**
- **Ground Stud:** Before power is applied to this supply, this ground stud must be properly connected to a good earth ground. Additionally, the load return must be connected to this ground stud.

## 5.0 Panel Controls and Indicators

*Reference Figure 4, section 9 for control panel layout.*

- **Input Voltage Selector:** Located on the interior control panel. Position slide switch to display the proper supplied input power (either 115V or 230V). Ensure the slide selector is in the correct position prior to applying power to the supply. **FAILURE TO DO SO CAN RESULT IN DAMAGE TO THE POWER SUPPLY.**
- **Input Power Switch:** Located on the interior control panel. When proper AC voltage is supplied at the input power connector, this switch provides AC power to the supply when switched to the "I" position. **NOTE:** For remote operations, this switch must be in the "I" position for the supply to function.
- **HV Control:** Located on the interior control panel. With power applied to the supply, this switch is used to enable or disable the HV output when operating in local control mode. This switch will not enable the HV output if the interlock pins are open.

- Current and Voltage Control Potentiometers: Located on the interior control panel. The current control (left side) and the voltage control (right side) are used in the local control operation mode to adjust the program current or program voltage settings. These 10-turn potentiometers include a lever lock on the dial to secure the potentiometer in the selected position.
- Current/Voltage Selector Switch: Located on the interior control panel. This switch will select between current or voltage parameters being displayed on the panel meter. It can be used in local or remote control operating modes.
- Program/Monitor Selector Switch: Located on the interior control panel. This switch is used in conjunction with the Current/Voltage selector switch to select the parameter being displayed on the panel meter. It can be used in local and remote control operating modes.
- Panel Meter: Located on the interior control panel. With the selector switches in the desired positions, this meter will display the selected parameter for current or voltage. Current is displayed in mA units while voltage is displayed in kV units. All measurements displayed are positive values regardless of the supply polarity. The panel meter functions can be used in local and remote control operating modes.
- HV ON Indicators: One is located on the interior control panel and one is located on the side of the enclosure. When the HV output is enabled (whether voltage is at the output or not) these red colored indicators will be illuminated.
- PS Fault Indicators: One is located on the interior control panel and one is located on the side of the enclosure. When the power supply enters a fault condition, these yellow colored indicators will be illuminated. The HV output will also be disabled.

**CAUTION! Even if the HV output becomes disabled, the load may still be charged to dangerous levels. Do not attempt to make or remove any connection or to handle or move the load or exposed high voltage connections until the load has been properly discharged.**

- AC ON Indicator: Located on side of enclosure. This is a white colored lighted fuse indicator that remains lit while power is supplied to the power supply and the input power switch is in the “I” position. The fuse is a 5A, time delay type (1/4" x 1 1/4", MDL-5 or equivalent).

## 6.0 Interface Functions

*NOTE: All DC signal voltages noted below are with respect to the power supply common.*

### Remote Interface:

- Current Program In: Provide a positive 0 - 10VDC signal to linearly adjust the output current programming from 0 to 100% of rated.
- Voltage Program In : Provide a positive 0 - 10VDC signal to linearly adjust the output voltage programming from 0 to 100% of rated.
- Current Monitor: A positive 0 – 10VDC signal that is proportional to the output current is available at this terminal. The measuring instrumentation must have a high input impedance ( $\geq 10\text{M}\Omega$ ).
- Voltage Monitor: A positive 0 – 10VDC signal that is proportional to the output voltage is available at this terminal. The measuring instrumentation must have a high input impedance ( $\geq 10\text{M}\Omega$ ).
- HV Enable: By providing a positive nominal 10-12VDC (<2mA) signal to this terminal, the power supply HV output will be enabled (if the external interlock terminals are shorted together). When the HV has been enabled, the red HV ON indicators will be illuminated. Transition voltage thresholds are:

$>10\text{VDC}$  = HV enabled;  
 $< 2.3\text{VDC}$  = HV disabled

- PS Fault/PS Fault Return: (*reference Figure 2, in section 9*) These are a set of normally closed dry contacts indicating a no fault condition. A PS fault occurs when 8 arc events are detected in a 20 second period. When a PS fault occurs, the unit is latched in an HV disabled mode. To clear the latched fault condition, the input power must be cycled by first switching the power off for at least 10 seconds followed by switching the power back on. Contact conditions between these terminals for fault are:

Closed = no fault  
Open = fault

- Shield Return: In remote control operations, a good quality shielded cable must be used for the interface functions. A cable shield connected to this terminal will be tied to the power supply chassis.

- Power Supply Common: This terminal is the instrumentation/measurement return reference. **It must not be used as a current return for the load or as the main earth ground.**
- External Interlock/External Interlock Return: These terminals are provided for contact closure control of the safety interlock. The power supply will be fully functional when these terminals are shorted together. When these terminals are not shorted together, no output or control operations are possible. **CAUTION:** If the HV has been locally or remotely set to an enabled state, the power supply will immediately enter an HV enabled condition when the external interlock terminals are shorted together.
- +12V Reference: This terminal provides a positive 12VDC, 12mA maximum source that may be used with contact closure control to provide the HV Enable signal.

## 7.0 Mounting

Four through-hole mounting feet are provided on the bottom of the enclosure for securing the supply as required. During shipping, these feet are positioned completely under the enclosure. To position them for mounting, the box-head cap screws securing each mounting foot may be loosened and the foot rotated in 90 degree increments to the desired mounting position. Properly re-secure the foot with the cap screw.

## 8.0 Operation

**WARNING: Voltages used in and the output from this supply are dangerous and can be lethal. Extreme caution must be exercised when working with this equipment. Before operating this equipment, the safety precautions of Section 3 must be reviewed and applied.**

### Remote Control Operation

- Prior to providing any remote control signals to the supply, ensure the input power switch located on the interior control panel is set to the “I” position. Provide output programming signals, HV Enable and external interlock signals as described in section 9 for remote control operation of the supply. (*Reference Figures 5 through 11 in section 9*).

## Local Control Operation

The HVP is supplied with a special mating connector for use during local control operations. This connector provides the following:

- 1) Programming Outputs shorted to Programming Inputs
  - *I Program Out* shorted to *I program In*
  - *V Program Out* shorted to *V Program In*
- 2) *Interlock Out* is shorted to *Interlock In*
- 3) *HV Enable* is shorted to *Local Enable*

Before installing the local control connector, verify the power supply is properly grounded through the ground stud and the HV load is returned to the same ground stud. Check to make sure the power switch is set to the “O” position and the HV control switch is set to “Disabled”.

- Connect the local control connector to the interface connector. The external interlock is internally connected in this connector.
- Set both the current and voltage control potentiometers fully counterclockwise to the minimum output setting.
- Set the Input Power switch the “I” position.
- Set the HV control switch to the enabled position.
- Program the output current or output voltage by moving the program/Monitor selector switch to “Program” and setting the Current/Voltage selector switch to the desired parameter. Adjust the output current or output voltage control potentiometers while viewing the programmed settings on the panel meter (output current is displayed as positive mA values and output voltage is displayed as positive kV values).

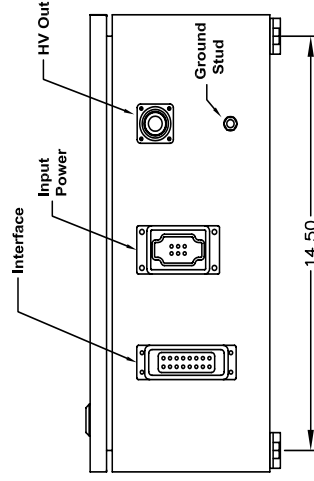
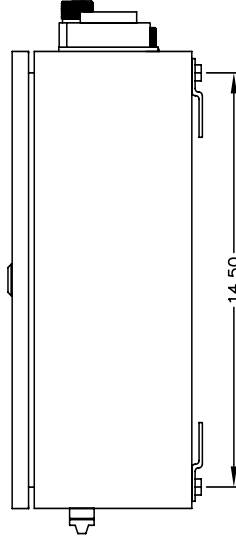
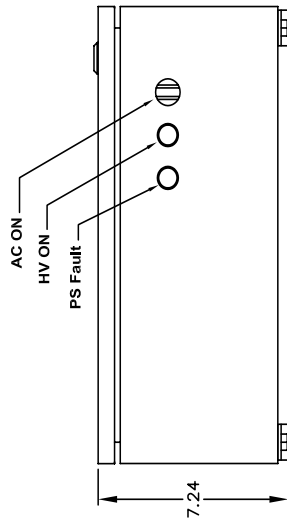
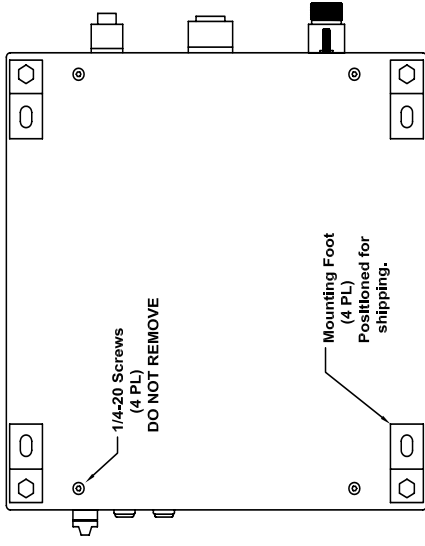
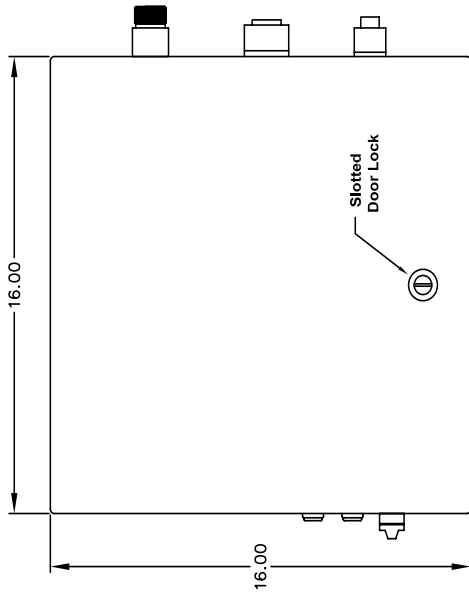
**NOTE:** When operating in the *voltage regulation mode*, the output current program level must be higher than the expected output operating current to prevent the power supply from unintentionally crossing over into *current regulation mode*.

If operating in *current regulation mode*, the output voltage program level must be set higher than the expected operating voltage to prevent the supply from unintentionally crossing over into *voltage regulation mode*.

- Monitor the output current and output voltage on the panel meter by moving the Program/Monitor selector switch to “Monitor” and selecting the desired parameter with the Current/Voltage selector switch (output current is displayed as positive mA values and output voltage is displayed as positive kV values).

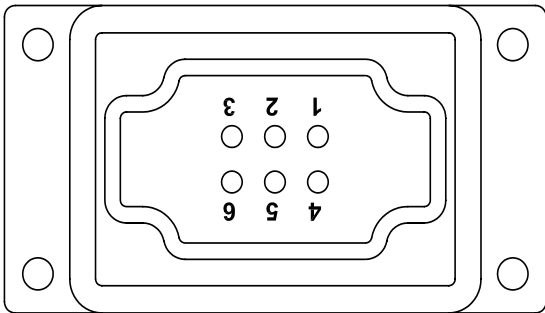
## **9.0 Reference Drawings**

The following pages include the drawings referenced throughout this manual.



**Figure 1**

# Input Power Connector



Thomas and Betts P/N: MS206  
insert in PB306 base (or similar).

Pin Number	Function	Wire Color
1	Ground	Green
2	Neutral	White
3	Line	Black
4	PS Fault Out	Blue
5	PS Fault Rtn	Yellow
6	N/C	N/A

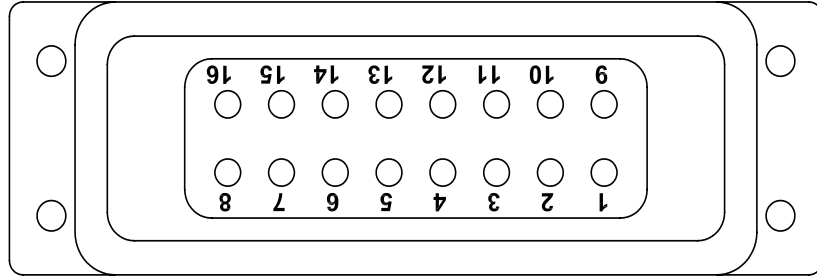
**Figure 2**



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HVP SERIES POWER SUPPLY

# Interface Connector



Thomas and Betts P/N: FS116A  
insert in PB316A base (or similar).

Pin Name	Function
1	Interlock Out
2	Interlock In
3	+12V Reference
4	HV Enable
5	Local Enable
6	Common
7	I Monitor
8	V Monitor
9	I Program In
10	V Program In
11	I Program Out
12	V Program Out
13	N/C
14	N/C
15	N/C
16	Shield



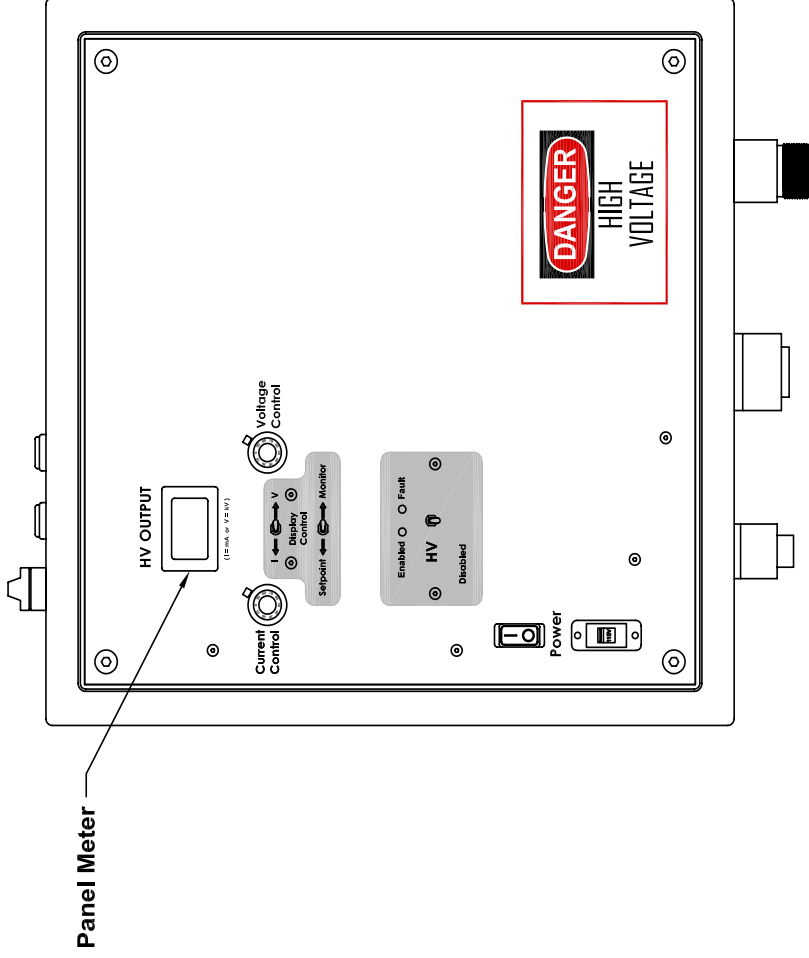
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**Figure 3**

HVP SERIES POWER SUPPLY

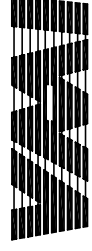
# Control Panel

(door removed for clarity)



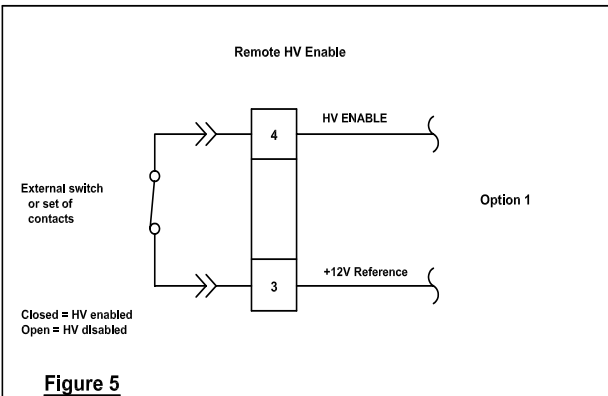
**NOTE:** The panel view shown at right is set to view the output voltage monitor on the panel meter. Also, the HV Control switch is in the disabled position.

**Figure 4**

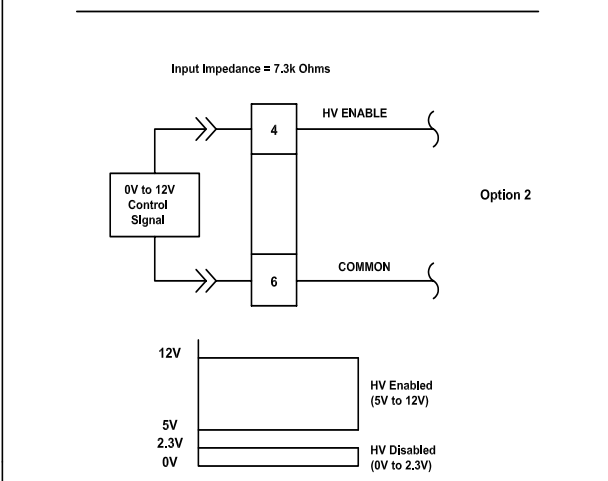


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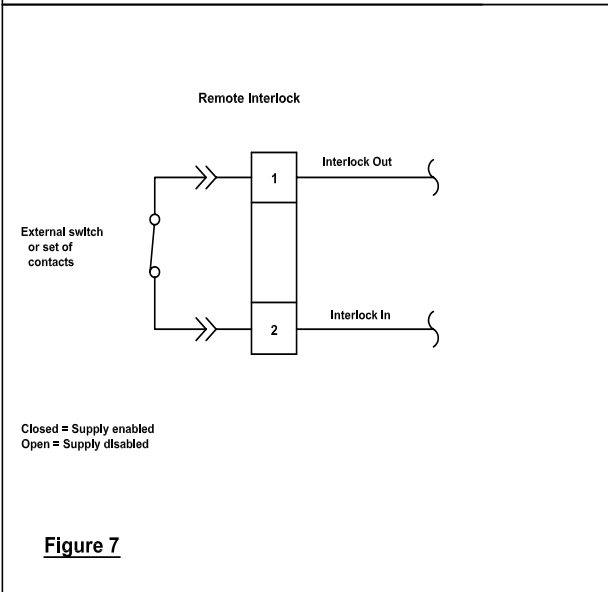
HVP SERIES POWER SUPPLY



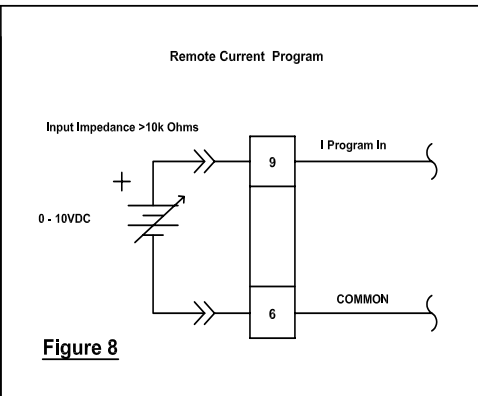
**Figure 5**



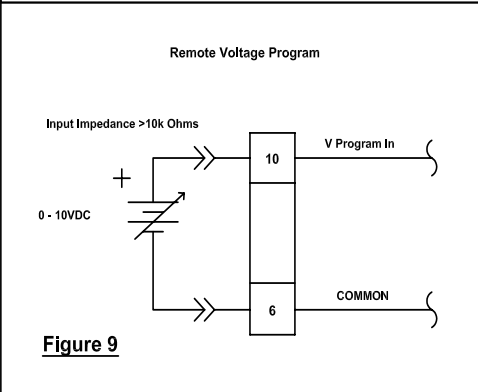
**Figure 6**



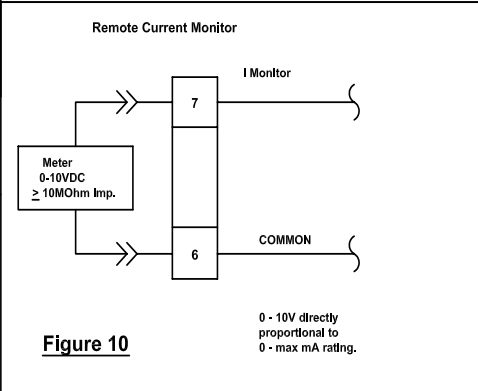
**Figure 7**



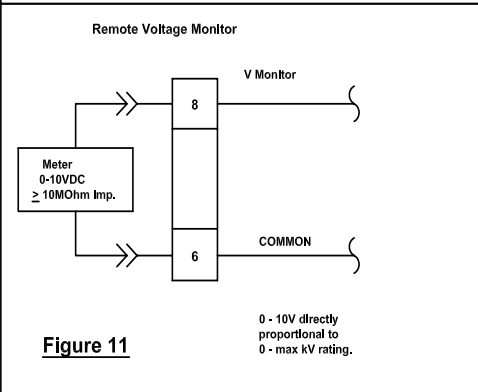
**Figure 8**



**Figure 9**



**Figure 10**



**Figure 11**

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