RDM-Apps

Capability Statement **Contact Information**

Voltage Amplifier Modules ... Both Precision and High Speed Amplifiers
Current to Voltage Converter Modules... Pico-Amp, Nano-Amp, Milli-Amp ... 1A, 10A/V, 100A/V
Transimpedance Amplifiers... Pico-Amp, Nano-Amp, Milli-Amp ... 1A, 10A/V, 100A/V
Constant Current Source / Sink Modules... ±10pA to 125mA, 1A, 5A &10A full range output modules
Voltage to Constant Current Converter Modules... ±10pA to 125mA, 1A, 5A &10A full range output modules
Precision Isolation Amplifiers

CONTINUE TO NEXT PAGE FOR VTVM SERIES MODULE DOCUMENTATION

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Voltage Amplifier Module (VTVM) Features:

- **VTVM PRECISION series module:**
  1.) Digitally selectable 4 Gain Selections: x1, x10, x100, x1000
  2.) 80dB gain when enabling additional 20dB jumper
  3.) 300KHz Typical Freq. Response (-3dB) at Gain of 1
  4.) Single ended or Differential input
  5.) Input Impedances better than 10TΩ
  6.) Accommodate Source Impedances greater than a GΩ
  7.) Accuracy better than ±0.1%
  8.) Single ended or Differential input
  9.) Module Output impedance = 600Ω:
    a.) ±10V Output into a ≥1MΩ Load (Device)
    b.) ±5V Output into a 600Ω Load (Device)
  10.) Low-pass filter (Enable/Disable) ... ~ 30Hz cut-off freq. ..
- **HIGH SPEED VTVM8 Series Module:**
  1.) Fixed Gain 20dB (x10)
  2.) 100KHz to 300MHz (-3dB) BW
  3.) Accuracy better than ±0.5%
  4.) Input / Output impedance = 50Ω
- **HIGH SPEED VTVM8P Series Module:**
  1.) Digitally selectable 4 Gain Selections: x1, x10, x100, x1000
  2.) 5-10MHz Typical Freq. Response (-3dB) at Gain of 1
  3.) Accuracy better than ±0.5%
  4.) Series Module (Output impedance = 50Ω):
    a.) ±5V into a 50Ω Load (Device)
    b.) ±10V into a ≥100KΩ Load (Device)
- **HIGH VOLTAGE VTVMHV Series Module:**
  1.) Jumper selectable 3 Gain Selections: x1, x10, x100
  2.) +-60Vp, 28W Output
  2.) Slew Rate 25V/us
  3.) Accuracy better than ±0.5%
  4.) Input / Output impedance = 50Ω
- Offset Voltage Null Capability
- ESD Protection available with certain models
- Low Drift, Low Input Noise, Low Power Consumption
- Short Circuit Protection
- Low Power Consumption
- Call for 2, 4, 6 & 8 Voltage Channel Modules.
- Call for PCB only, single supply/polarity, custom application specific or small scale product alternative options.
- ECCN BIS classification: EAR99
  Product Description: General Purpose Precision Op-Amp Circuit.

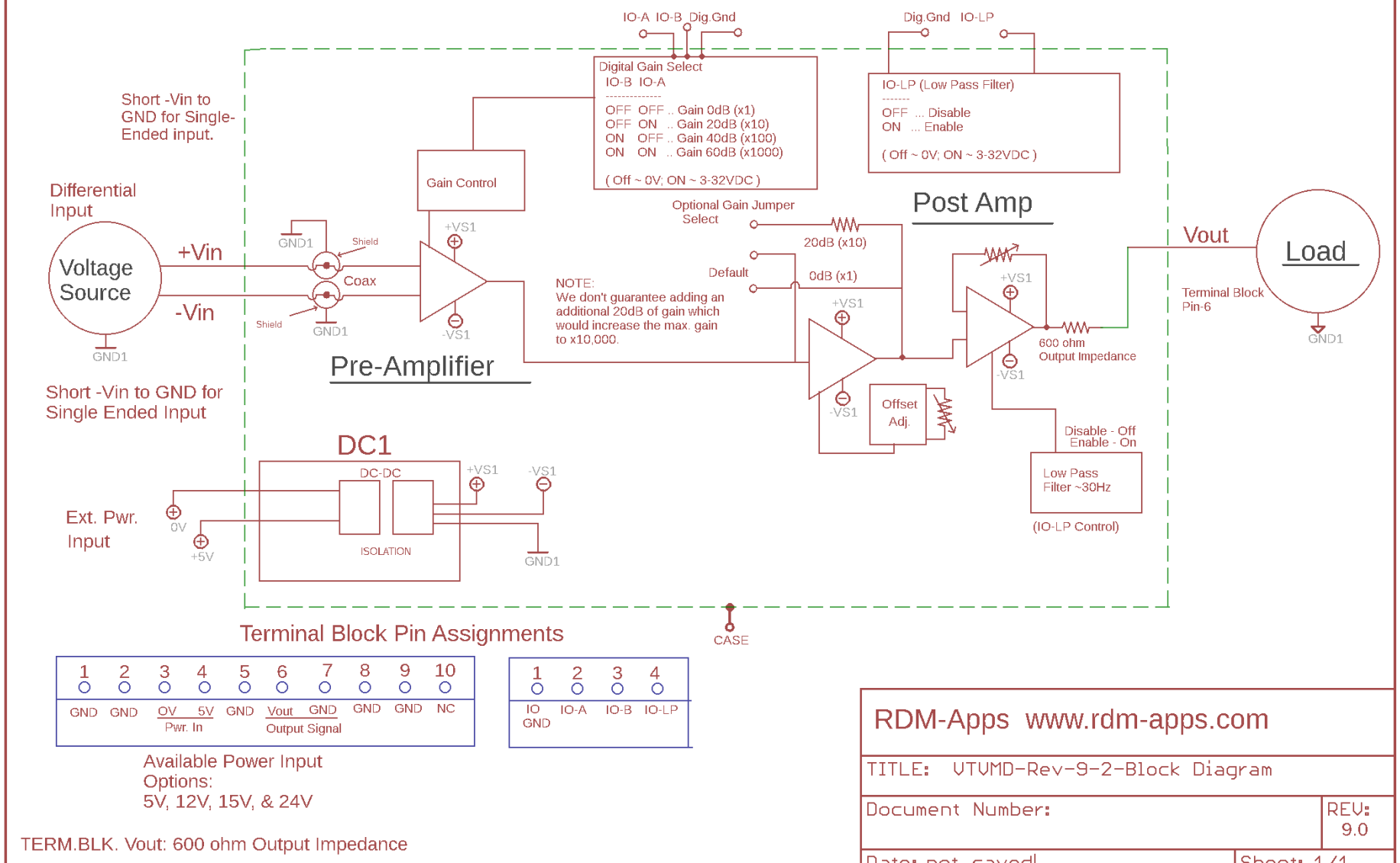
Applications:

- General Purpose / Universal Precision Voltage Amplifier
- Accurate Instrumentation Level Voltage Measurements
- Industrial and Scientific Sensors
- Detector Preamplifier
- Integrated Measurement Systems for Scientific and Industrial
- Applications
- Pulsed thermal EMF Analysis
- Chopped thermopiles & Bolometers
- Medical Instrumentation
- Transducer Interfaces
- Precision Data Acquisition
- Microphone Preamplification
- Vibration Analysis
- Multiplexed Input
- ADC Driver
- Analog Output Control applications:
  1.) Multiplication, Division, Squaring
  2.) Modulation or demodulation
  3.) Phase detection
  4.) Voltage-controlled amplifiers or attenuators or filters

CONTACT INFORMATION

	Precision Series Module 4 Selectable Gain Ranges	**Precision Series Module** 4 Selectable Gain Ranges	**High Speed Series Module** 4 Selectable Gain Ranges	**High Speed Series Module** Fixed Gain (20dB)	**High Voltage Series Module** 3 Selectable Gains
	VTVMD10FE4-30G VTVMS10FE4-30G **Recommended for most Apps.**	VTVMD10FE4-1T VTVMS10FE4-1T	VTVM8PS10FE4-50	Vtvm8-20-1-00	VTVMHV-60V-28W-0-40dB
Input Type - Bipolar	Differential / Single ended	Differential / Single Ended	Single ended	Single ended	Single ended
ESD Protection	None	4KV	None	None	None
Input Bias	< 100pA	< 3pA	< 10pA	< 10pA	< 200pA
Input Impedance	< 29GΩ	< 10TΩ	50Ω	50Ω	< 1MΩ
Voltage Source Output impedance:	< 1GΩ	< 100GΩ	50Ω	50Ω	<10MΩ
Accuracy; Gain <= 60dB; @Spec. Gain Setting - better than	±0.1%	±0.1%	±1%	±1%	±1%
Accuracy; Gain <= 60dB; between Gain Settings - better than	±0.25%	±0.25%	±0.5%	±0.5%	±0.5%
Accuracy; Gain <= 60dB; Overall - better than	±0.50%	±0.50%	±1%	±1%	±1%
Accuracy; Gain = 80dB; Overall - better than	±1.0%	±1.0%			
Output Impedance	600**Ω**	600**Ω**	50**Ω**	50**Ω**	1**Ω**
BW (-3dB) ... Gain Setting: 0db	0Hz to 700Khz @ ±10Vpeak	0Hz to 500Khz @ ±10Vpeak	0Hz to 10Mhz @ ±10Vpeak		Slew Rate 25V/us
BW (-3dB) ... Gain Setting: 20db	0Hz to 300KHz @ ±10Vpeak	0Hz to 300Khz @ ±10Vpeak	0Hz to 10Mhz @ ±10Vpeak	100KHz to 300Mhz @ ±1Vp	Slew Rate 25V/us
BW (-3dB) ... Gain Setting: 40db	0Hz to 100Khz @ ±10Vpeak	0Hz to 50Khz @ ±10Vpeak	0Hz to 6Mhz @ ±10Vpeak		Slew Rate 25V/us
BW (-3dB) ... Gain Setting: 60db	0Hz to 50Khz @ ±10Vpeak	0Hz to 35Khz @ ±10Vpeak	0Hz to 2Mhz @ ±10Vpeak		
BW (-3dB) ... Gain Setting: 80db	0Hz to 5.0Khz @ ±10Vpeak	0Hz to 1.0Khz @ ±10Vpeak			
Low Pass Filter - Fixed	< 30Hz	< 30Hz	< 30Hz	< 30Hz	< 30Hz
Input Noise [nV/√Hz] @ gains 20db / 80dB ... less than	75 / 8	75 / 8	20 / 1	5	20
Input Drift [µV/°C]... less than	2.0	2.0	2.0	2.0	15.0
Output Voltage Range; Into a high impedance Load … Load impedance >100KΩ	±10Vdc; ±10Vpeak; ±7.07Vrms	±10Vdc; ±10Vpeak; ±7.07Vrms	±10Vdc; ±10Vpeak; ±7.07Vrms	±2.8 Vdc; ±2.8 Vpeak; ±1.98 Vrms	±60Vdc
Output Voltage Range; Into a 50Ω Load			±5Vdc; ±5Vpeak; ±3.5Vrms	±1.4 Vdc; ±1.4 Vpeak; ±1 Vrms;	±60Vdc
Output Current - Max.; Zout=600Ω; Standard Module	±15mA	±15mA			
Output Current - Max.; Zload=>50Ω			±200mA	±30mA	±0.5A (<30W Max. Output Power)
Power Supply Voltage	+4.5V to +9Vdc	+4.5V to +9Vdc	+9V to +18Vdc	+4.5V to 9Vdc	+24Vdc
In / Out Connectors (Default: SMA)	BNC, SMA, SMB or SMC	BNC, SMA, SMB or SMC	BNC, SMA, SMB or SMC	BNC, SMA, SMB or SMC	Terminal Block Only

Block Diagram - VTVMD Series Precision Multi-Range Voltage Amplifier - Differential Input



Terminal Block Plug-In: Part# OSTTJ105153 (Digikey) or Part# 1757093 (Mouser) Pluggable Terminal Blocks 10 Pos 5.08mm pitch Plug 24-12 AWG Screw 	LINKS TO ENCLOSURE DETAILS: **VTVMD Precision Series Module Enclosure**
Terminal Block Plug-In: Part# 732-2042-ND (Digikey) or Part# 710-691351500004 (Mouser)  Pluggable Terminal Blocks 4 Pos 5.08mm pitch Plug 24-12 AWG Screw	

Continue to next page …

Insufficient input shielding applied to the VTVM module could increase the noise-signal ratio which could result in VTVM input or output inaccuracy. Default VTVM power input(s): +4.9VDC to +9VDC

VTVMD Series Precision Multi-Range Voltage Amplifier PCB diagram:

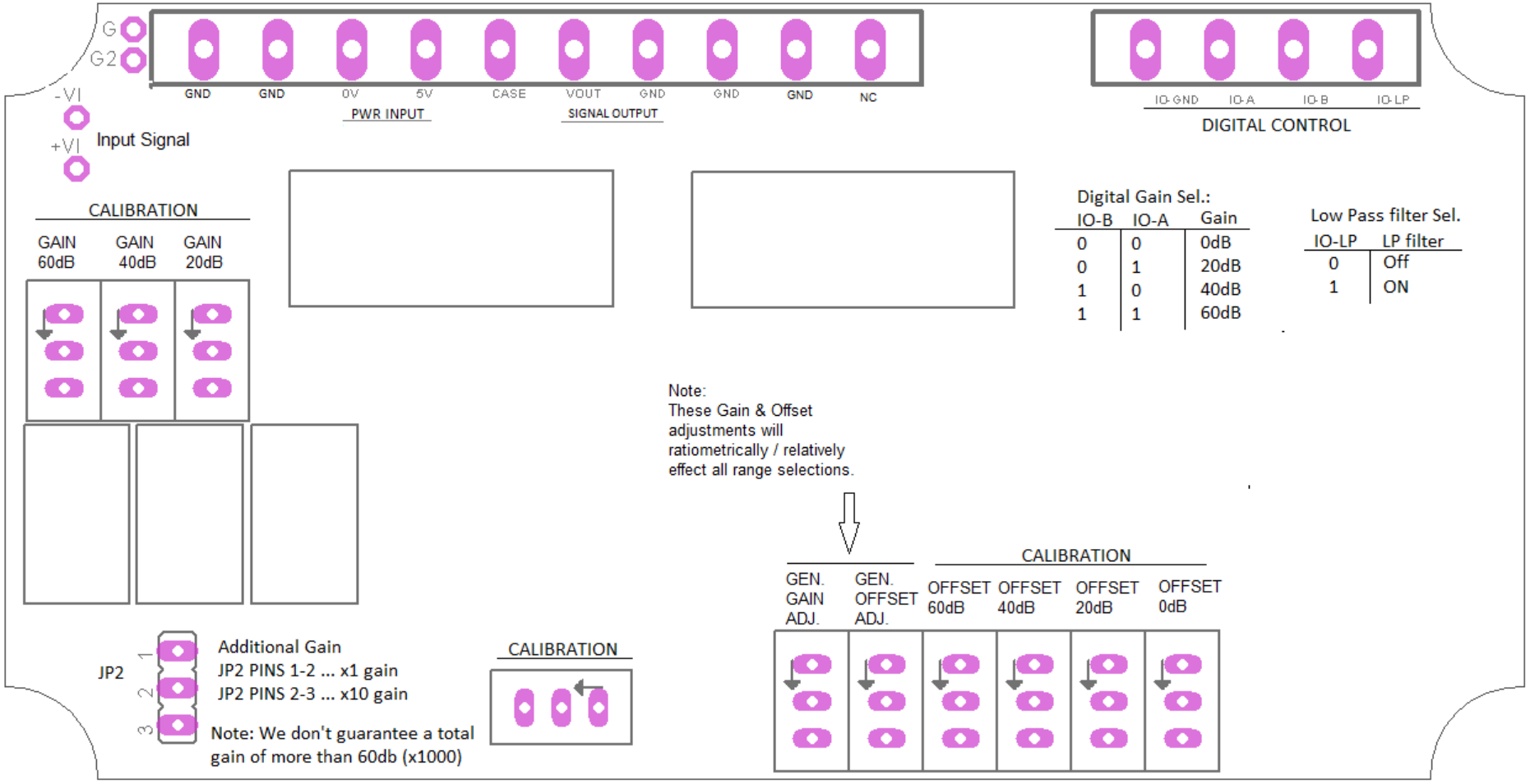


Table #1

VTVMD Series Binary Logic Table
Digital Gain Control: (3.3V, 5V, 12V & 24V compatible logic levels)

Dig. Input	**Gain 0dB (x1)**	**Gain 20dB (x10)**	**Gain 40dB (x100)**	**Gain 60dB (x1000)**
IO-B	0	0	1	1
IO-A	0	1	0	1

Table #2

VTVMD Series Binary Logic Table
Digital Gain Control: (3.3V, 5V, 12V & 24V compatible logic levels)

Dig. Input	**Low Pass Filter ON**	**Low Pass Filter Off**
IO-LP	1	0

Continue to next page …

VTVMD series Full Calibration Procedure of all Gain Ranges for Precision modules:

Note: Use this below procedure to independently calibrate each gain selection.

Required Conditions:

1.) VTVM Module must have required DC power applied.
2.) Allow VTVM module to warm up for at least 3 mins. Before continuing to the procedure.
3.) It is advised to set the 25 turn Gen. Gain & Gen. Offset trim pots. to their mid-range positions. This can be done by turning each trim pot. to it's most clockwise position and then turn 12.5 turns back in the counter-clockwise position. You will know the trim pot. is in it's most clockwise position when you hear a mechanical click.

VTVMD Series Binary Logic Table Settings & Gain / Offset adjustment potentiometers
Digital Gain Control: (3.3V, 5V, 12V & 24V compatible logic levels)

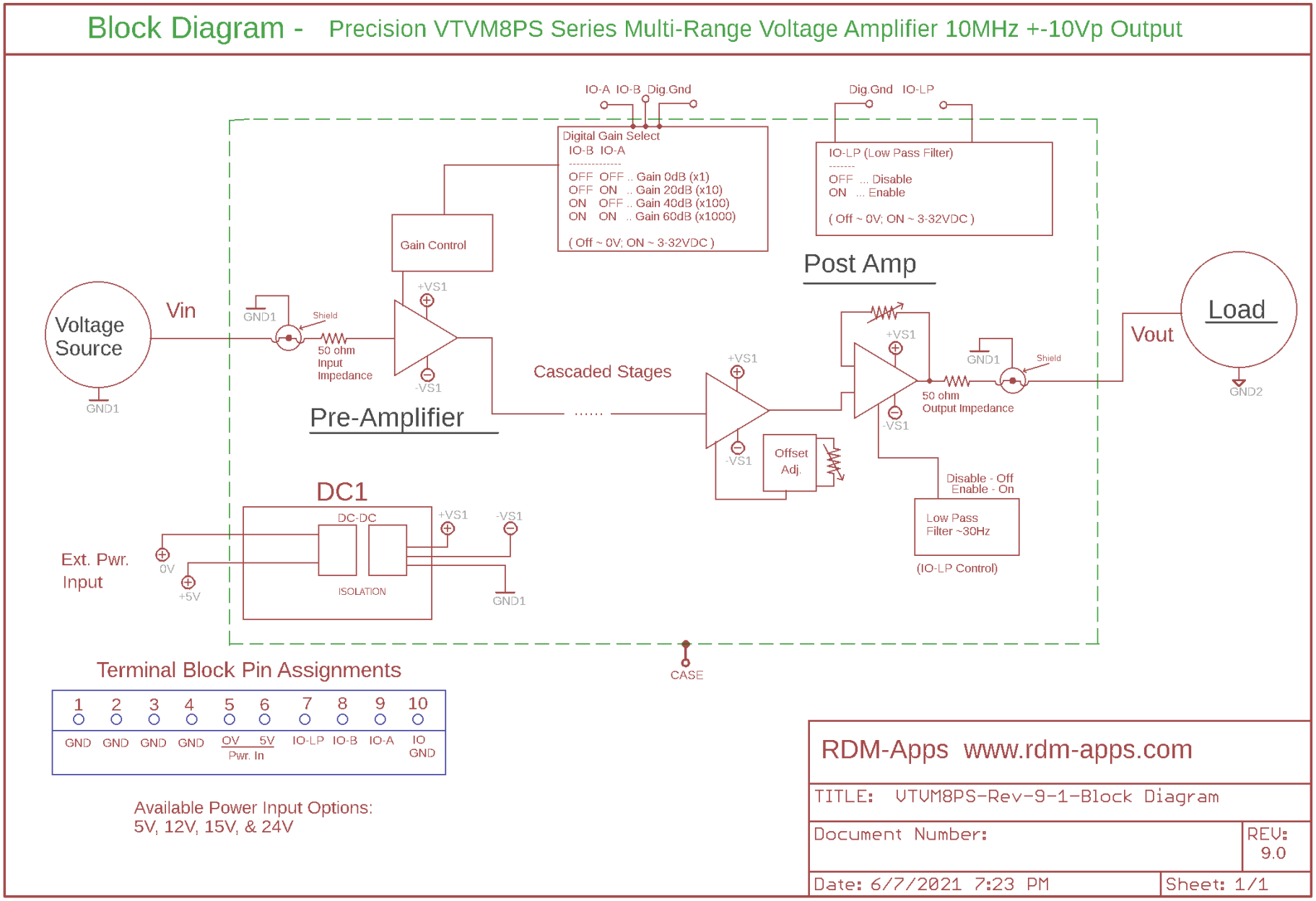
Dig. Input	**Gain 0dB (x1)**	**Gain 20dB (x10)**	**Gain 40dB (x100)**	**Gain 60dB (x1000)**
IO-B	0	0	1	1
IO-A	0	1	0	1
Gain Pot.	Gen. Gain Adj.	Gain 20dB	Gain 40dB	Gain 60dB
Offset Pot.	Offset 0dB	Offset 20dB	Offset 40dB	Offset 60dB

Procedure (do for each gain setting):

1.) Refer to the above table and digitally set the IO-B & IO-A to the Gain setting you wish to calibrate. Use the applicable Gain / Offset potentiometers for adjustment. Connect your voltage source to the VTVM input. Set the voltage source to zero volts out (or short all signal inputs to ground) and then adjust corresponding OFFSET pot. until the VTVM output is approximately 0.000V.
2.) With a known voltage applied to the VTVM input adjust the GAIN pot. until the output voltage corresponds to the applicable input. For example, if 500mV is applied to the VTVM input and the gain setting you are calibrating is x10 then adjust the GAIN until the output is approximately 5.000V.

Note(s):

You will probably have to repeat procedure steps 1 and 2 a couple of times to assure proper calibration. If the Gain adjustment potentiometer is set to one of the extreme top or bottom extents extremely high or low gain states can occur which may cause confusion when making sequential offset and gain adjustments. Also, we advise you adjust the gain for anyone setting using an input voltage that is a mid-range value. For example, if the gain you are calibrating is x100 and the maximum output is 10V then apply 50mV to the VTVM input and adjust the gain so the VTVM output is 5.000V. You can also do this using a -50mV and -5V, respectively.


Block Diagram - Precision VTVM8PS Series Multi-Range Voltage Amplifier 10MHz +-10Vp Output
IO-A IO-B Dig.Gnd
Digital Gain Select
IO-B IO-A
OFF OFF .. Gain 0dB (x1)
OFF ON .. Gain 20dB (x10)
ON OFF .. Gain 40dB (x100)
ON ON .. Gain 60dB (x1000)
(Off ~ 0V; ON ~ 3-32VDC)
Dig.Gnd IO-LP
IO-LP (Low Pass Filter)
OFF ... Disable
ON ... Enable
(Off ~ 0V; ON ~ 3-32VDC)
Gain Control
Post Amp
Voltage Source
Vin
GND1
Shield
50 ohm Input Impedance
+VS1
-VS1
Pre-Amplifier
Cascaded Stages
Offset Adj.
50 ohm Output Impedance
Vout
Load
GND2
Disable - Off
Enable - On
Low Pass Filter ~30Hz
(IO-LP Control)
DC1
DC-DC
ISOLATION
Ext. Pwr. Input
0V
+5V
CASE
Terminal Block Pin Assignments
1 2 3 4 5 6 7 8 9 10
GND GND GND GND 0V 5V IO-LP IO-B IO-A IO GND
Pwr. In
Available Power Input Options:
5V, 12V, 15V, & 24V
RDM-Apps www.rdm-apps.com
TITLE: VTVM8PS-Rev-9-1-Block Diagram
Document Number:
REV: 9.0
Date: 6/7/2021 7:23 PM
Sheet: 1/1

Insufficient input shielding applied to the VTVM module could increase the noise-signal ratio which could result in VTVM input or output inaccuracy. Default VTVM power input(s): +4.9VDC to +9VDC

VTVM8PS Series Multi-Range Voltage Amplifier (+-10Vp Output) PCB diagram:

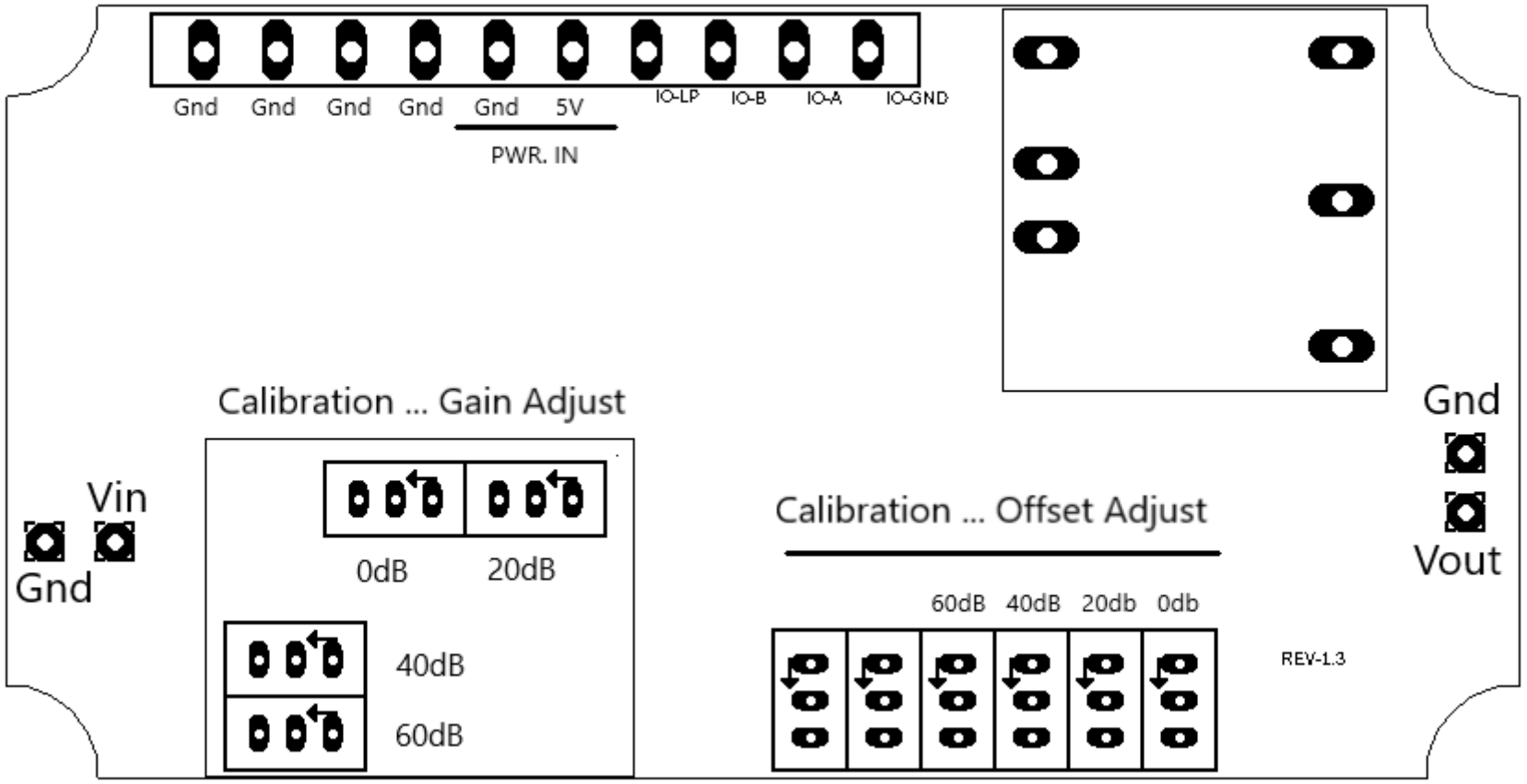


Table #1

VTVM8PS Series Binary Logic Table
Digital Gain Control: (3.3V, 5V, 12V & 24V compatible logic levels)

Dig. Input	**Gain 0dB (x1)**	**Gain 20dB (x10)**	**Gain 40dB (x100)**	**Gain 60dB (x1000)**
IO-B	0	0	1	1
IO-A	0	1	0	1

Table #2

VTVM8PS Series Binary Logic Table
Digital Gain Control: (3.3V, 5V, 12V & 24V compatible logic levels)

Dig. Input	**Low Pass Filter ON**	**Low Pass Filter Off**
IO-LP	1	0

Continue to next page …

VTVM8PS series Full Calibration Procedure of all Gain Ranges for Precision modules:

Note: Use this below procedure to independently calibrate each gain selection.

Required Conditions:

1.) VTVM Module must have required DC power applied.
2.) Allow VTVM module to warm up for at least 3 mins. Before continuing to the procedure.
3.) It is advised to set the 25 turn Gen. Gain & Gen. Offset trim pots. to their mid-range positions. This can be done by turning each trim pot. to it's most clockwise position and then turn 12.5 turns back in the counter-clockwise position. You will know the trim pot. is in it's most clockwise position when you hear a mechanical click.

VTVM8PS Series Binary Logic Table Settings & Gain / Offset adjustment potentiometers
Digital Gain Control: (3.3V, 5V, 12V & 24V compatible logic levels)

Dig. Input	**Gain 0dB (x1)**	**Gain 20dB (x10)**	**Gain 40dB (x100)**	**Gain 60dB (x1000)**
IO-B	0	0	1	1
IO-A	0	1	0	1
Gain Pot.	Gain 0dB	Gain 20dB	Gain 40dB	Gain 60dB
Offset Pot.	Offset 0dB	Offset 20dB	Offset 40dB	Offset 60dB

Procedure (do for each gain setting):

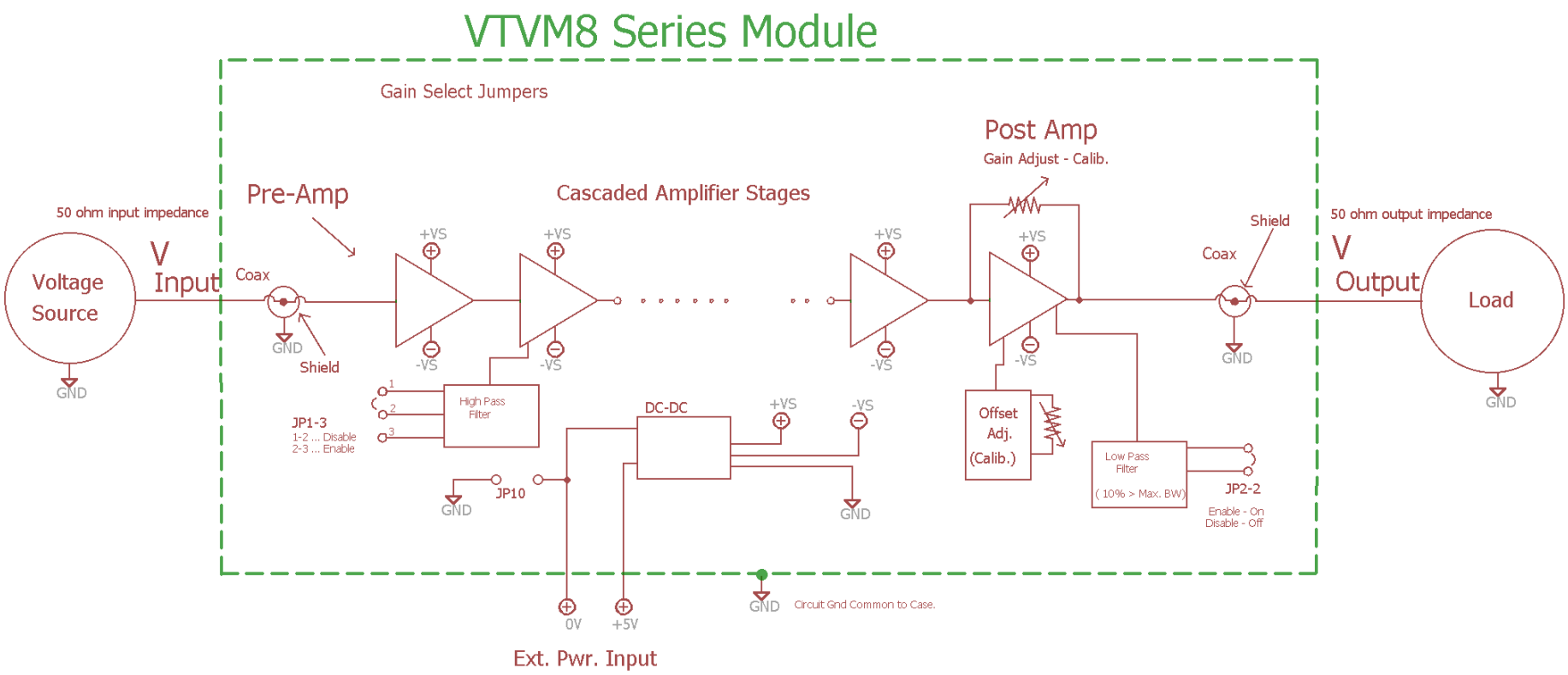
1.) Refer to the above table and digitally set the IO-B & IO-A to the Gain setting you wish to calibrate. Use the applicable Gain / Offset potentiometers for adjustment. Connect your voltage source to the VTVM input. Set the voltage source to zero volts out (or short all signal inputs to ground) and then adjust corresponding OFFSET pot. until the VTVM output is approximately 0.000V.
2.) With a known voltage applied to the VTVM input adjust the GAIN pot. until the output voltage corresponds to the applicable input. For example, if 500mV is applied to the VTVM input and the gain setting you are calibrating is x10 then adjust the GAIN until the output is approximately 5.000V.

Note(s):

You will probably have to repeat procedure steps 1 and 2 a couple of times to assure proper calibration. If the Gain adjustment potentiometer is set to one of the extreme top or bottom extents extremely high or low gain states can occur which may cause confusion when making sequential offset and gain adjustments. Also, we advise you adjust the gain for anyone setting using an input voltage that is a mid-range value. For example, if the gain you are calibrating is x100 and the maximum output is 10V then apply 50mV to the VTVM input and adjust the gain so the VTVM output is 5.000V. You can also do this using a -50mV and -5V, respectively.

Terminal Block Plug-In: Part# OSTTJ105153 (Digikey) or Part# 1757093 (Mouser) Pluggable Terminal Blocks 10 Pos 5.08mm pitch Plug 24-12 AWG Screw 	LINKS TO ENCLOSURE DETAILS: **VTVM8PS10FE4-50 Module Enclosure**

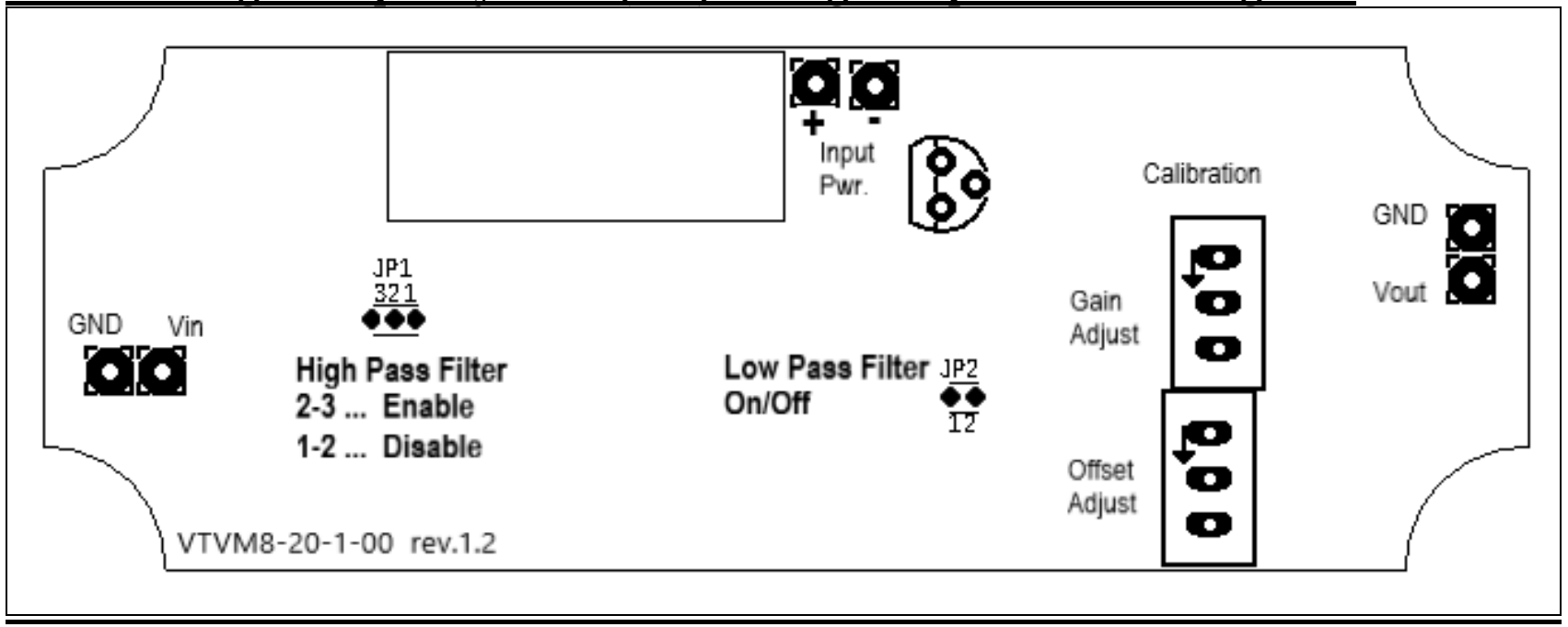
Block Diagram - Precision High Freq. (300MHz -3dB BW) 20dB (x10) +-1.4V Output Voltage Amp. Module



RDM-Apps www.rdm-apps.com	
TITLE: VTVM8-20-1-00 Block-Diagram-1	
Document Number:	REV: 1.0
Date: 7/15/2022 10:01 AM	Sheet: 1/1

Insufficient input shielding applied to the VTVM module could increase the noise-signal ratio which could result in VTVM input or output inaccuracy. **Default VTVM power input(s): +4.9VDC to +9VDC**

Precision High Frequency 20dB (x10) Voltage Amplifier PCB Diagram:



Full Calibration Procedure for Precision VTVM8-20-1-00 module

1.) Use the Gain / Offset potentiometers shown in the above diagram for calibration adjustments. Connect your voltage source to the VTVM input. Set the voltage source to zero volts out (or short signal input to ground/case) and then adjust the OFFSET pot. until the VTVM output is approximately 0.000V.
2.) With a known voltage applied to the VTVM input adjust the GAIN pot. until the output voltage corresponds to the applicable input. For example, if 200mV peak-peak is applied to the VTVM input then the output should be 1.0V peak (0.707Vrms) since the gain is 20dB(x10)

Note(s):

You will probably have to repeat procedure steps 1 and 2 a couple of times to assure proper calibration. If the Gain adjustment potentiometer is set to one of the extreme top or bottom extents extremely high or low gain states can occur which may cause confusion when making sequential offset and gain adjustments. Also, we advise you adjust the gain using a mid-range input value as in the above example.

LINKS TO ENCLOSURE DETAILS: VTVM8-20-1-50 Module Enclosure

VTVMHV Series Documentation