

Controller Specifications

24-Hour Accuracy

The 24-hour accuracy specification indicates the controller's relative accuracy over its full measurement range for short time intervals and within a stable environment. Short-term accuracy is specified for a 24-hour period and for a $\pm 2^{\circ}\text{C}$ temperature range.

1-Year Accuracy

These long-term accuracy specifications are valid for a $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ temperature range. These specifications include the initial calibration errors plus the controller's long-term drift errors.

Temperature Coefficients

Accuracy is specified for a Calibration Temperature $\pm 5^{\circ}\text{C}$ temperature range. This is a common temperature range for many operating environments. You must add additional temperature coefficient errors to the accuracy specification if you are operating the controller's outside a $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ temperature range.

Terminal Specifications

Analog Inputs 1, 2, 3 and 4

Analog inputs 1, 2, 3 and 4 are general purpose analog inputs typically used to measure mV accelerometer signals. All four inputs are functionally identical with user-selectable ranges of $\pm 1\text{V}$, $\pm 10\text{V}$ and $\pm 20\text{V}$ and configurable constant current power source for accelerometers. Each input can be individually configured for Single Ended or Differential modes, either with or without capacitor coupling.

Drive Output

Drive output is dedicated to drive an amplifier or servo-hydraulic valve controller. The output has a user-selectable range of $\pm 1\text{V}$ or $\pm 10\text{V}$.

Aux/ Cola Output

Aux/COLA (Constant Output Level Adapter) output is dedicated to trigger a strobe or other external equipment. The output has a user-selectable range of $\pm 1\text{V}$ or $\pm 10\text{V}$. It is also used as an analog output in special purpose applications.

Accuracy Specifications \pm (% of reading + % of range)

Function	Range	Input Frequency (Hz)	Analog Input 1, 2, 3 and 4		
			24 Hour Tcal $\pm 2^{\circ}\text{C}$	1 Year Tcal $\pm 5^{\circ}\text{C}$	Temperature Coefficient/ $^{\circ}\text{C}$ 0 $^{\circ}\text{C}$ to (Tcal -5 $^{\circ}\text{C}$) (Tcal +5 $^{\circ}\text{C}$) to 50 $^{\circ}\text{C}$
Voltage	$\pm 10\text{V}, \pm 20\text{V}$	1-10	$\pm 2.0 + 0.0005$	$\pm 2.0 + 0.0005$	0.1 + 0.0000
	$\pm 10\text{V}, \pm 20\text{V}$	10-2000	$\pm 0.5 + 0.0005$	$\pm 1.0 + 0.0005$	0.1 + 0.0000
	$\pm 10\text{V}, \pm 20\text{V}$	2000-8000	$\pm 0.7 + 0.0005$	$\pm 1.2 + 0.0005$	0.1 + 0.0000
	$\pm 10\text{V}, \pm 20\text{V}$	8000-10000	$\pm 1.0 + 0.0005$	$\pm 1.5 + 0.0005$	0.1 + 0.0000
	$\pm 10\text{V}, \pm 20\text{V}$	10000-15000	+1.5 + 0.0005 -(1.0 + 0.0005)	+2.0 + 0.0005 -(1.5 + 0.0005)	0.1 + 0.0000
	$\pm 10\text{V}, \pm 20\text{V}$	15000-20000	+3.0 + 0.0005 -(1.0 + 0.0005)	+3.0 + 0.0005 -(1.5 + 0.0005)	0.1 + 0.0000
	$\pm 10\text{V}, \pm 20\text{V}$	20000-25000	+4.0 + 0.0005 -(1.0 + 0.0005)	+4.0 + 0.0005 -(1.5 + 0.0005)	0.1 + 0.0000
	$\pm 10\text{V}, \pm 20\text{V}$	25000-33000	+5.0 + 0.0005 -(1.0 + 0.0005)	+5.0 + 0.0005 -(1.5 + 0.0005)	0.1 + 0.0000
	$\pm 1\text{V}$	1-10	$\pm 2.0 + 0.0025$	$\pm 2.0 + 0.0025$	0.1 + 0.0000
	$\pm 1\text{V}$	10-2000	$\pm 0.5 + 0.0025$	$\pm 1.0 + 0.0025$	0.1 + 0.0000
	$\pm 1\text{V}$	2000-8000	$\pm 0.7 + 0.0025$	$\pm 1.2 + 0.0025$	0.1 + 0.0000
	$\pm 1\text{V}$	8000-10000	$\pm 1.0 + 0.0025$	$\pm 1.5 + 0.0025$	0.1 + 0.0000
	$\pm 1\text{V}$	10000-15000	+1.5 + 0.0025 -(1.0 + 0.0025)	+2.0 + 0.0025 -(1.5 + 0.0025)	0.1 + 0.0000
	$\pm 1\text{V}$	15000-20000	+3.0 + 0.0025	+3.0 + 0.0025	0.1 + 0.0000

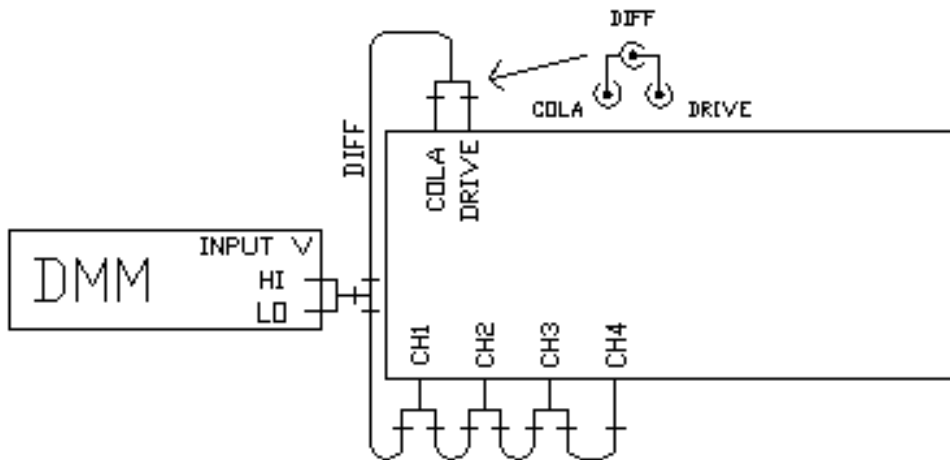
			$-(1.0 + 0.0025)$	$-(1.5 + 0.0025)$	
	$\pm 1V$	20000-25000	$+4.0 + 0.0025$	$+4.0 + 0.0025$	$0.1 + 0.0000$
	$\pm 1V$	25000-33000	$-(1.0 + 0.0025)$	$-(1.5 + 0.0025)$	
			$+5.0 + 0.0025$	$+5.0 + 0.0025$	$0.1 + 0.0000$
			$-(1.0 + 0.0025)$	$-(1.0 + 0.0025)$	

Function	Range	Output Frequency Hz	Drive Output and Aux/Cola Output		
			24 Hours	1 Year	Temperature Coefficient/ $^{\circ}C$
Voltage	$\pm 1V, \pm 10V$	1-10	$\pm 2.0 + 0.0005$	$\pm 2.0 + 0.0005$	$0.1 + 0.0000$
	$\pm 1V, \pm 10V$	10-10000	$\pm 1.0 + 0.0005$	$\pm 1.5 + 0.0005$	$0.1 + 0.0000$
	$\pm 1V, \pm 10V$	10000-15000	$\pm 1.5 + 0.0005$	$\pm 2.0 + 0.0005$	$0.1 + 0.0000$
	$\pm 1V, \pm 10V$	15000-20000	$+1.5 + 0.0005$ $-(3.0 + 0.0005)$	$+2.0 + 0.0005$ $-(3.0 + 0.0005)$	$0.1 + 0.0000$
	$\pm 1V, \pm 10V$	20000-25000	$+1.5 + 0.0005$ $-(5.0 + 0.0005)$	$+2.0 + 0.0005$ $-(5.0 + 0.0005)$	$0.1 + 0.0000$
	$\pm 1V, \pm 10V$	25000-33000	$+1.5 + 0.0005$ $-(10.0 + 0.0005)$	$+2.0 + 0.0005$ $-(10.0 + 0.0005)$	$0.5 + 0.0000$
Frequency	$\pm 1V, \pm 10V$	3-40	$\pm 0.1 + 0.0000$	$\pm 0.5 + 0.0000$	$0.01 + 0.0000$
	$\pm 1V, \pm 10V$	40-33000	$\pm 0.05 + 0.0000$	$\pm 0.5 + 0.0000$	$0.01 + 0.0000$

Required Equipment

- (5) BNC (coaxial) cables
- (4) BNC Tee connectors to connect the BNC cables together
- Differential mode Tee
- Agilent 34401A or 34410A digital multimeter (DMM) with valid calibration certificate. The DMM is our sole reference source for this procedure.

Figure 1: Connection diagram



Measurement Details

The calibrated reference is either an Agilent 34401A or an Agilent 34410A DMM. The accuracy specifications were determined incorporating the uncertainties inherent to these DMMs. The VR9500 Drive output is used to generate a single-ended sinusoidal output. The VR9500 Drive output is paired with the VR9500 Aux/COLA output to produce a differential sinusoidal output. The reference output is nominally $1.414 V_{pk-pk}$ ($1.00 V_{RMS}$). Each input is verified both single-ended and differentially. The outputs and the inputs are verified simultaneously.

At frequencies below 5Hz the DMM is used in 5-1/2 digit mode to acquire the reference at 300 samples per second using DC peak-hold mode. The Maximum minus the Minimum value of the acquired reference is then

divided by 2 times the square root of 2 to convert the double-amplitude peak value to a reference sinusoidal RMS value.

At frequencies above 5Hz the DMM is used in 6-1/2 digit mode to directly measure AC RMS voltage. The slow filter setting is used from 5Hz to 200Hz, the medium filter is used from 200Hz to 1000Hz, and the fast filter is used at and above 1000Hz.

The Agilent 34401A must be configured for RS232, 9600Baud, 8 Bit, No parity, and Language =SCPI. The Agilent 34410A can be configured the same way, and may also be configured to communicate via Ethernet. For Ethernet communications, the Agilent communication software must be installed on the PC.

Field Procedure

1. Connect a power cord to the VR9500 unit.
2. Turn the unit on, and allow 1 hour for the temperature to stabilize.
3. Connect the Differential Adapter to the Drive and Cola outputs of the VR9500 unit, as shown in figure 1.
4. Connect (5) BNC cables together with (4) Tee connectors.
5. Connect one end of the cable to the output of the Differential Adapter
6. Connect the other end of the cable to the DMM.
7. Run VibrationVIEW.
8. Select the Test..System Check menu command.
9. Select the Configuration..Verification menu command.
10. Select Device "Agilent 34401A connected to CommN", and connect the Agilent 34401A or 34410A to the selected Comm port N. (VibrationVIEW also supports the Agilent 34410A USB and network connections. This requires the Agilent IO Control application.)
11. Select the configuration setting "Calibration Verification 9500"
12. Press "Next >" to connect to the DMM.
13. Once communication with the DMM is established, you will receive connection instructions. Verify that your connections are made in accordance with the displayed diagram.
14. Press "Next >" to start verification. A form will be displayed, pre-filled with the DMM details. Fill in the remaining fields with appropriate values.
15. The calibration will proceed. Wait for the automated procedure to complete.
16. If anything fails to meet the 1-hour factory specifications, you will receive a warning message. Check your cable connections and procedure to ensure that proper connection instructions and procedure were followed. If proper procedure has been followed and the result remains out of the specifications, then the VR9500 must be recalibrated. Contact the factory for recalibration information.
17. Upon completion, you will be prompted to save a report file. Enter a file name (or accept the automatically generated name) and click "Save".
18. If report indicates calibration is good, then you will also be prompted to generate a Calibration Certificate. Generating a certificate will also reset the "calibration due" date in the VR9500, and store the reports and data in the permanent memory of the VR9500 unit. Click "Yes".
19. You will be prompted for a file name for the certificate. Enter a file name (or accept the automatically generated name) and click "Save".
20. With VibrationVIEW software open and controller communicating, measure the voltage on the "aux inputs/outputs" connector on back of the VR9500 between pin 29 (+5V) and pin 30 (GND). If this voltage is less than 4.9 VDC contact the factory. This does not affect calibration in any way, but continued equipment reliability may be compromised.

Special instructions for systems with more than one VR9500.

Multiple Box Procedure

Only the VR9500 configured for channels 1-4 is verified when using the Configuration..Verification function. To verify all VR9500 units in a system with multiple VR9500 units, follow this procedure:

1. Open menu *Configuration..Parameters*.
2. Record the existing box assignment in *table 1*.
3. Assign box to be calibrated to Channels 1-4, and clear out all other box assignments.
4. Run the Automated Calibration Verification procedure for that VR9500 unit.
5. Repeat steps 3 and 4 for each VR9500 unit to be calibrated.
6. Restore existing control box assignments from *table 1*.

Table 1: Assign channels to Control Boxes (s/n)

Channels 1-4	
Channels 5-8	
Channels 9-12	
Channels 13-16	
Channels 17-20	
Channels 21-24	
Channels 25-28	
Channels 29-32	