



Valhalla Scientific, Inc.  
Calibration Laboratory  
12127 Kirkham Rd  
Poway, CA 92064 (858) 457-5576

**VALHALLA SCIENTIFIC MODELS  
2703 – 2705**

***ROUTINE MAINTENANCE  
AND  
CALIBRATION PROCEDURE***

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## 1 General

This section contains routine maintenance procedures designed to provide maximum utility from the Model 2703/05. Included are cleaning instructions and a calibration procedure. It is assumed throughout this section that the calibration technician is familiar with operation of the 2703/05 as described in Section 6. If desired, the Model 2703/05 may also be returned to the factory for maintenance and calibration traceable to NIST.

## 2 Periodic Maintenance

As a recommendation, the Model 2703/05 should be operated in a dust-free, clean environment. However, if the unit is exposed to contaminants periodic cleaning will be required.

Loose dirt or dust on the exterior surfaces may be removed with a dry soft cloth or brush. Any remaining residue may be removed with a soft cloth dampened in a mild soap and water solution. **Do not use abrasive cleaners!**

The front panel may be cleaned with a soft cloth and a glass cleaner such as Windex or its equivalent. **Do not use petroleum based cleaners on the front panel!**

If required, the interior may be cleaned by blowing with dry compressed air. The filter for the intake fan is removable and should be kept clean to ensure maximum airflow. The filter element may be cleaned by blowing with compressed air. Replacement filter elements are available as Valhalla Stock #05-10494.

If the unit becomes heavily contaminated with dirt or other residue, a complete overhaul is recommended. Contact your local Valhalla Scientific representative or the factory for details.

## 3 Calibration

The calibration procedure should be performed on a regular basis (annually is recommended) to ensure that the Model 2703/05 remains within the specifications set forth in Section 2 of its user-service manual. The 2703/05 should be allowed to warm-up for a minimum of one (1) hour with the covers in place in a stable environment prior to beginning the procedure.

Due to the differences between the procedures for the Model 2703 and Model 2705, a separate procedure is provided for each instrument. Refer to section 3.1 for the 2703, and to section 3.2 for the 2705 procedure.

### 3.1 Model 2703 Calibration

This section describes routine calibration of the Model 2703. The procedure should be performed with all covers in place using the front panel controls. Adjustment of the internal potentiometers may be required following repair or component replacement. If internal adjustments are required, contact the factory for advice.

#### 3.1.1 Required Test Equipment

Performance of the calibration procedure requires the following items:

- A precision AC measurement standard such as the DATRON 4920.

or

- A thermal-transfer AC measurement system such as the HOLT 6B, in conjunction with a DC voltage calibrator such as the Valhalla Model 2701C.

☞ Most precision DVM's lack the accuracy, linearity, and bandwidth necessary to calibrate the Model 2703/05. Use of one of the devices listed above or its exact equivalent is required in order to calibrate the 2703/05 to the full range of its specifications.

#### 3.1.2 Calibration Configuration Switch

The 2703/05 includes a switch that allows the user to select between a short or long calibration cycle, and to set the .12V range calibration voltage. The long cycle should be used for routine calibration in order to maintain the full range of specifications for the instrument. The short cycle may be used as a rough calibration following maintenance, but is not recommended for routine calibration.

The switches are accessed by removing the top cover of the instrument and locating the 5-pole DIP switch block on the left-hand microprocessor PCB. With the instrument turned off, set the switches as follows (in order from top to bottom):

\_ Always OPEN for 2703. Always CLOSED for 2705.

\_ Leave OPEN for the long calibration cycle of the 2703. Set CLOSED for the short cycle of 2703 (refer to Table 8-1). For 2705, leave this switch in the CLOSED position.

\_ Leave OPEN always.

\_ If OPEN, causes the 2703/05 to calibrate the .12V range at 1 volt instead of .1 volts. This is to ensure compatibility with most thermal voltmeters. Leave this switch CLOSED for normal calibration.

\_ Not used.

### 3.1.3 Calibration Procedure

The short calibration cycle consists of five "cal points", while the long cycle for the 2703 consists of 59 cal points. It is important that a high quality shielded lead set such as Valhalla Option "BBL" be used for calibration. It is also strongly recommended that the instrument be connected in the 4-wire (REMOTE SENSE) configuration for the greatest accuracy.

1. The calibration cycle is activated by turning the rear panel key switch to the CALIBRATE position. The display flashes "cal 2703" (or 2705) and moves to the first cal point.
2. **.100000, 1000Hz** Select OPERATE mode and wait for stabilization of the voltage measuring device. Adjust the voltage amplitude knobs until the output is exactly .100000 volts (or 1.00000 volts depending on the setting of the "calibration configuration switch").
3. After completing the adjustment, enter the correction by pressing the STANDBY/OPERATE switch again. The instrument moves to the next cal point.
4. Each cal point is calibrated in a similar manner. Table 3.1.4 lists the sequence of events in the calibration cycles.

### 3.1.4 Calibration Cycle - Sequence of Cal Points

	<u>Range</u>	<u>Voltage</u>	<u>Frequency</u> <sup>1</sup>	<u>OPERATE Keypress Required?</u>
1	1.2 V	1.00000 V	1000 Hz	Yes
2	.12 V	.100000 V (or 1.00000 V)	1000 Hz	Yes
3	12 V	10.0000 V	1000 Hz	Yes
4	120 V	100.000 V	1000 Hz	Yes
5	1200 V	1000.00 V	10 Hz	Yes

End cycle for short calibration, and for 2705. ■

6	.12 V	.100000 V (or 1.00000 V)	10 kHz	Yes
7	.12 V	.100000 V (or 1.00000 V)	20 kHz	No
8	.12 V	.100000 V (or 1.00000 V)	30 kHz	No
9	.12 V	.100000 V (or 1.00000 V)	40 kHz	No
10	.12 V	.100000 V (or 1.00000 V)	50 kHz	No
11	.12 V	.100000 V (or 1.00000 V)	60 kHz	No
12	.12 V	.100000 V (or 1.00000 V)	70 kHz	No
13	.12 V	.100000 V (or 1.00000 V)	80 kHz	No
14	.12 V	.100000 V (or 1.00000 V)	90 kHz	No
15	.12 V	.100000 V (or 1.00000 V)	100 kHz	No
16	.12 V	.100000 V (or 1.00000 V)	10 Hz	No

<sup>1</sup> For 2705, leave the master set to 100Hz for all cal points.

	<u>Range</u>	<u>Voltage</u>	<u>Frequency</u>	<u>OPERATE Keypress Required?</u>
17	1.2V	1.00000 V	10 kHz	Yes
18	1.2V	1.00000 V	20 kHz	No
19	1.2V	1.00000 V	30 kHz	No
20	1.2V	1.00000 V	40 kHz	No
21	1.2V	1.00000 V	50 kHz	No
22	1.2V	1.00000 V	60 kHz	No
23	1.2V	1.00000 V	70 kHz	No
24	1.2V	1.00000 V	80 kHz	No
25	1.2V	1.00000 V	90 kHz	No
26	1.2V	1.00000 V	100 kHz	No
27	1.2V	1.00000 V	10 Hz	No

28	12 V	10.0000 V	10 kHz	Yes
29	12 V	10.0000 V	20 kHz	No
30	12 V	10.0000 V	30 kHz	No
31	12 V	10.0000 V	40 kHz	No
32	12 V	10.0000 V	50 kHz	No
33	12 V	10.0000 V	60 kHz	No
34	12 V	10.0000 V	70 kHz	No
35	12 V	10.0000 V	80 kHz	No
36	12 V	10.0000 V	90 kHz	No
37	12 V	10.0000 V	100 kHz	No
38	12 V	10.0000 V	10 Hz	No

39	120 V	100.000 V	10 kHz	Yes
40	120 V	100.000 V	20 kHz	No
41	120 V	100.000 V	30 kHz	No
42	120 V	100.000 V	40 kHz	No
43	120 V	100.000 V	50 kHz	No
44	120 V	100.000 V	60 kHz	No
45	120 V	100.000 V	70 kHz	No
46	120 V	100.000 V	80 kHz	No
47	120 V	100.000 V	90 kHz	No
48	120 V	100.000 V	100 kHz	No
49	120 V	100.000 V	10 Hz	No

50	1200 V	1000.00 V	100 Hz	Yes
51	1200 V	1000.00 V	200 Hz	No
52	1200 V	1000.00 V	300 Hz	No
53	1200 V	1000.00 V	400 Hz	No
54	1200 V	1000.00 V	500 Hz	No
55	1200 V	1000.00 V	600 Hz	No
56	1200 V	1000.00 V	700 Hz	No
57	1200 V	1000.00 V	800 Hz	No
58	1200 V	1000.00 V	900 Hz	No
59	1200 V	1000.00 V	1000 Hz	No

"End CAL" displayed; Turn keyswitch back to OPERATE. ■

☞ Any step may be skipped without changing its value by pressing the STANDBY/OPERATE switch before making any adjustment to the VOLTAGE AMPLITUDE controls.

### 3.2 Model 2705 Calibration

The calibration of the 2705 is very similar to that of the "Short Cal" of Model 2703. It requires the same test equipment as in 3.1.1, and uses the same adjustment technique as in 3.1.3. The procedure for setting the internal switches, if required, is the same as described in 3.3.2.

Listed below are the calibration notes that apply to the Model 2705 only:

1. Make sure that the master is set for 1.00000 volts, 100Hz OPERATE at all times.
2. The calibration cycle consists of steps 1 through 5 as listed in Table 3.1.4.

## 4 Remote Calibration via the GPIB

Calibration of the 2703/05 may be performed automatically via the GPIB interface, if installed. The sequence of cal points and the internal switch settings remain the same as described in sections 3.1.3. and 3.1.2, respectively.

The process of adjusting each cal point is essentially identical. Adjustment of cal point #1 is described below:

1. Make connections to the voltage measuring device.
2. Initiate the calibration cycle by turning the rear keyswitch to CALIBRATE.
3. The 2703/05 will be in the 1.2V range, STANDBY. Send the instrument the code "V1" (for the 1 volt cal point) to place it into OPERATE.
4. Let the reading stabilize on the voltage measuring device. If adjustment is required, send the correction using the "V" code as described in section 7-9-1 of the user manual.

For example, if the 1 volt cal point is measured 500 $\mu$ V low, send the code "V1.0005" to bring it up. Send adjustments as necessary for an output of exactly 1.00000 volt.

5. Enter the correction and move to the next cal point by sending the code "C".
6. The subsequent cal points are calibrated in a similar manner. Make sure that the correct OPERATE code is sent for the corresponding cal point as in step c. For example "V.1" for .100000 volts OPERATE, "V100" for 100.000 volts OPERATE, etc.

For 2703, the frequency is selected automatically. For the 2705, the phase lead is always 0°.