Model 1248

BCD Dual Limit Comparator

Operation Manual

VALHALLA SCIENTIFIC

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CERTIFICATION

Valhalla Scientific, Inc. certifies that this instrument was thoroughly tested and inspected and found to meet published specifications when shipped from the factory. Valhalla Scientific, Inc. further certifies that its calibration measurements are traceable to the National Institute of Standards and Technology to the extent allowed by NIST's calibration facility.

WARRANTY

The warranty period for this instrument is stated on your invoice and packing list. Please refer to these to determine appropriate warranty dates. We will repair or replace the instrument during the warranty period provided it is returned to Valhalla Scientific, Inc. freight prepaid. No other warranty is expressed or implied. We are not liable for consequential damages. Permission and a return authorization number must be obtained directly from the factory for warranty repairs. No liability will be accepted if returned without such permission. Due to continuing product refinement and due to possible parts manufacturer changes, Valhalla Scientific reserves the right to change any or all specifications without notice.

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SECTION I UNPACKING & INSTALLATION

1-1. Introduction

The Valhalla Model 1248 BCD Comparator is a device that has been specifically designed to enhance the capabilities of Valhalla ohmmeters and power analyzers. The 1248 "reads" the data indicated on the display of the master unit and compares it to the limits (tolerance) that have been set by the operator. An instantaneous "GO" or "NO-GO" decision is made, reducing operator workload and mental fatigue.

The standard "relay contact closure" feature allows an automated sorting process to be set up at an economical cost. The data inputs of the 1248 are in an industry- accepted parallel BCD format which facilitates custom design applications.

Please refer to Section 3 for complete operating instructions.

1-2. Initial Inspection

If the external shipping container shows evidence of damage, it should be immediately brought to the attention of the carrier and such damage noted on the bill of lading.

Unpack the instrument and retain the shipping container until the instrument has been inspected for possible damage in shipment. If shipment damage is apparent, notify the carrier and obtain authorization for repairs before returning the instrument to the factory. If the external shipping container shows evidence of damage, but the instrument shows no external damage, it may be advisable to check the performance of the unit to determine that the instrument has not sustained hidden damage.

1-3. Power Requirements

The Model 1248 uses little power which is usually supplied by the device to which it is connected. The 1248 may, if necessary, be equipped with its own internal power supply which operates from the AC line.

Externally powered units receive their power via the rear panel data input connector at pins 26 (+5V) and 50 (common). This method is used when interfacing with Valhalla Models 2191, 4014, 4020, 4100ATC, 4150ATC, 4165, 4165-1344, and 4314.

Internally powered units receive their power via an AC power cord and will operate at line voltages from 105VAC to 125VAC, 50-60 Hz. This option is designated as "AC-1" and is required when using the Model 1248 with the Model 4300B Digital Micro-ohmmeter. Option "AC-1" may also be required when using the Model 1248 with some older version instruments. The 1248 may also be wired for operation from 208VAC to 250VAC, 50-60 Hz. Please contact the factory for details.

1-4. Installation

The Model 1248 uses less than 5 watts of power and generates negligible heat. The instrument may be installed in any convenient location that best suits your application. It is recommended that the ambient air temperature around the 1248 not exceed 50°C.

After placing the instrument in the desired location, make the AC power connections (if necessary) and turn on the front panel power switch. The 1248 requires no warm-up period.

SECTION II SPECIFICATIONS & OPTIONS

2-1. Specifications

Input Code Format	Five decades of binary-coded-decimal (BCD) 8-4-2-1 parallel data; or five decades of BCD 8-4-2-1 bit-parallel, digit-serial data with positive logic.
Input Logic Levels	TTL compatible where 0 ≤ 0.7 volts and 1 ≥ 2.4 volts
Maximum Input Voltage	+6 volts DC
Upper Limit Range	Five thumbwheel switches select from 00000 to 99999 counts.
Lower Limit Range	Five thumbwheel switches select from 00000 to 99999 counts.
Out-of-Limit Indications	Separate red LED's indicate either HI (high limit exceeded) or LO (low limit exceeded).
In-Limit Indication	Single green LED indicates that neither limit has been exceeded.
Relay Contacts	Relay contacts close when either limit has been exceeded. Contacts are rated at 100 volts, 100mA.
Optional Internal Power Supply	Option AC-1: Allows operation from 105 to 125 VAC @ 50-60Hz. Option AC-2: Allows operation from 208 to 250 VAC @ 50-60Hz.
Standard External Power Supply Requirements	+5 volts @ 60mA (pin 26 is +5V input and pin 50 is common)
Dimensions	2.5"H x 6.5"D x 6"W (6.5cmH x 16.5cmD x 15.5cmW)
Weights	3lbs (1.5kg) net, 5lbs (2.5kg) shipping

2-2. Options

The optional equipment available for use with the Model 1248 BCD Comparator is described below.

IDC-2 / Input Data Cable

Option IDC-2 is a 2½ foot interface cable designed to connect the Model 1248 to Valhalla instrument Models 2191, 4014, 4020, 4100ATC, 4150ATC, 4165, 4165-1344, and 4314 that have been equipped with the BCD option. This cable has identical male 50 pin connectors on both ends and separate wires for accessing the relay closure function.

IDC-3 / Input Data Cable

Option IDC-3 is identical to the cable described above however it is specifically designed for use with the Valhalla 4300B Digital Micro-ohmmeter. One end of the cable is terminated in a 50 pin male connector that mates with the Model 1248 and the other end is a 24 pin male connector that mates with the 4300B outputs. A 1248 using this cable must be equipped with either Option AC-1 or AC-2.

AC-1 / Internal Power Supply

Option AC-1 eliminates the need for an external power supply for the 1248. This option (or Option AC-2) is ***required*** *when using the Model 1248 with the Valhalla Model 4300B Digital Micro-ohmmeter, however it does not restrict the 1248 from being used with other Valhalla products. Option AC-1 operates from AC line voltages of 105 to 125 volts, 50-60Hz and uses less than 5 watts of power.*

AC-2 / Internal Power Supply

Option AC-2 is similar in function to Option AC-1 above however it operates at AC line voltages from 208 to 250 volts, 50-60Hz.

R-203 / Rack Mount Adapter

Option R-203 allows the Model 1248 to be installed in a standard 19" equipment rack.

SECTION III OPERATION

3-1. General

The Valhalla Model 1248 BCD Comparator is designed for use with devices such as DVM's and Valhalla ohmmeters that have a binary-coded-decimal data output available. The 1248 is compatible with the BCD outputs of the following Valhalla Models: 2191, 4014, 4020, 4100ATC, 4150ATC, 4165, 4165-1344, 4300B, and 4314. The inputs to the 1248 are TTL compatible (see Section 2).

The front panel controls of the 1248 permit setting of upper and lower limits on the input value. When the BCD input is within this "window", the green **GO** indicator is illuminated. If the BCD input falls outside the set window, the appropriate **HI** or **LO** indicator will illuminate. Internal relay contacts close when either the **HI** or **LO** indicator is illuminated. Separate relays and LED's are provided for the upper and lower limits.

3-2. Front Panel Controls

The window for the BCD input value is set via two banks of thumbwheel switches on the 1248 front panel. There are 100,000 possible combinations from 00000 to 99999. Valhalla products use only the range 00000 to 19999.

The **upper limit** is set by dialing up the desired value on the right set of thumbwheel switches. This value is dependant on the actual displayed number (i.e. 12345) with the decimal point being ignored.

The **lower limit** is set using the left set of thumbwheel switches in the same manner as the upper limit and must use the same number of significant digits as the upper limit (i.e. 00995). If the BCD input falls outside of these limits, the corresponding LED will illuminate.

NOTE: The left switches must be used for the lower limit and the right switches for the upper limit. If the number selected for the upper limit is actually *smaller* than the number selected for the lower limit, undefined results will occur.

The **power switch** applies power to the internal circuits when in the ON position.

3-3. Rear Panel Connections

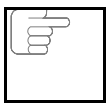
The rear panel is equipped with a female 50 pin Amphenol 57-40500 connector. A male mating connector is supplied as a standard accessory. Additional connectors may be ordered from the factory as Valhalla Stock #05-10013. The pin functions of the rear panel connector are shown in Table 3-1.

When using cables **IDC-2** or **IDC-3**, the 1248 is connected to the end of the cable possessing the individual wire break-outs.

3-4. Data Latches

Some instruments that provide BCD data outputs will hold their last valid reading in a buffer between measurements. Therefore, the reading will not change if the inputs to the instrument are, for example, moved to another device. If, however, the last valid reading is *not* held until a new valid reading is available and the inputs are moved to another test point, the BCD data will be temporarily invalid on the 1248 inputs. These ambiguous inputs may cause the 1248 to indicate that the upper or lower limit has been exceeded.

To combat this problem, the Model 1248 has *latch control lines* available for each bit of data. A logic "1" (or open terminal) tells the latch to transfer any new data as it is received. A logic "0" causes the latch to hold the last reading placed on its inputs (before the $1 \rightarrow 0$ transition) until the latch control line is returned to a logic "1" state. By linking these lines together the flow of data may be controlled to exclude invalid readings.



NOTE: Pin 5 of the rear panel connector determines the latch polarity. A logic "1" (or open) on this pin causes the latch to operate in the manner described above. A logic "0" (0V) on this pin causes the latch to operate in a manner opposite of that described above. i.e. Data is transferred when the latch control line is "0", and data is held when the latch control line is "1".

Refer to Section 4-2-5 for a more technical description of the latch functions.

Table 3-1, Input Connector Pin Functions

Pin #	Function	Pin #	Function
1	1	26	+5VDC supply [1]
2	2	27	N/C
3	4	28	N/C
4	8	29	1's latch [2]
5	Latch polarity [3]	30	10's latch [2]
6	10	31	100's latch [2]
7	20	32	1000's latch [2]
8	40	33	10000's latch [2]
9	80	34	N/C
10	N/C	35	N/C
11	100	36	N/C
12	200	37	N/C
13	400	38	N/C
14	800	39	N/C
15	N/C	40	N/C
16	1000	41	N/C
17	2000	42	N/C
18	4000	43	N/C
19	8000	44	Upper limit closure
20	N/C	45	Upper limit closure
21	10000	46	N/C
22	20000	47	Lower limit closure
23	40000	48	Lower limit closure
24	80000	49	N/C
25	N/C	50	Common (0V)

[1]+5VDC line requires 60mA (standard unit) or can provide up to 10mA (Options AC-1 and AC-2)

[2]These lines can be used to control the flow of information to the comparators. Refer to Sections 3-4 and 4-2-5.

[3]This line determines whether data is transferred from the latches to the comparators with a "1" or a "0" on the control lines. Refer to Sections 3-4 and 4-2-5.

SECTION IV THEORY OF OPERATION

4-1. General

The Model 1248 BCD Comparator circuits consist of two banks of five type CD4063 four-bit magnitude comparators and five type CD4042 quad latches. Output lines from the thumbwheel switches are applied to one set of inputs and the external BCD signals are applied to the other set of inputs. If the BCD input exceeds the High Limit setting, the output of the High Limit detector will be high, enabling the **HI** limit LED and the **HI** limit relay. When the High Limit detector is activated the green **GO** LED is disabled.

A similar set of components is used by the Low Limit detector. The output of the Low Limit detector goes high when the BCD input signal is below the limit set by the thumbwheel switches. When this output is high the **LO** limit LED is enabled, the **LO** limit relay is closed and the green **GO** LED is disabled.

4-2. Detailed Circuit Descriptions

The circuit descriptions in the following paragraphs refer to the schematic diagram 1248-070 at the back of this manual. These are provided to make troubleshooting to component level possible.

Please Note: Under normal conditions the Model 1248 is a highly reliable and trouble-free instrument. If problems are observed when using this device, please check the following areas before replacing any components:

- ☼ Dirty or damaged pins on the input connector
- ☼ Broken wires or dirty contacts on the input data cable
- ☼ Failure to use or improper use of the input data latches
- ☼ Failure of the device generating the BCD data
- ☼ Improper connection of cable IDC-2 or IDC-3 (the 1248 is connected to the end with the wires)

4-2-1. Power Supply

The 1248 may be powered either by an internal power supply or by an external source, usually the device generating the BCD data. Instruments powered externally require 5 volts @ 60mA on the appropriate pins of the input connector (see Table 2-1).
Units equipped with an internal power supply (Option AC-1 or AC-2) provide +5VDC @ up to 10mA on the designated pins of the rear panel connector as indicated in Table 2-1.

Units equipped with an internal power supply use transformer T1 to step down the AC line voltage to be rectified by CR3 and CR4 to produce approximately +9 VDC. This +9 volts is filtered by C1 and regulated to +5 volts by IC16. The +5 volt supply is filtered by C2.

The same transformer is used for either 115VAC or 230VAC; however the primaries are wired in parallel for 115VAC and in series for 230VAC.

4-2-2. CD4063 Magnitude Comparators

The Model 1248 uses two banks of 4-bit magnitude comparators (CD4063) to determine whether the BCD input is within the upper and lower limit. The CD4063 has two sets of comparator inputs. One set, pins 10, 12, 13 and 15, are the A0, A1, A2 and A3 inputs, respectively. The other set, pins 9, 11, 14 and 1, are the B0, B1, B2 and B3 inputs, respectively. The A>B, A=B and A<B outputs are pins 5, 6 and 7, respectively.

4-2-3. Lower Limit Detector

The following paragraphs describe the function of the Lower Limit detector. Refer to the Model 1248 schematic diagram, drawing number 1248-070. Note that IC4, IC6, IC8 and IC10 have their outputs connected to the cascading inputs of the next highest digit comparator. Note also that the A>B output of IC2 is connected to the base of Q3. If the value of any digit in the BCD input (B_x) is less than the value set by the thumbwheel switch (A_x) connected to that comparator, the A>B output of that comparator will go high. When the A>B output of IC2 pin 5 goes high, Q3 is turned on, S5 is closed and the **LO** LED illuminates. The green **GO** LED is disabled by the activation of Q3.

The comparators are configured in such a way that an A<B condition on any comparator will overrule the A>B output from any comparator of lesser significance.

4-2-4. Upper Limit Detector

The Upper Limit detector operates in much the same manner as the Lower Limit detector except that all comparisons are made with the A<B output being significant. A high on pin 7 of IC1 would indicate that the input BCD data (B_x) is larger than the upper limit set with the thumbwheel switches (A_x). This output turns on Q1 which causes S4 to close and the **HI** LED to illuminate.

Enabling either Q1 or Q3 disables the **GO** LED by turning on Q4.

4-2-5. Input Latches

The input latches are used to hold the BCD input data in a buffer for an indefinite period of time. See Section 3-4 for a description of the uses for this feature.

IC11 through IC15 are quad latches type CD4042. When pin 5 of these IC's is held high (or open), their outputs follow their inputs. If pin 5 is held low, the latch will hold on its output the last data it received before the $1 \rightarrow 0$ transition.

If the data is in *parallel* form, pin 5 of all latches may be connected to +5V (high), or left open-circuit.

If the data is in *serial* form, the similar input lines (pins 4, 7, 13 and 14) of all latches are usually paralleled together to form an input data bus. Pin 33 of J1 must have +5V applied while the most significant data is on the bus and must transition to 0V before the data is removed. Similarly, pins 32, 31, 30 and 29 must follow this same timing while their respective data is on the bus.

Pin 5 of the rear panel connector is tied to pin 6 of all latches and is used to determine the polarity of the latch control lines. If pin 5 of the connector is a "1" or open, the latch will transfer data when a "1" or open is present on its control line. If pin 5 is a "0" (0V), the latch will transfer data when a "0" (0V) is present on its latch control line.