

MODEL DC-2000

Operation and Calibration Instructions

Part No. 552295

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General Information on Model DC-2000

The Model DC-2000 is manufactured in two styles, DC-2000-A with built-in 5/16 in. long Needles, and DC-2000-C with an Electrode Cable Connector for use with a series of special optional Electrode configurations which are detailed elsewhere in this manual. Both styles of the DC-2000 share the same heavy wall rugged plastic enclosure to assure dependable operation in the field.

This instrument measures direct current resistance in wood and wood products and relates this measurement to Moisture Content. The DC resistance of lumber varies from species to species and with moisture content. A Range Selector switch is included on the instrument to allow corrected indications on a wide variety of Species without the need for special calibration charts or tables. Internal auto-ranging is used to permit the DC-2000 to read moistures from 5% to over 62% with no switching. For best accuracy, calibration charts are available in Appendix 2.

The DC resistance of wood also varies with temperature. Accurate results will be obtained over a range in wood temperature from 70 deg. F. to 90 deg. F. without the need for Temperature Correction. A Temperature Correction Chart (Appendix 2) is used to correct readings from 0 deg. F. to 160 deg. F.

The DC-2000 employs a specially programmed Micro-Computer Unit to make accurate DC resistance measurements, compute the moisture content, and display the results on a direct reading Liquid Crystal Display. The instrument is powered by one 9V battery which is readily available, even at your local supermarket. The battery will provide continuous operation for over 100 hours, before dropping too low in voltage for the instrument to give accurate readings. At this point the display indicates '99' showing that it is time for battery replacement.

While the instrument is enclosed in a rugged injection molded plastic case, and will withstand the harshest field used, it still must be treated as an electronic instrument, and be kept dry and clean. Accumulations of moisture and dirt in the unit or around the measuring needles will cause the instrument to give incorrect moisture readings. If the instrument reads over '5' or '6' when it is turned on, this is generally caused by dirt and moisture on the remote electrode or on the DC-2000.

Instrument accuracy is not generally affected when the needles are not fully inserted in the wood being tested. However, since the DC resistance path is only between the needles, shallow insertion will mean that only a surface reading is being taken. When deep penetration readings are required, use of DC-2000-C with the DP Electrode is required.

The DC-2000 can be used for other moisture testing jobs such as locating dry rot, testing before painting on wood as well as plaster. In these cases, particular moisture content is used as a high level 'no-go' indication. Typically it is safe to paint wood at moisture contents less than 15% with any type of paint. For plaster, it is safe to paint when the instrument indicates less than 23%. Dry rot is usually indicated by pockets or areas of unusually high moisture content.

Battery Replacement

The battery is replaced by removing the lower half of the instrument enclosure. Un-screw the four screws visible on the bottom of the unit. Remove the bottom of the case, and the battery can be lifted from its compartment. Snap off the connector and snap it in the replacement battery. The instrument is protected against reverse battery polarity, but if the battery is accidentally touched to the connector the wrong way, this will greatly reduce battery life. When replacing the screws, just tighten snugly to avoid stripping the screw threads. A good grade of alkaline battery is recommended for best battery life and instrument operation. If the DC-2000 is to be stored for a long time without use, remove the battery.

Testing Procedure

It is best to test at least twelve inches in from the end of a board to avoid obtaining too dry a reading. Boards which are surface wet will give too high a reading, so be sure to turn wet boards over before reading. Be sure that short needles are inserted between 1/4 in. and 5/16 in. for best accuracy, and the long needles to the depth required.

Moisture content calibration data above 30% (fiber saturation) is not highly accurate. The DC-2000 provides indications up to 62% so that for wetter or even green lumber, comparative readings of moisture can be made.

Service Information

Other than occasional battery replacement, the DC-2000 is designed to last many years without trouble. Several things can happen due to normal use of the unit. Erratic operation may be experienced due to a broken cable wire which makes and breaks contact. To check this, find a piece of wood which gives roughly a 12% reading, then flex and wiggle the cable. If the readings are erratic, they will be most erratic when flexing the cable at the location of the broken wire.

Readings above '5' or '6' when no Electrode is attached indicate that there is dirt and/or moisture in or around the Electrode connector or built in needles. If the DC-2000 reads O.K. without the Electrode attached, but goes up-scale when the Electrode cable is attached, look for dirt and/or moisture on the Electrode, or a dirty or damaged cable. If the display goes blank when connecting the cable or electrode, there is a short.

For any troubles with the Switches, Connectors, or electronic components, Factory Service is recommended. With high resistance DC measurement circuitry, special solder fluxes and repair procedures must be used to maintain the accuracy of the instrument.

Cleaning

Use a good grade of denatured alcohol to remove dirt and grease from the Instrument or Electrode. Dry the components well before using them again.

Model DC-2000 Operating Instructions

- 1. Connect:** When using an Electrode with a Cable, be sure that the Cable is properly connected to the Instrument Receptacle and to the Electrode Receptacle. Align the Cable Connector slots with the Receptacle 'Ears', push in, and turn one-quarter turn clockwise to lock the Connector.
- 2. Select Range:** The Range Switch is used to accommodate for Wood Species which have lower or higher DC resistance values for the same moisture contents. Appendix 1 is a list showing which Range Switch position should be used for a number of different Wood Species. Set the Range Switch in position 'A', 'B', or 'C' depending upon which Wood Species you are testing. Note that the Range Switch correction for Species is approximate and best in the range from 6% to 15%. For greatest accuracy set the Range Switch to position 'B' and refer to the Species correction charts in Appendix 2.
- 3. Turn On:** When the DC-2000 is turned on, it performs a self check with the display showing '00'. Then the display will show the moisture content percentage of the sample being tested. When the Electrode needles are not inserted into a wood sample, the display will show either '5' or '6'. If any higher readings are displayed, the electrode or cable is contaminated with dirt or moisture and must be cleaned and dried.
- 4. Testing Wood:** When using either the built-in Needles or a remote Electrode, best accuracy will result when the needles are inserted the full 5/16 in. into the sample. The instrument need not be turned off when moving the Electrode to a new testing location or sample.
- 5. Temperature Correction:** The calibration data for the DC-2000 is normalized at a temperature of 80 deg. F. When testing lumber at temperatures between 70 deg. and 90 deg. it is not necessary to make any corrections to the readings obtained. However if the wood temperature is either lower or higher than these temperatures, the readings should be corrected according to the Temperature Correction Chart found in Appendix 3.
- 6. Low Battery:** The DC-2000 operates from a single 9V battery which will last over 100 hours before replacement is required. When the battery is too low to operate the instrument correctly, the display will show a reading of '99'. Incorrect moisture readings are prevented by this means. For longest battery life, replace the battery with an alkaline type 9V unit.
- 7. When Finished Testing:** Be sure to turn the Power switch OFF. This will prevent the instrument from being damaged should the battery become fully discharged and leak.

APPENDIX 1 – Species Range Selection

HARDWOODS	RANGE SWITCH POSITION
Ash, Commercial White	A
Basswood	A
Birch	C
Cherry, Black	C
Elm, American	A
Gum, Black	C
Gum, Red	B
Hickory, True	B
Magnolia	C
Mahogany, African (Khaya)	C
Mahogany, American (Honduras)	B
Mahogany, Philippines (Luan)	A
Maple, Sugar	C
Oak, Commercial Red	B
Oak, Commercial White	A
Persimmon	B
Prima Vera	A
Rosewood	B
Shorea	A
Tupelo, Black	C
Walnut, Black	B
Yellow Poplar	C
SOFTWOODS	
Bald Cypress	B
Balsa	A
Cedar, Red	C
Douglas fir (Coast Type)	B
Fir, California Red	B
Fir, California White	C
Hemlock, Western	B
Larch, Western	C
Pine, Eastern White	B
Pine, Longleaf	C
Pine, Ponderosa	C
Pine, Short Leaf	C
Pine, Sugar	B
Redwood	B
Spruce, Engle man	B
Spruce, Sitka	B

APPENDIX 2 – Calibration Data

Dial Reading	Ash, White	Balsa	Basswood	Birch	Cedar, Red	Cherry, Black
6	6.0	5.5	6.6	7.1	7.8	8.0
7	6.7	6.0	7.1	8.0	8.7	9.0
8	7.4	6.5	7.4	8.9	9.6	10.0
9	8.2	7.1	8.1	9.8	10.6	11.0
10	9.1	7.8	8.8	10.7	11.6	12.0
11	10.0	8.5	9.6	11.7	12.5	13.0
12	10.9	9.2	10.6	12.7	13.5	14.0
13	11.8	10.0	11.6	13.8	14.5	15.0
14	12.7	10.9	12.7	14.9	15.4	16.0
15	13.6	11.8	13.8	16.0	16.4	17.0
16	14.5	12.7	14.8	17.1	17.4	18.0
17	15.3	13.8	15.7	18.2	18.3	19.0
18	16.1	14.8	16.7	19.3	19.3	20.0
19	17.0	15.8	17.6	20.4	20.3	21.0
20	17.8	16.9	18.6	21.5	21.2	22.0
21	18.7	18.0	19.6	22.6	22.2	23.0
22	19.5	19.1	20.5	23.7	23.2	24.0
23	20.4	20.3	21.5	24.8	24.1	25.0
24	21.4	21.6	22.5	25.9	25.1	26.0
25	22.5	22.8	23.4	27.0	26.1	27.0
26	23.7	24.1	24.3	28.1	27.0	28.0
27	24.9	25.4	25.2	29.2	28.0	29.0
28	26.0	26.7	26.1	30.3	29.0	30.0
29	27.2	28.0	27.0	31.4	30.0	31.0
30	28.4	29.3	28.0	32.5	31.0	32.0

Dial Reading	Cypress	Elm	Fir, Douglas	Fir, Red	Fir, White	Gum, Black
6	5.6	6.0	6.0	6.2	6.7	6.5
7	6.7	6.9	7.0	7.2	7.7	7.7
8	7.8	7.6	8.0	8.2	8.7	9.0
9	8.9	8.2	9.0	9.2	9.7	10.1
10	10.0	8.8	10.0	10.2	10.6	11.1
11	11.0	9.4	11.0	11.3	11.5	12.0
12	12.0	10.0	12.0	12.4	12.5	13.0
13	13.0	10.7	13.0	13.6	13.5	13.9
14	14.0	11.5	14.0	14.7	14.6	14.8
15	15.0	12.3	15.0	15.9	15.7	15.6
16	16.0	13.1	16.0	17.1	16.8	16.3
17	17.0	13.9	17.0	18.2	17.9	16.8
18	18.0	14.8	18.0	19.2	18.9	17.6
19	19.0	15.6	19.0	20.2	19.9	18.4
20	19.9	16.4	20.0	21.2	21.0	19.1
21	20.8	17.1	21.0	22.1	22.0	19.7
22	21.8	17.8	22.0	23.1	23.0	20.6
23	22.8	18.6	23.0	24.0	24.1	21.5
24	23.8	19.4	24.0	25.0	25.1	22.2
25	24.8	20.3	25.0	26.1	26.2	23.0
26	25.8	21.3	26.0	27.2	27.3	23.7
27	26.8	22.5	27.0	28.3	28.4	24.4
28	27.8	23.7	28.0	29.4	29.4	25.0
29	28.8	25.2	29.0	30.5	30.4	25.5
30	29.8	26.8	30.0	31.6	31.4	26.0

Dial Reading	Gum, Red	Hemlock	Hickory	Larch	Magnolia	Mahogany, African
6	6.3	6.0	7.2	6.4	6.5	6.4
7	7.3	7.1	8.0	7.6	7.7	7.8
8	8.3	8.2	8.6	8.8	9.0	9.3
9	9.3	9.3	9.1	9.9	10.2	10.6
10	10.3	10.4	9.7	11.0	11.4	12.0
11	11.4	11.5	10.3	12.0	12.6	13.4
12	12.4	12.6	11.0	13.0	13.7	14.8
13	13.5	13.7	11.8	14.0	14.7	16.0
14	14.5	14.8	12.5	15.1	15.6	17.2
15	15.6	15.8	13.2	16.2	16.5	18.4
16	16.6	16.8	14.0	17.2	17.5	19.5
17	17.6	17.7	14.8	18.2	18.4	20.6
18	18.6	18.6	15.6	19.2	19.2	21.7
19	19.6	19.4	16.4	20.2	20.0	22.7
20	20.5	20.2	17.2	21.2	20.7	23.7
21	21.4	21.1	18.0	22.2	21.4	24.7
22	22.3	21.9	18.8	23.3	22.2	25.7
23	23.2	22.8	19.6	24.3	22.9	26.7
24	24.1	23.6	20.6	25.4	23.5	27.7
25	25.0	24.4	21.6	26.4	24.1	28.7
26	25.8	25.2	22.8	27.4	24.7	29.8
27	26.6	26.0	24.0	28.4	25.3	30.9
28	27.4	27.0	25.1	29.4	25.8	32.0
29	28.2	28.0	26.2	30.5	26.2	33.0
30	29.0	29.0	27.2	31.5	26.8	34.0

Dial Reading	Mahogany, Honduras	Mahogany, Philippines	Maple, Sugar	Oak, Red	Oak, White	Persimmon
6	6.0	5.2	6.8	5.6	6.0	5.9
7	7.1	6.0	7.8	6.9	6.9	6.9
8	8.2	6.8	8.6	8.0	7.8	7.8
9	9.3	7.4	9.3	9.0	8.6	8.8
10	10.4	8.1	10.1	10.0	9.5	9.8
11	11.5	8.8	11.0	11.0	10.5	10.8
12	12.6	9.6	11.9	12.0	11.5	11.8
13	13.5	10.3	12.8	13.0	12.5	12.7
14	14.4	11.1	13.9	14.0	13.4	13.7
15	15.3	11.8	14.9	15.0	14.3	14.7
16	16.2	12.5	15.9	16.0	15.2	15.7
17	17.0	13.2	16.9	17.0	16.0	16.7
18	17.8	14.0	18.0	18.0	16.8	17.6
19	18.6	14.7	19.0	18.9	17.6	18.6
20	19.4	15.5	20.1	19.9	18.5	19.6
21	20.2	16.2	21.2	20.9	19.3	20.6
22	21.0	16.9	22.4	21.9	20.1	21.6
23	21.7	17.6	23.7	23.0	21.0	22.5
24	22.5	18.3	25.0	24.0	22.0	23.5
25	23.2	19.0	26.3	25.1	23.5	24.5
26	24.0	19.6	27.5	26.2	25.0	25.5
27	24.7	20.2	28.7	27.3	26.5	26.5
28	25.4	21.0	29.9	28.4	28.0	27.5
29	26.1	21.8	31.0	29.5	29.5	28.5
30	26.8	22.6	32.2	30.6	31.0	29.5

Dial Reading	Pine, Longleaf	Pine, Ponderosa	Pine, Short Leaf	Pine, Sugar	Pine, White	Poplar, Yellow
6	6.0	6.3	6.5	6.0	6.0	6.0
7	7.2	7.4	7.6	7.0	7.0	7.2
8	8.7	8.6	8.7	8.0	8.1	8.5
9	9.8	9.8	9.8	9.0	9.3	9.6
10	10.9	11.0	10.9	10.0	10.5	10.8
11	12.0	12.2	12.0	11.1	11.6	12.0
12	13.2	13.4	13.1	12.3	12.7	13.1
13	14.4	14.5	14.3	13.5	13.8	14.3
14	15.5	15.6	15.4	14.7	15.0	15.5
15	16.6	16.6	16.5	15.7	16.1	16.5
16	17.6	17.6	17.6	16.8	17.2	17.5
17	18.6	18.5	18.5	17.8	18.2	18.5
18	19.5	19.4	19.5	18.8	19.2	19.6
19	20.4	20.4	20.5	19.9	20.1	20.6
20	21.3	21.3	21.5	20.9	21.1	21.7
21	22.2	22.2	22.5	21.9	22.0	22.8
22	23.1	23.2	23.5	22.8	23.0	24.0
23	24.0	24.3	24.5	23.8	23.8	25.1
24	25.0	25.5	25.4	24.8	24.5	26.3
25	26.0	26.5	26.4	25.7	25.3	27.5
26	26.9	27.5	27.4	26.6	26.2	28.7
27	27.8	28.5	28.3	27.5	27.0	29.9
28	28.6	29.5	29.3	28.3	28.0	31.1
29	29.5	30.5	30.2	29.2	29.0	32.3
30	30.5	31.5	31.1	30.0	30.0	33.5

Dial Reading	Prima Vera	Redwood	Rosewood	Spruce, Engle man	Spruce, Sitka	Walnut, Black
6	5.0	6.0	6.5	5.4	6.0	6.5
7	5.8	7.0	7.5	6.5	7.0	7.5
8	6.6	8.0	8.5	7.6	8.1	8.5
9	7.4	9.0	9.4	8.7	9.2	9.4
10	8.2	10.0	10.4	9.8	10.3	10.4
11	9.0	11.0	11.4	10.9	11.4	11.4
12	9.8	11.8	12.4	12.0	12.5	12.4
13	10.7	12.6	13.4	13.2	13.5	13.4
14	11.5	13.5	14.4	14.4	14.6	14.4
15	12.3	14.3	15.4	15.5	15.7	15.4
16	13.1	15.2	16.3	16.6	16.8	16.3
17	13.9	16.1	17.2	17.7	17.8	17.2
18	14.7	17.0	18.1	18.8	18.9	18.1
19	15.5	18.1	19.0	19.9	19.9	19.0
20	16.4	19.2	20.0	21.0	21.0	20.0
21	17.3	20.5	20.9	21.1	22.1	20.9
22	18.2	21.8	21.8	22.2	23.2	21.8
23	19.1	23.2	22.7	23.3	24.4	22.7
24	20.1	24.6	23.6	24.5	25.6	23.6
25	21.1	25.9	24.5	25.6	26.7	24.5
26	22.2	27.1	25.5	26.7	27.8	25.5
27	23.3	28.3	26.5	27.9	28.9	26.4
28	24.4	29.4	27.5	29.0	30.0	27.4
29	25.5	30.5	28.5	30.1	31.1	28.4
30	26.6	31.7	29.5	31.2	32.2	29.3

APPENDIX 3 – Temperature Correction

Model DC-2000 readings are for wood at 80 degrees Fahrenheit. When testing at other temperatures, this chart will give corrected moisture content readings.

Temperatures in degrees Fahrenheit

Indicated Moisture	0	30	60	100	130	160
6	10.3	8.3	7.0	5.6	4.9	4.4
7	11.9	9.6	8.0	6.5	5.7	5.1
8	13.5	10.9	9.1	7.4	6.5	5.8
9	15.0	12.2	10.2	8.3	7.3	6.5
10	16.5	13.5	11.3	9.2	8.1	7.2
11	18.1	14.8	12.3	10.1	8.9	8.0
12	19.7	16.0	13.4	11.0	9.7	8.7
13	21.2	17.3	14.5	11.9	10.5	9.4
14	22.7	18.6	15.5	12.8	11.3	10.1
15	24.3	19.9	16.4	13.7	12.1	10.8
16	25.9	21.1	17.7	14.6	12.9	11.6
17	27.4	22.4	18.8	15.5	13.7	12.3
18	29.0	23.7	19.9	16.4	14.5	13.0
19	30.5	25.0	20.9	17.3	15.3	13.7
20	-	26.3	22.0	18.2	16.1	14.4
21	-	27.6	23.1	19.1	16.9	15.2
22	-	28.8	24.2	20.0	17.7	15.9
23	-	30.1	25.3	20.9	18.5	16.6
24	-	-	26.4	21.8	19.3	17.3
25	-	-	27.4	22.7	20.1	18.1
26	-	-	28.5	23.6	20.9	18.8
27	-	-	29.6	24.5	21.7	19.5
28	-	-	30.7	25.4	22.5	20.3
29	-	-	-	26.3	23.3	21.0
30	-	-	-	27.2	24.1	21.7

CORRECTED MOISTURE CONTENT READINGS

Model DC-2000 readings are for wood at 80 degrees Fahrenheit. When testing at other temperatures, this chart will give corrected moisture content readings.

Temperatures in degrees Fahrenheit

Indicated Moisture	180	190	200	210	220	230	240
6	3.7	3.5	3.4	3.2	3.0	2.8	2.6
7	4.3	4.1	3.9	3.7	3.5	3.3	3.1
8	5.0	4.7	4.5	4.2	4.0	3.8	3.5
9	5.6	5.3	5.0	4.8	4.5	4.2	4.0
10	6.2	5.9	5.6	5.3	5.0	4.7	4.4
11	6.8	6.5	6.2	5.8	5.5	5.2	4.8
12	7.4	7.1	6.7	6.4	6.0	5.6	5.3
13	8.1	7.7	7.3	6.9	6.5	6.1	5.7
14	8.7	8.3	7.8	7.4	7.0	6.6	6.2
15	9.3	8.9	8.4	8.0	7.5	7.1	6.6
16	9.9	9.4	9.0	8.5	8.0	7.5	7.0
17	10.5	10.0	9.5	9.0	8.5	8.0	7.0
18	11.2	10.6	10.1	9.5	9.0	8.5	7.9
19	11.8	11.2	10.6	10.1	9.5	8.9	8.4
20	12.4	11.8	11.2	10.6	10.0	9.4	8.8
21	13.0	12.4	11.8	11.1	10.5	9.9	9.2
22	13.6	13.0	12.3	11.7	11.0	10.3	9.7
23	14.3	13.6	12.9	12.2	11.5	10.8	10.1
24	14.9	14.2	13.4	12.7	12.0	11.3	10.6
25	15.5	14.8	14.0	13.3	12.5	11.8	11.0
26	16.1	15.3	14.6	13.8	13.0	12.2	11.4
27	16.7	15.9	15.1	14.3	13.5	12.7	11.9
28	17.4	16.5	15.7	14.8	14.0	13.2	12.3
29	18.0	17.1	16.2	15.4	14.5	13.6	12.8
30	18.6	17.7	16.8	15.9	15.0	14.1	13.2

Notes:

Moisture Register Products manufacture Continuous On-Line Systems and Hand-Held Portable Meters that are designed for optimum performance, essential convenience and complete reliability to accomplish a multitude of applications in a wide range of industries.

Our Continuous On-Line Systems offer Near Infrared and Radio Frequency Sensors to constantly measure your process moisture. These systems assist you in analyzing, recording and controlling moisture on your product line.

Our Hand-Held Portable Moisture Meters offer on the spot measurement as well as flexibility for use on a variety of materials such as:

Moisture Register Products has portable moisture meters for use on a wide variety of materials, some of which are listed below.

**LUMBER
PLASTER WALL
GYPSUM BOARD
NONWOVENS
CORK**

**VENEER
DRY WALL
TEXTILES
PAPER PRODUCTS
AIRCRAFT RADOMES**

Moisture Register Products and AQUA Measure Instrument Company are fully committed in providing products and services at a quality level that continues to improve and that meets our customer's expectations.

www.MoistureRegisterProducts.com