



WAGNER MODEL L612

"DIGITAL RECORDING"

MOISTURE METER

OWNER'S MANUAL

DOCUMENT NO: [500-61201-001](#)

REV: K

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FCC Compliance Statement

This equipment has been tested and found to comply within the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations.

This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Move the equipment away from the receiver
- Plug the equipment into an outlet on a circuit different from that to which the receiver is powered
- If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions.

CAUTION: Only equipment certified to comply with Class B (computer input/output devices, terminals, printers, etc.) should be attached to this equipment.

Finally, any changes or modifications to the equipment by the user not expressly approved by the grantee or manufacturer could void the user's authority to operate such equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Canadian Department of Communications Compliance Statement

This Class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations.

Avis de conformité aux normes du ministère des Communications du Canada

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

L612 Digital Recording Moisture Meter

In response to today's growing need for timely, accurate moisture monitoring information and record keeping, Wagner introduces the L612 Digital Recording Moisture Meter. This remarkable instrument combines Wagner's unique "Wood-Friendly" electromagnetic scanning with the latest microcomputer technology.

- Stores and displays up to 50 user-selected species adjustments by name.
- Stores up to 5000 separate moisture readings.
- Stores readings in up to 200 groups.
- Built-in real time clock/calendar.
- Send reports directly to a printer or data to a computer for advanced analysis using supplied Stat-Pak software.

Using non-volatile memory, stored readings are retained even when the batteries are removed. A backlit LCD display features a 2-line, 32-character display. Function buttons and scroll arrows operate a menu system that guides the user step by step through the selecting, storing and reporting process. The meter has auto-shut-off to extend battery life.

Like all Wagner hand-meters, it is virtually unaffected by wood temperature in the normal operating range outside of a kiln environment. Refer to the stack probe manual for more information about measuring wood in kilns. Contact Wagner technical support for guidelines

when wood is below freezing.

L612 Specifications

Physical Size (in):	L 8.5 x W 4 x H 3.75
(mm)	L 216 x W 102 x H 95
Scanning Area (in):	2.5 x 2.5
(mm)	63.5 x 63.5
Scanning Depth (in):	1.0 in. (25.4 mm)
Weight:	18 oz. (510 g)
Power:	4 AA Alkaline Batteries
Battery Life:	~8 hours of continual use*.
Real Time Clock:	Records both date and time
Auto Power Shut Down:	After 1 minute of non-use.
Moisture Measurement Range:	5 to 30% (dependent on species setting)
Specify Gravity Range:	0.30 to 0.75
Meter Operating Temperature:	30° to 120°F
Comm Port:	RS-232 Serial Interface
Probe Port:	L712/L722 Sensor Probe Interface
Patent Numbers:	5,486,815 and 5,621,391

*Battery life is significantly reduced when using the display backlight. It is recommended to use rechargeable Nickel-Cadmium or Nickel-Metal Hydride batteries when extended backlight usage is planned. The Ni-Cd or Ni-MH batteries and charger may usually be purchased at most electronics supply stores. Be sure to use a battery charger that has a battery conditioner and an auto shut-off feature to avoid over charging of the batteries.

Getting Started

This sections informs you about

- Turning on the meter
- Moisture readings
- Storing a reading
- What is a group
- Viewing statistics
- The menu system
- Changing species

Before you begin, make sure your hand-meter has a fresh set of batteries.

Turning on the meter

Turn on the meter by pressing the STORE button for one second. The display will momentarily show the model, software version, and revision numbers. Your meter is now ready to take moisture readings.

Moisture readings

Take moisture readings by pressing the bottom of the meter to the wood surface. The first line of the display shows the species for which the meter is calibrated. The second line shows the reading in percent moisture content.

Storing a reading

While pressing the bottom of the meter to the wood surface at the location of interest, press the STORE button to save that reading in a group.

What is a group

A group is a set of readings that belong together. You determine which readings belong together. Switch to another group by first pressing the GROUP button. Press the ARROW buttons to select a different number. Press the STORE button to activate the selection. The active group number is shown in the bottom right corner of the display.

Viewing statistics

Statistical values such as mean, standard deviation, highest reading, and lowest reading are calculated on individual groups. They may be accessed for viewing by using the menu system.

The menu system

For example, to view the mean and standard deviation values for the active group, press the MENU button to activate the main menu. Press the ARROW button to scroll through the menu until the menu item Mean/Std is displayed. Press the STORE button to activate the menu item.

Changing species

If the meter is not set to the species you are measuring change it using the menu system. See the section “Factory Species List” for a complete list of available species. If your species is not listed, you may customize a species as outlined in the section “Changing Species.”

	Turning on the Meter	Readings Mode	Storing Readings
Operation	<p>To turn on the meter, press the STORE button for one second. The display will briefly show the Model, Version, and Revision numbers.</p> <p>The meter will turn off after 1 minute of inactivity. Inactivity means no change in moisture readings or buttons pressed.</p>	<p>The meter takes continuous percent moisture content (%MC) readings and puts them on the display. When a reading is below 5%, the first line shows the current species and group field label. The second line shows the current reading and the active group number. When a reading is above 5%, the first line becomes a bar graph representing the current reading.</p>	<p>When storing a valid reading, the second line will display the message Storing along with the sample number.</p> <p>When attempting to store an invalid reading, the second line will display message Too Low along with the last sample number.</p>
Display	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <p>WAGNER L612 V xx.xx Rxx.xx</p> </div>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <p>Douglas Fir GRP .0 % 0</p> </div>	<p>Storing 14 or Too Low 13</p>
STORE	To turn the meter on, press the STORE button for one second.	Press the STORE button to store the current reading into the active group.	
GROUP		Press the GROUP button to activate the change group function.	
MENU		Press the MENU button to activate the main menu.	
ARROWS		Refer to the Factory Default section.	

	Changing Groups	Activating Main Menu	Main Menu Selection
Operation	<p>Press the GROUP button to activate the change group function.</p> <p>Use the ARROW buttons to select the desired group number.</p> <p>Press the STORE button to activate the change.</p> <p>The group number range is from 0 to 199.</p>	<p>Press the MENU button to activate the main menu.</p> <p>Press the ARROW buttons to scroll through the menu.</p> <p>Press the STORE button to activate the selected menu item.</p>	<p>Locale</p> <p>Species</p> <p>Mean/Std</p> <p>High/Low</p> <p>Clear</p> <p>Print</p> <p>Calibration</p> <p>Backlight</p> <p>Battery</p>
Display	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Group 1 </div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Menu Language </div>	
STORE	<p>Press the STORE button to save the change and return to the readings mode</p>	<p>Press the STORE button to activate the selected menu item.</p>	
GROUP	<p>Press the GROUP button to cancel the change and return to the readings mode</p>	<p>Press the GROUP button to return to the readings mode</p>	
MENU	<p>Press the MENU button to cancel the change and return to the readings mode</p>	<p>Press the MENU button to activate the selected menu item.</p>	
ARROWS	<p>Press the ARROW buttons to increment or decrement the group number.</p>	<p>Press the ARROW buttons to scroll through the menu.</p>	

	Locale Menu	Locale Menu Selection	Changing Language
Operation	<p>Enter the main menu and activate the Locale item.</p> <p>Press the ARROW buttons to scroll through the Locale menu.</p> <p>Press the STORE button to activate the selected menu item.</p>	<p>Language</p> <p>Date</p> <p>Decimal</p>	<p>Enter the Locale menu and activate the Language item.</p> <p>Press the ARROW buttons to scroll through the Language menu. The languages available are dependent on your locale.</p> <p>Press the STORE button to activate the language for the meter text.</p>
Display	<div style="border: 1px solid black; padding: 2px;"> <p>Locale Language</p> </div>		<div style="border: 1px solid black; padding: 2px;"> <p>Language English</p> </div>
STORE	<p>Press the STORE button to activate the selected menu item.</p>		<p>Press the STORE button to activate the language for the meter text.</p>
GROUP	<p>Press the GROUP button to return to the readings mode.</p>		<p>Press the GROUP button to return to the readings mode.</p>
MENU	<p>Press the MENU button to activate the selected menu item.</p>		<p>Press the MENU button to activate the language for the meter text.</p>
ARROWS	<p>Press the ARROW buttons to scroll through the menu.</p>		<p>Press the ARROW buttons to scroll through the menu.</p>

	Changing Date Format	Date Menu Selection
Operation	<p>Enter the Locale menu and activate the Date item.</p> <p>Press the ARROW buttons to scroll through the Date menu.</p> <p>Press the STORE button to activate the selected menu item.</p>	<p>MM/DD/YY DD/MM/YY</p> <p>Selecting the MM/DD/YY item will format the date in the month/day/year order. Selecting the DD/MM/YY item will format the date in the day/month/year order.</p>
Display	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Date MM/DD/YY </div>	
STORE	Press the STORE button to activate the selected menu item.	
GROUP	Press the GROUP button to return to the readings mode.	
MENU	Press the MENU button to activate the selected menu item.	
ARROWS	Press the ARROW buttons to scroll through the menu.	

	Changing Decimal Format	Decimal Menu Selection
Operation	<p>Enter the Locale menu and activate the Decimal item.</p> <p>Press the ARROW buttons to scroll through the Numbers menu.</p> <p>Press the STORE button to activate the selected menu item.</p>	<p>Period Comma</p> <p>Selecting the Period format will use the period '.' character as the decimal separator. Selecting the Comma format will use the comma ',' character as the decimal separator.</p>
Display	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> Decimal Period </div>	
STORE	Press the STORE button to activate the selected menu item.	
GROUP	Press the GROUP button to return to the readings mode.	
MENU	Press the MENU button to activate the selected menu item.	
ARROWS	Press the ARROW buttons to scroll through the menu.	

	Changing Species	Editing Specific Gravity	Editing Species Name
Operation	<p>Enter the main menu and activate the Species item.</p> <p>Use the ARROW buttons to scroll through the species list (See the section “Factory Species List”).</p> <p>Press the STORE button to activate the selected species.</p>	<p>Enter the Edit SG mode through the Species item.</p> <p>Use the ARROW buttons to change the SG number.</p> <p>Press the STORE button to save and activate changes.</p>	<p>Enter the Edit Name mode through the Species item and Edit SG mode.</p> <p>Use the ARROW buttons to change the alpha character.</p> <p>Press the MENU button to move the edit cursor to the right.</p> <p>Press the STORE button to save and activate changes.</p>
Display	<div style="border: 1px solid black; padding: 2px; width: fit-content;"> Species SG Walnut, Black.41 </div>	<div style="border: 1px solid black; padding: 2px; width: fit-content;"> Edit SG Walnut, Black.45 </div>	<div style="border: 1px solid black; padding: 2px; width: fit-content;"> Edit Name Walnut, Black.45 </div>
STORE	Press the STORE button to activate the selected species.	Press the STORE button to save and activate changes.	Press the STORE button to save and activate changes.
GROUP	Press the GROUP button to return to the readings mode.	Press the GROUP button to cancel changes and return to the readings mode.	Press the GROUP button to cancel changes and return to the readings mode.
MENU	Press the MENU button to activate the Edit SG mode.	Press the MENU button to activate the Edit Name mode.	Press the MENU button to move the edit cursor one character to the right. That character will be cleared.
ARROWS	Press the ARROW buttons to scroll through the species list.	Press the ARROW buttons to increment or decrement the SG number.	Press the ARROW buttons to cycle through the alphabet.

	Mean/Std Statistics	High/Low Statistics												
Operation	<p>Enter the main menu and activate the Mean/Std item.</p> <p>Use the ARROW buttons to scroll through the group statistics. Only groups that contain readings will be shown.</p> <p>Press the STORE button to return to the readings mode.</p>	<p>Enter the main menu and activate the High/Low item.</p> <p>Use the ARROW buttons to scroll through the group statistics. Only groups that contain readings will be shown.</p> <p>Press the STORE button to return to the readings mode.</p>												
Display	<table border="1"> <tr> <td>Mean</td> <td>Std</td> <td>GRP</td> </tr> <tr> <td>8.3</td> <td>4.7</td> <td>0</td> </tr> </table>	Mean	Std	GRP	8.3	4.7	0	<table border="1"> <tr> <td>High</td> <td>Low</td> <td>GRP</td> </tr> <tr> <td>11.0</td> <td>6.1</td> <td>1</td> </tr> </table>	High	Low	GRP	11.0	6.1	1
Mean	Std	GRP												
8.3	4.7	0												
High	Low	GRP												
11.0	6.1	1												
STORE	Press the STORE button to return to the readings mode.	Press the STORE button to return to the readings mode.												
GROUP	Press the GROUP button to advance to the next valid group.	Press the GROUP button to advance to the next valid group.												
MENU	Press the MENU button to return to the readings mode.	Press the MENU button to return to the readings mode.												
ARROWS	Press the ARROW buttons to increment or decrement the group number.	Press the ARROW buttons to increment or decrement the group number.												

	Clear Menu	Clear Menu Selection
Operation	<p>Enter the main menu and activate the Clear menu.</p> <p>Press the ARROW buttons to scroll through the Clear menu.</p> <p>Press the STORE button to activate the selected item.</p>	<p>Group Readings</p> <p>All Groups</p>
Display	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> <p>Clear Group</p> </div>	
STORE	Press the STORE button to activate the selected item.	
GROUP	Press the GROUP button to return to the readings mode.	
MENU	Press the MENU button to activate the selected item.	
ARROWS	Press the ARROW buttons to scroll through the menu.	

	Clear Group	Clear Readings	Clear All Groups
Operation	<p>Enter the Clear menu and activate the Group item.</p> <p>Press the ARROW buttons to select the group to clear. Only groups that contain readings will be shown.</p> <p>Press the STORE button to clear the selected group.</p>	<p>Enter the Clear menu and activate the Readings item.</p> <p>Press the ARROW buttons to select the reading to clear.</p> <p>Press the STORE button to clear the selected reading.</p>	<p>Enter the Clear menu and activate the All Groups item.</p> <p>Press the STORE button to clear all groups.</p> <p>Press any other button to cancel operation and return to the readings mode.</p>
Display	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Group 0 </div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Reading GRP 17.6 % 10 21 </div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> All Groups Yes = STORE </div>
STORE	Press the STORE button to clear the selected group.	Press the STORE button to clear the selected reading.	Press the STORE button to clear all groups.
GROUP	Press the GROUP button to advance to the next valid group.	Press the GROUP button to advance to the next valid group.	Press the GROUP button to return to the readings mode.
MENU	Press the MENU button to cancel and to return to the readings mode.	Press the MENU button to return to the readings mode.	Press the MENU button to return to the readings mode.
ARROWS	Press the ARROW buttons to increment or decrement the group number.	Press the ARROW buttons to increment or decrement reading number.	Press the ARROW button to return to the readings mode.

	Printing Reports	Print Menu Selection
Operation	<p>Enter the main menu and activate the Print menu.</p> <p>Press the ARROW buttons to scroll through the Print menu.</p> <p>Press the STORE button to activate the menu item.</p>	<p>Group Summary Readings</p>
Display	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> Print Group </div>	
STORE	Press the STORE button to activate the selected menu item.	
GROUP	Press the GROUP button to return to the readings mode.	
MENU	Press the MENU button to activate the selected menu item.	
ARROWS	Press the ARROW buttons to increment or decrement the menu.	

	Group Report	Group Summary Report	Readings Report
Operation	<p>Enter the Print menu and activate the Group item.</p> <p>Press the ARROW buttons to select the group to print.</p> <p>Press the STORE button to send the group report to the printer.</p>	<p>Enter the Print menu and activate the Summary item.</p> <p>Press the STORE button to send the report to the printer.</p>	<p>Enter the Print menu and activate the Readings item.</p> <p>Press the ARROW buttons to select the group to print.</p> <p>Press the STORE button to send the readings report to the printer.</p>
Display	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Group 0 </div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Print Summary </div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Group 0 </div>
STORE	Press the STORE button to send the report to the printer.	Press the STORE button to send the report to the printer.	Press the STORE button to send the report to the printer.
GROUP	Press the GROUP button to advance to the next valid group.	Press the GROUP button to return to the readings mode.	Press the GROUP button to advance to the next valid group.
MENU	Press the MENU button to cancel and return to the readings mode.	Press the MENU button to send the report to the printer.	Press the MENU button to cancel and return to the readings mode.
ARROWS	Press the ARROW buttons to increment or decrement the group number.	Press the ARROW buttons to increment or decrement the menu.	Press the ARROW buttons to increment or decrement the group number.

Sample Group Report

612 Stat-Pak
Group Report

15:06:08 07/14/97

Company Name

Meter #: 1
First: 10:10:07 07/14/97
Last: 10:18:14 07/14/97

Group	Readings	Mean	Std	High	Low Species	SG
0	32	11.9	2.3	15.1	5.6 Douglas Fir	.50

%	Readings	%Total	Histogram
<	0	.0	
6	2	6.2	*****
8	1	3.1	****
10	6	18.7	*****
12	11	34.3	*****
14	11	34.3	*****
16	1	3.1	****
18	0	.0	
20	0	.0	
22	0	.0	
24	0	.0	
26	0	.0	
>	0	.0	

Sample Group Summary Report

612 Stat-Pak
Summary Report

15:07:39 07/14/97

Company Name

Meter #: 1
First: 10:10:07 07/14/97
Last: 10:23:43 07/14/97

Group	Readings	Mean	Std	High	Low	Species	SG
0	32	11.9	2.3	15.1	5.6	Douglas Fir	.50
7	36	14.3	4.0	24.0	6.8	Douglas Fir	.50
11	35	13.2	3.0	19.2	7.5	Douglas Fir	.50
199	31	12.8	3.4	22.3	7.9	Douglas Fir	.50

4	134	13.1	3.3	24.0	5.6	Summary	

%	Readings	%Total	Histogram
<	0	.0	
6	3	2.2	***
8	9	6.7	*****
10	21	15.6	*****
12	36	26.8	*****
14	31	23.1	*****
16	16	11.9	*****
18	10	7.4	*****
20	4	2.9	*****
22	3	2.2	***
24	1	.7	*
26	0	.0	
>	0	.0	

Sample Readings Report

612 Stat-Pak
 Readings Report

15:09:32 07/14/97

Company Name

Meter #: 1
 First: 10:10:07 07/14/97
 Last: 10:18:14 07/14/97

Group	Readings	Mean	Std	High	Low Species	SG			
0	32	11.9	2.3	15.1	5.6 Douglas Fir	.50			
#	%	#	%	#	%	#	%		
1	12.3	2	12.3	3	12.6	4	13.9	5	15.1
6	14.8	7	14.4	8	13.0	9	12.4	10	12.2
11	11.3	12	10.6	13	10.3	14	9.7	15	9.4
16	10.1	17	10.9	18	11.2	19	11.6	20	11.9
21	12.4	22	13.1	23	14.2	24	14.1	25	12.3
26	13.9	27	14.1	28	13.7	29	14.2	30	8.4
31	5.6	32	6.3						

	Calibration
Operation	Enter the main menu and activate the Calibration item.
Display	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Calibration xx.x % </div>
STORE	Press the STORE button to return to the readings mode.
GROUP	Press the GROUP button to return to the readings mode.
MENU	Press the MENU button to return to the readings mode.
ARROWS	Press the ARROW button to return to the readings mode.

Checking Calibration

Calibration is factory set. It may be checked by using a Wagner Calibration Verification Block (CVB) (P/N: 840-60130-002). Use only to verify L612 factory calibration is within tolerance limits. If calibration is out of tolerance, return L612 to factory or repair depot for re-calibration. Never adjust L612 to this device. Protect CVB from direct sunlight. Store in cool dry place. Follow these steps for checking calibration.

1. Enter the Calibration menu item.
2. Hold the meter in mid air so the bottom is several feet from any object. The correct reading for air is .0 %MC. If the reading is outside the range, -2 to 2 %MC, the unit is out of calibration.
3. Place the CVB, rubber feet down, on a metal surface: such as a file cabinet, a piece of sheet metal, etc.
4. Orientate the long axis of the handmeter with the long axis of the CVB. Press the handmeter sensor in the center of the CVB and observe the reading. The correct reading is 17.5 %MC. If the reading is outside the range, 15.5 to 19.5 %MC, the unit is out of calibration.

Warning—There are two (2) hole plugs located on either side of the L612 handle. Do not remove these plugs because the adjustments below them are factory set and should not be adjusted by the customer. If adjustment is attempted, the unit will not be in calibration and will require factory re-calibration.

	Backlight	Battery
Operation	<p>Enter the main menu and activate the Backlight item.</p> <p>Press the STORE button to change state of the backlight to ON or OFF.</p>	<p>Enter the main menu and activate the Battery item.</p> <p>When a low battery condition occurs, the battery voltage bar graph will be replaced with the message Too Low. Also, when in the readings mode, GRP will be replaced with BAT.</p> <p>Life-time for alkaline batteries are ~8 hours (continuous use, backlight OFF).</p>
Display	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Backlight ON</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">xxxxxxx 4.0 Volts</div>
STORE	Press the STORE button to change state of the backlight.	Press the STORE button to return to the readings mode.
GROUP	Press the GROUP button to return to the readings mode.	Press the GROUP button to return to the readings mode.
MENU	Press the MENU button to return to the readings mode.	Press the MENU button to return to the readings mode.
ARROWS	Press the ARROW buttons to return to the readings mode.	Press the ARROW buttons to return to the readings mode.

	Restore Factory
Operation	<p>Pressing the ARROW buttons at the same time while in the readings mode will clear memory and restore the meter to factory settings. Warning, you will lose all changes made to the species list.</p> <p>Press the STORE button to restore factory settings.</p> <p>Press the GROUP or MENU button to cancel operation and return to the readings mode.</p>
Display	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>Factory Yes = STORE</p> </div>
STORE	Press the STORE button to restore factory settings.
GROUP	Press the GROUP button to cancel the operation and return to the readings mode.
MENU	Press the MENU button to cancel the operation and return to the readings mode.
ARROWS	No function.

Technical Notes

Clock/Calendar—The L612 is contains a real time clock and calendar. The clock/calendar is set through the Stat-Pak program. All reports use the clock/calendar to show the date and time a report is printed, and Group and Reading reports show when the first and last readings where taken.

Company Name—Your company name may appear on the reports. The company name is set through the Stat-Pak program.

Readings and Groups—The L612 can store up to 5000 readings in up to 200 groups. Groups are numbered 0 to 199 and can be selected at random. There is no limit to the number of readings per group as long as the total readings of all groups do not exceed 5000.

Automatic Menu Escape—When in the menu system and 15-seconds of no key presses, the Meter will automatically return to the Readings mode ready to store the next reading in the current group.

Repeat Key—If a key (button) is held down for more than one (1) second, then the key pressed is repeated at a rate of one (1) repeat each second. After 5 repeats the rate doubles and after an additional 5 repeats the rate doubles again. Use this feature to scroll through a long list of species or readings.

Determining Specific Gravity

The L612 meter calibration is based on an equation that relates measurement correction to the specific gravity of a given species. Species of wood in different regions may have a specific gravity that differs from that which is published in wood drying handbooks. If you do not know the species of the wood you are using, or the specific gravity differs from the handbook because of a different growing region, then use the following procedure for determining specific gravity.

1. Select a sample of wood with all edges being true. Carefully measure the dimensions of your sample using a caliper. You will need the length, width, and thickness.
2. Convert these measurements into feet or meters (ft. or m).
3. Carefully measure the weight of your sample.
4. Convert the weight to pounds or kilograms (lb. or kg).
5. Calculate specific gravity (SG).

An English units illustration:

Length: 10 in. converted to feet is $10 \text{ in.} / 12 = 0.833 \text{ ft.}$

Width: 7.5 in. converted to feet is $7.5 \text{ in.} / 12 = 0.625 \text{ ft.}$

Thickness: 1.5 in. converted to feet is $1.5 \text{ in.} / 12 = 0.125 \text{ ft.}$

Weight: 20 oz. converted to lb. is $20 \text{ oz.} / 16 = 1.25 \text{ lb.}$

Volume: $L \times W \times T: 0.833 \times 0.625 \times 0.125 = 0.065 \text{ ft}^3.$

$SG = (\text{Weight} / \text{Volume}) / \text{Density of Water}$

$SG = (1.25 \text{ lb.} / 0.065 \text{ ft}^3) / 62.34 \text{ lb.} / \text{ft}^3 = 0.31$

A metric units illustration:

Length: 254 mm converted to meters is $= 0.254 \text{ m.}$

Width: 190 mm converted to meters is $= 0.190 \text{ m.}$

Thickness: 38 mm converted to meters is $= 0.038 \text{ m.}$

Mass: 565 converted to kg is $= 0.565 \text{ kg.}$

Volume: $L \times W \times T: 0.254 \times 0.190 \times 0.038 = 0.00183 \text{ m}^3.$

$SG = (\text{Mass} / \text{Volume}) / \text{Density of Water}$

$SG = (0.565 \text{ kg} / 0.00183 \text{ m}^3) / 1000 \text{ kg} / \text{m}^3 = 0.31$

In order to ensure that the value obtained for the specific gravity is statistically significant, a number of pieces must be measured and the average determined. Use this value of specific gravity for your species of wood.

Factory Species List

The L612 has a factory default of 50 species. The specific gravity (SG) value or name may be adjusted from the Editing Specific Gravity mode or Editing Species Name mode menu item. This allows you to tailor the meter calibration to a species not listed. The factory species list may also be custom configured through the Stat-Pak program.

Note: SA denotes South Africa.

Species	SG
Alder, Red	.41
Basswood, Amer.	.37
Cedar, EastRed.	.47
Cedar, WestRed.	.32
Cherry, Black	.50
Douglas Fir	.50
Ebony, E Indn	.70
Elliottii, SA	.49
Euca Grand SA.	.70
Fir, Balsam	.35
Fir, Cal Red	.38
Fir, Subalpine.	.32
Fir, White	.39
Hemlock, East	.40
Hemlock, West	.45
Hickory, Nutmg.	.60
Hickory, Pecan.	.66
Hickory, Mockr.	.72
Jarrah	.67
Keruing	.64*

Larch, Western.	.52
Mahogany, True.	.59*
Maple, Bigleaf.	.48
Maple, Sugar	.63
Oak, Black, Red.	.61
Oak, Califrnia.	.51
Oak, North Red.	.63
Oak, South Red.	.59
Oak, Bur, White.	.64
Oak, White	.66
Patula SA	.50
Pine, E White	.35
Pine, Jack	.43
Pine, Loblolly.	.51
Pine, Ldgepole.	.41
Pine, Longleaf.	.59
Pine, Parana	.54*
Pine, Pnderosa.	.40
Pine, Shrtleaf.	.51
Pine, Slash	.59
Pine, Sugar	.36
Poplar, Yellow.	.42
Primavere	.45*
Redwood, Old	.40
SYP	.55
Taeda, SA	.58
Tamarack	.53
Teak	.59*
Walnut, Black	.55
Custm Species.	.50

*The values for these species changed per Technical Bulletin #14, shown on next page.

Technical Bulletin 14

L612 SPECIES ADJUSTEMENT

In our quest to continually upgrade our products and services, it has come to our attention that some of the lesser used species adjustment values (SG) stored in the default list of L612 hand-meter are not the correct values.

If you use any of the following species in your operation, please store the new values to ensure the greatest accuracy of your hand-meter. Should the internal lithium battery in the meter fail, or you restore factory settings, or the meter is sent in for service, you will have to re-enter the appropriate values.

Change SG:	From	To
Keruing	0.69	0.64
Mahogany, True	0.45	0.59
Pine, Parana	0.46	0.54
Primavere	0.40	0.45
Teak	0.55	0.59

This change can be performed by turning on the meter and editing the species value by pressing: Menu > up/down arrows to select Change Species > Store > Select appropriate species with up/down arrows > Store > press Menu until "Edit" is displayed > up/down to select new SG value > Store to save.

In addition, several of the imported hardwood species found in the DOS Stat-Pak program are not

correct. If you download any of these species to your meter from DOS Stat-Pak, you will need to make the following corrections for the species you are using:

Changes to IMPORT .SPC	
Old Value	New Value
Afrormosia .61	Afrormosia .69
Andiroba .54	Andiroba .64
Apitong .69	Apitong .64
Avodire .48	Avodire .55
Banak .42	BanakCuangare.62
CaribbeanPine.68	CaribbeanPine.61
Cativo .40	Cativo .44
Determa .52	Determa .58
Gmelina .41	Gmelina .50
Iroko .54	Iroko .70
Jelutong .36	Jelutong .46
Keruing .69	Keruing .64
Lauan, Red .34	Lauan, Red .67
Lauan, White .55	Lauan, White .50
Limba .38	Limba .45
Mahogany,Afr .42	Mahogany,Afr .61
Mahogany,True.45	Mahogany,True.59
Manni .58	Manni .68
Mersawa .52	Mersawa .65
Obeche .30	Obeche .38
Ocote pine .55	Ocote pine .66
Okoume .33	Okoume .44

Opepe .63	Opepe .73
Parana pine .46	Parana pine .54
Peroba rosa .66	Peroba rosa .75
Primavera .40	Primavera .45
Ramin .52	Ramin .65
RobleQuercus .70	RobleQuercus .64
Santa Maria .52	Santa Maria .61
Sapele .55	Sapele .62
Teak .55	Teak .59

Wagner Electronics
 Technical Services Department

Commentary On Specific Gravity

In 1992, a study was conducted at the Forest Research Laboratory of Oregon State University on species correction for the Wagner hand-held moisture meters. The species tested were Douglas Fir, Lodgepole Pine, Western Red Cedar, Western Hemlock, White Fir, Western Larch, Engelmann Spruce and White Oak. Three to four 40-piece samples of each species were tested. Specific gravity was found to be the primary factor on species correction. A species correction equation as a function of specific gravity and the meter reading was obtained using multiple regression technique (R-square = 0.95) as follows:

$$CF = 8.8772 + (0.2492 * MM) - (15.8649 * SG) - (0.6204 * SG * MM)$$

CF = species correction; MM = meter reading; SG = species average specific gravity in oven-dry weight and 12 %MC volume basis

Wood is not a uniform material. Specific gravity of solid sawn lumber varies within the piece and between pieces. In the OSU study, the average sample specific gravity for each species differed from the individual sample by plus and minus 1% to plus and minus 8%. For general applications, average specific gravity values can be found in the Wood Handbook (USDA Agriculture Handbook '72, 1987). Except for one species whose experimental value is 7% higher, the species' overall average specific gravity values obtained in the OSU study are comparable with those in the Wood Handbook. The exception may be caused by unknown biases in the

sampling scheme. The Wood Handbook values are used in the species list.

Species correction can be determined for lumber sorted, or otherwise known, to have specific gravity different from the species' average. One example is lumber graded under the Dense rules. If the specific gravity of a lumber sample is known, species correction for this lumber sample can be obtained by the species correction equation.

The species correction equation provides a way to expand the use of the Wagner hand-held moisture meters for lumber of any species groups having similar species specific gravity values. One example is Hem-Fir. For a species group, one way to determine the species correction is by the use of a weighted average of the individual species' average specific gravity values. The weighing procedure used in the ASTM D2555 by standing timber volume can be used. Species correction is not recommended for any species group having a broad range of species specific gravity values. There are no recognized limits on species group species correction. Species correction for species groups should be used with knowledge on the variability of specific gravity of all individual species involved and the effect of it on species correction. If the species mix in the lumber production of a species group is controlled or known to have specific gravity different from that used for the species group, a better estimation of species correction can be determined using the known specific gravity in the above species correction equation.

Connecting to a Serial Printer

To print a report to a serial printer, the following equipment is needed: L612, coiled modular serial cable, DB25P to RJ11 adapter, and a serial printer.

- The serial printer must be ON, on line and configured for 9600 baud, 8 data bits, no parity, 1 stop bit.
- Plug one end of the modular serial cable into the COMM port of the L612.
- Plug the other end into the DB25P to RJ11 modular adapter.
- Plug the DB25P to RJ11 adapter into the serial printer.
- Follow the Print Report instructions.

DB25P to RJ11 Adapter Pin Assignments

Pin	Description
2	Receive
3	Transmit
7	Ground
1	No Connection
4-6	No Connection
8-25	No Connection

DB9S to RJ11 Adapter Pin Assignments

Pin	Description
2	Transmit
3	Receive
5	Ground
1	No Connection
4	No Connection
6-9	No Connection

Question and Answers

Q: I'm nervous about buying a new technology. What about Wagner Electronic Products, Inc.? How long have they been building this type of moisture meter?

A: Wagner Electronic Products has been building quality moisture detection equipment for over 30 years. They are the leading supplier of moisture metering equipment for the primary forest products industry. The advanced electro-magnetic wave technology used in Wagner's meters has been closely scrutinized by professional wood grading associations and scientists in the industry. It has proven reliable, consistent and much easier to use than pin-type resistance moisture metering.

Q: How can I take accurate moisture readings without sticking pins into my wood? Why doesn't my new Wagner Hand-Held Meter read the same moisture content as my old pin meter?

A: Pin-type meters work on a primitive, resistance principle that basically measures the flow of electricity through a substance. This method is subject to many environmental variables that can dramatically affect moisture readings such as chemicals in the water trapped within the wood and the temperature of the wood. Pin-type meter readings must always be corrected for any difference in temperature above or below 70 degrees F. Wagner Hand-Held Moisture Meters use advanced electro-magnetic wave technology and are sensitive to changes in density and the actual moisture content of the wood.

Q: What is the narrowest piece of lumber I can measure accurately with the Wagner Hand-Held Moisture Meter?

A: Model L612 measures boards as narrow as 2 1/2" in width.

Q: What thickness boards can I measure?

A: You can accurately measure boards as thin as 1/2" and up to 2" thick.

Note: Make sure there is nothing behind boards less than 1" thick when you take the measurement because Wagner meters will read through the thinner board and measure the moisture in the material behind. Under no circumstances measure a piece of wood that is sitting on a metal table. (The Wagner L612 measures to a depth of 1", which will reach the center of a 2" board)

Q: Can I get accurate results on 4x or larger lumber?

A: No hand-held moisture meter can accurately read to the center of 4x material unless you are willing and able to drive pins 1" into the lumber all the way up and down its length and breadth. However using a Wagner Hand-Held Moisture Meter, you can quickly and easily scan 4x lumber on both sides (4 x 4's on all four sides). Then only the center 1 5/8" would be unmeasured.

Note: Most wood grading agencies are generally not concerned about the moisture content in the center of thicker beams and posts. They consider 1" deep scanning more than adequate.

Q: Where is the reading taken with a pin-type meter? With a Wagner Hand-Held?

A: Pin-type Meters take their measurements at the depth that you've been able to drive the pins. . . and only in a line between the non-insulated portion of the pins (often only the tips). In contrast, Wagner Hand-Held Moisture Meters generate a three-dimensional field that measures from the surface of the wood to a depth of 1" under the entire sensor (approximately 2 1/2" x 2 1/2" on the L612).

Q: How does this difference in measuring techniques affect accuracy?

A: If you're using a pin-type meter, the moisture content you are reading is determined by the micro-thin path the electricity takes to travel from one pin to the other. In effect, it measures only the moisture content of that very tiny path. If there is a single wet fiber between the pins, the electric charge will flow easily along that fiber and cause pin-type meters to exaggerate the moisture content in the wood when in fact it is just a very small fiber that is wet. However, if the place you choose to drive the pins into the wood is simply extraordinarily dry and untypical of the rest of the piece you will get an exaggerated dry reading. On the other hand, Wagner Hand-Held Moisture Meters take an average of the moisture content discovered by the full scan of the three-dimensional field so small wet fibers are not read as large wet spots. Plus, it only takes seconds to scan the entire board.

Q: How are moisture meters affected by surface moisture?

A: Most moisture meters can be affected by standing water, or visible water on the board. You should always wipe off as much excess water as possible. Once the standing water is removed, Pin-type meters with non-insulated pins will register a highly exaggerated moisture reading. Wagner Hand-Held Meters will read slightly higher than normal (probably less than 3 to 4%). If water is allowed to soak into the wood, it will naturally show a higher moisture content. If a piece of wood is quite rough, it will soak up the water quite readily and readings will be affected.

Q: What are the effects of relative humidity on Wagner Hand-Held Moisture Meter readings?

A: As long as there is not condensation on the bottom surface of the instrument there is no effect from changes in relative humidity.

Q: Do the meters on the Wagner Hand-Held products ever require readjustment? Does my Wagner Hand-Held Moisture Meter need to be calibrated? If so, how often must it be done?

A: Occasionally Wagner Hand-Held Moisture Meters require adjustment. However, the process of checking zero points and calibration is very simple.

Note: Wagner Meters are originally calibrated at the factory. Type and amount of use will determine how long this original calibration will last. A calibration block is available for the customers who must check their calibration often. Anytime that the meter is not reading correctly on that calibration block, it should be sent into the factor for calibration.

Q: I have a very thin veneer over a doorstock and I'm trying to measure the moisture content of the core. Can I measure accurately through laminated materials?

A: If you're measuring an all-wood door with a very thin veneer wood laminate, you can probably use a correction factor to determine the moisture content of the core material.

Note: If you're measuring a door that has a plastic laminate or Formica-type laminate, the Formica laminate is going to have its own density, which is going to affect the reading of the meter. You can determine the variance caused by the laminate by first measuring only the core and then the core with the laminate. For example, if the core measures 12% without the laminate and 13.5% with, you will then know to correct your readings of the combined material by 1.5%.

Q: Will Wagner Hand-Held Meters work the same on rough lumber as they do on smooth clean lumber?

A: There are little fibers in very rough material that actually allow a minute layer of air between the meter and the main body of the wood. However, this should not materially affect the reading, or if it does, only slightly lower.

Note: It's important on rough material to use some pressure and force the meter down firmly against the wood. Occasionally, the measurement of exceptionally rough material may necessitate adding 1 to 2% to get an accurate reading.

Q: Can you check moisture content of plywood, particle board or wafer board with hand-held meters?

A: Because of the glues and mixed species nature of these materials, it is very difficult to take reliable moisture readings with pin-type or Wagner Hand-Held Moisture Meters.

Note: However, If you would like to work up your own calibrations for materials you use repetitively, you can contact Wagner for guidelines and suggestions.

Q: Does it matter which way you set a Wagner Hand-Held Moisture Meter on the wood? Cross grain, with the grain, or at an angle?

A: Because Wagner Hand-Held Meters use advanced electro-magnetic wave technology, they are completely unaffected by orientation on the wood.

Q: Are the readings that I take with my Wagner Hand meter affected by the temperature of the wood like those taken with a pin-type meter? What about frozen wood?

A: Unlike pin-type meters which require corrections for temperatures above or below 70 degrees F, the readings on the Wagner Hand-Held Moisture Meter are essentially unaffected by the temperature of the wood. Moisture content can accurately be measured as soon as the hot wood is taken out of the kiln. When the same wood is measured hours later, again with the Wagner Hand-Held Meter, the readings stay consistently the same, unless the wood continues to dry during the cooling process.

For frozen wood, as long as the moisture content of the wood you are measuring is below 15%, you can get reliable readings. When moisture content readings in frozen wood exceed 15%, you will need to make corrections.

Q: How rugged are the Wagner Hand-Held Moisture Meters? Are they too delicate to be used on an abusive production line?

A: The Wagner L612 Moisture Meter is a tough production-line model. They can all be damaged by being dropped or slammed down hard on wood surfaces.

Q: How accurate is the Wagner Hand-Held Meter?

A: The Wagner Moisture Meter is as accurate, or more accurate than any moisture detector that is on the market. This can be verified by several university studies.

Q: Is the Wagner Moisture Meter safe to use?

A: Wagner's Hand-Held Meters have been tested and certified to comply with FCC and CE regulations.

Q: What is proper moisture content in wood? What moisture content is considered too high or too low?

A: There is no right answer for this question. As a rule, differences in woods and their uses determine the moisture content desired. For instance, if the wood is to be used in construction as a stud for building, the moisture content requirement could be under 15% to 19%. If the wood is to be glued, and it is too dry it will not bond. If it is too wet, it will not hold. Ideally the

moisture content of wood to be used in furniture is between 6 and 8%.

The best way to determine the proper moisture content of the wood you are using is to contact the nearest University Wood Product Representative. You may also call the Forest Products Research Laboratory in Madison, WI (608-231-9200).

Warranty

Wagner Electronic Products, Inc. warrants this product against defects in material and workmanship for one (1) year from the date of purchase, subject to the following terms and conditions:

Wagner's liability under this warranty shall be limited, at Wagner's option, to repair or replacement of this product or any part thereof, which is demonstrated to be defective. To exercise this warranty, customer must telephone, fax or e-mail Wagner's Customer Service Department for an RMA (Return Materials Authorization) number and factory instructions for shipment. This limited warranty does not apply if accident, negligent handling, misuse, alteration, damage during shipment, or improper service have damaged the product. Wagner Electronic Products, Inc. shall, in no event, be liable for incidental or consequential damages for the breach of any express or implied warranty with respect to this product or its calibration.

With proper care and maintenance, as recommended in the manual, the meter should stay in calibration; however, because Wagner Electronic Products, Inc. has no control over the manner in which the unit will be used, it makes no warranty that the meter will stay in calibration for any specific period of time. Wagner Electronic Products, Inc. recommends purchasing a calibration standard or return the unit to the factory for diagnostic checkup and re-calibration, on the anniversary date of purchase, each year the meter is in service.

This warranty is in lieu of all other warranties, whether oral or written, express or implied. Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are excluded. Agents and employees of Wagner Electronic Products, Inc. are not authorized to make modifications to this warranty or additional warranties binding on Wagner Electronic Products, Inc. Accordingly, additional statements, whether oral or written, except written statements from an officer of Wagner Electronic Products, Inc. do not constitute warranties and should not be relied upon by the customer.

This warranty is personal to the customer purchasing the product from Wagner Electronic Products, Inc. and is not transferable.

Repair Service

All products returned for repair should be returned to the following address, unless other instructions are received at the time an RMA number is issued:

Wagner Electronic Products, Inc.
326 Pine Grove Road
Rogue River, Oregon 97537
Phone (541) 582-0541
Fax (541) 582-4138

Customer must pay the expense of shipping the product to Wagner. Wagner will pay the cost of return shipment by surface carrier within the Continental United States. Customer must pay all extra costs of expedited shipping or shipment to and from locations outside of the Continental United States.

E-mail: support@wwwagner.com

Web: www.wwwagner.com