

SECTION 5 REFERENCE

25-point preventative maintenance checklist

- [] 1. Check and clean (blow out) machinery/control compartment.
- [] 2. Check and clean (blow out) main blower motors.
- [] 3. Check and clean (blow out and brush) axial fans.
- [] 4. Check burner blower motor and fan operation.
- [] 5. Check and clean igniter assembly.
- [] 6. Check and clean all orifices.
- [] 7. Install pilot tee if oven is not so equipped.
- [] 8. Check gas pressures; adjust as necessary.
- [] 9. Check air-fuel mixture; adjust as necessary.
- [] 10. Check ignition cable for signs of deterioration.
- [] 11. Check and tighten all electrical connections.
- [] 12. Inspect conveyor belt for damage; repair as necessary.
- [] 13. Inspect conveyor frame pivot plates.
- [] 14. Inspect conveyor shaft bushings - Replace drive side bushing.
- [] 15. Check conveyor drive chain tension; adjust as necessary.
- [] 16. Verify proper air finger arrangement; correct as required.
- [] 17. Inspect and clean (vacuum) conveyor motor and motor brushes.
- [] 18. Inspect conveyor motor sensor and magnet; verify correct spacing; adjust as necessary.
- [] 19. Check conveyor speed control; verify belt speed to be within 10 seconds of set point.
- [] 20. Verify that proper number of thermocouples are installed.
- [] 21. Check temperature control with thermocouple source to verify accuracy.
- [] 22. Check high limit safety circuit with thermocouple source to verify correct operation.
- [] 23. Check cool down feature with thermocouple source to verify correct operation.
- [] 24. Using the "read" function of the temperature controller, verify and record the high ambient reading.
- [] 25. Verify positive ignition on cold start.

Fractional inches to decimal and millimeter equivalents

INCH FRACTION	DECIMAL EQUIVALENT	METRIC EQUIVALENT	INCH FRACTION	DECIMAL EQUIVALENT	METRIC EQUIVALENT	
	1/64	.015625	0.397	33/64	.515625	13.097
1/32	.03125	0.794	17/32	.53125	13.494	
	3/64	.046875	1.191	35/64	.546875	13.891
1/16	.0625	1.588	9/16	.5625	14.287	
	5/64	.078125	1.985	37/64	.578125	14.684
3/32	.09375	2.381	19/32	.59375	15.081	
	7/64	.109375	2.778	39/64	.609375	15.478
1/8	.125	3.175	5/8	.625	15.875	
	9/64	.140625	3.572	41/64	.640625	16.272
5/32	.15625	3.969	21/32	.65625	16.669	
	11/64	.171875	4.366	43/64	.671875	17.067
3/16	.1875	4.762	11/16	.6875	17.463	
	13/64	.203125	5.159	45/64	.703125	17.860
7/32	.21875	5.556	23/32	.71875	18.238	
	15/64	.234375	5.953	47/64	.734375	18.635
1/4	.25	6.350	3/4	.75	19.049	
	17/64	.265625	6.747	49/64	.765625	19.446
9/32	.28125	7.144	25/32	.78125	19.842	
	19/64	.296875	7.541	51/64	.796875	20.239
5/16	.3125	7.937	13/16	.8125	20.636	
	21/64	.328125	8.334	53/64	.828125	21.033
11/32	.34375	8.731	27/32	.84375	21.430	
	23/64	.359375	9.128	55/64	.859375	21.827
3/8	.375	9.525	7/8	.875	22.224	
	25/64	.390625	9.922	57/64	.890625	22.621
13/32	.40625	10.319	29/32	.90625	23.018	
	27/64	.421875	10.716	59/64	.921875	23.415
7/16	.4375	11.112	15/16	.9375	23.812	
	29/64	.453125	11.509	61/64	.953125	24.209
15/32	.46875	11.906	31/32	.96875	24.606	
	31/64	.484375	12.303	63/64	.984375	25.004
1/2	.5	12.700	1	1.000	25.400	

Decimal equivalents of drill sizes

SIZE	DRILL DIAMETER	SIZE	DRILL DIAMETER	SIZE	DRILL DIAMETER	SIZE	DRILL DIAMETER	SIZE	DRILL DIAMETER
1	.2280	17	.1730	33	.1130	49	.0730	65	.0350
2	.2210	18	.1695	34	.1110	50	.0700	66	.0330
3	.2130	19	.1660	35	.1100	51	.0670	67	.0320
4	.2090	20	.1610	36	.1065	52	.0635	68	.0310
5	.2055	21	.1590	37	.1040	53	.0595	69	.0292
6	.2040	22	.1570	38	.1015	54	.0550	70	.0280
7	.2010	23	.1540	39	.0995	55	.0520	71	.0260
8	.1990	24	.1520	40	.0980	56	.0465	72	.0250
9	.1960	25	.1495	41	.0960	57	.0430	73	.0240
10	.1935	26	.1470	42	.0935	58	.0420	74	.0225
11	.1910	27	.1440	43	.0890	59	.0410	75	.0210
12	.1890	28	.1405	44	.0860	60	.0400	76	.0200
13	.1850	29	.1360	45	.0820	61	.0390	77	.0180
14	.1820	30	.1285	46	.0810	62	.0380	78	.0160
15	.1800	31	.1200	47	.0785	63	.0370	79	.0145
16	.1770	32	.1160	48	.0760	64	.0360	80	.0135
LETTER SIZES									
A	.234	G	.261	L	.290	Q	.332	V	.377
B	.238	H	.266	M	.295	R	.339	W	.386
C	.242	I	.272	N	.302	S	.348	X	.397
D	.246	J	.277	O	.316	T	.358	Y	.404
E	.250	K	.281	P	.323	U	.368	Z	.413
F	.257								

All dimensions are given in inches. See decimal equivalents.

Drills designated in fractions are available in diameters 1/8" to 4" in increments of 1/64".

SECTION 5 - REFERENCE

General conversion factors

MULTIPLY	BY	TO OBTAIN
atmospheres (std. - 760mm of mercury at 32°F/0°C)	14.696	lbs./sq. inch
atmospheres	76.0	cm of mercury
atmospheres	29.92	in. of mercury
atmospheres	33.90	ft. of water
atmospheres	1.0333	kg/sq. cm
atmospheres	14.70	lbs./sq. inch
atmospheres	1.058	tons/sq. ft.
BTU (British Thermal Units)	0.2520	kilogram-calories
BTU	777.5	ft.-lbs.
BTU	0.000393	horsepower-hrs.
BTU	0.293	Watt-hrs.
BTU/min	12.96	ft.-lbs.-sec.
BTU/min	0.02356	horsepower
BTU/min	0.01757	kilowatts
BTU/min	17.57	Watts
calories	0.003968	BTU
centimeters	0.3937	inches
centimeters	0.03280	feet
centimeters	0.01	meters
centimeters	10	millimeters
cm of mercury	0.01316	atmospheres
cm of mercury	0.4461	ft. of water
cm of mercury	136.0	kg/sq. meter
cm of mercury	27.85	lbs./sq. ft.
cm of mercury	0.1934	lbs./sq. in. (psi)
cubic feet	2.832x10 ⁴	cubic cm
cubic feet	1728	cubic inches
cubic feet	0.02832	cubic meters
cubic feet	0.03704	cubic yards
cubic feet	7.48052	gallons (U.S.)
cubic ft./min.	472	cubic cm/sec.
cubic ft./min.	0.1247	gallons/sec.
cubic ft./water	62.4	lb. @ 60°F/16°C
feet	30.48	centimeters
feet	12	inches
feet	0.3048	meters
feet	1/3	yards
feet of water	0.02950	atmospheres
feet of water	0.8826	in. of mercury
feet of water	0.03048	kg/sq. cm
feet of water	62.43	lbs./sq. ft.
feet of water	0.4335	lbs./sq. in. (psi)

MULTIPLY	BY	TO OBTAIN
feet/min	0.5080	cm/sec.
feet/min	0.01667	ft./sec.
feet/min	0.01829	km/hr.
feet/min	0.3048	meters/min.
feet/min	0.01136	miles/hr. (mph)
foot-pounds	0.001286	BTU
gallons (imp.)	1.201	gallons (U.S.)
gallons (U.S.)	0.833	gallons (imp.)
gallons (U.S.)	3785	cubic cm
gallons (U.S.)	0.1337	cubic feet
gallons (U.S.)	231	cubic inches
gallons (U.S.)	128	fluid ounces
gallons (U.S.)	3.785	liters
gallons (U.S.) water	8.35	lbs. H ₂ O@60°F/16°C
horsepower	42.44	BTU/min.
horsepower	33,000	foot-lbs./min.
horsepower	550	foot-lbs./sec.
horsepower	0.7457	kilowatts
horsepower	745.7	Watts
horsepower (boiler)	33,479	BTU/hr.
horsepower (boiler)	9,803	kilowatts
horsepower-hours	2547	BTU
horsepower-hours	0.7457	kilowatt-hours
inches	2.54	centimeters
inches	25.4	millimeters
inches	0.0254	meters
inches	0.0833	feet
inches of mercury	0.03342	atmospheres
inches of mercury	1.133	feet of water
inches of mercury	13.57	inches of water
inches of mercury	70.73	lbs./sq. ft.
inches of mercury	0.4912	lbs./sq. in. (psi)
inches of water	0.002458	atmospheres
inches of water	0.07355	in. of mercury
inches of water	0.5781	oz./sq. inch
inches of water	5.202	lbs./sq. ft.
inches of water	0.03613	lbs./sq. in. (psi)
kilowatts	56.92	BTU/min.
kilowatts	1.341	horsepower
kilowatts	1000	Watts
kilowatt-hours	3415	BTU
liters	0.2642	gallons
liters	2.113	pints (liquid)
liters	1.057	quarts (liquid)

MULTIPLY	BY	TO OBTAIN
meters	100	centimeters
meters	1000	millimeters
meters	3.281	feet
meters	39.37	inches
meters	1.094	yards
ounces (fluid)	1.805	cubic inches
ounces (fluid)	0.02957	liters
ounces/sq. in.	0.0625	lbs./sq. in. (psi)
ounces/sq. in.	1.73	inches of water
pints	0.4732	liter
pounds	16	ounces
pounds of water	0.01602	cubic ft.
pounds of water	27.68	cubic in.
pounds of water	0.1198	gallons
pounds/sq. ft.	0.01602	feet of water
pounds/sq. ft.	0.006945	lbs./sq. in. (psi)
pounds/sq. in.	0.06804	atmospheres
pounds/sq. in.	2.307	feet of water
pounds/sq. in.	2.036	in. of mercury
pounds/sq. in.	27.68	inches of water
temp. (°C)+273	1	absolute temp (°K)
temp. (°C)+17.78	1.8	temperature (°F)
temp. (°F)+460	1	absolute temp.
temp. (°F)-32	59	temperature (°C)
therm	100,000	BTU
ton, refrigeration	12,000	BTU/hr.
tons (long)	2240	pounds
tons (short)	2000	pounds
watts	3.415	BTU
watts	0.05692	BTU/min.
watts	44.26	foot-pounds/min.
watts	0.7376	foot-pounds/sec.
watts	0.001341	horsepower
watts	0.001	kilowatts
watt-hours	3.415	BTU/hr.
watt-hours	2655	foot-pounds
watt-hours	0.001341	horsepower hrs.
watt-hours	0.001	kilowatt-hours

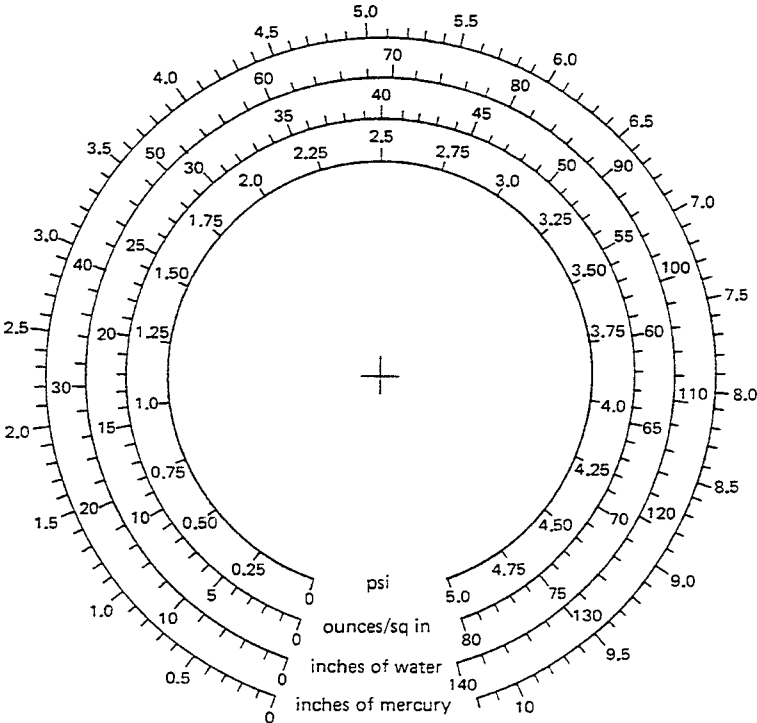
Pressure conversions

in. H ₂ O	in. Hg	mbar	psi	oz./sq. in.
0.10	0.007	0.20	0.0036	0.0577
0.20	0.015	0.50	0.0072	0.115
0.30	0.022	0.75	0.0108	0.173
0.40	0.029	0.98	0.0145	0.231
0.50	0.037	1.25	0.0181	0.289
0.60	0.044	1.50	0.0217	0.346
0.70	0.051	1.72	0.0253	0.404
0.80	0.059	1.98	0.0289	0.462
0.90	0.066	2.23	0.325	0.520
1.00	0.074	2.50	0.036	0.577
1.36	0.100	3.38	0.049	0.785
1.74	0.128	4.33	0.067	1.00
2.00	0.147	4.97	0.072	1.15
2.77	0.203	6.87	0.100	1.60
3.00	0.221	7.48	0.109	1.73
4.00	0.294	9.95	0.144	2.31
5.00	0.368	12.4	0.181	2.89
6.00	0.442	14.9	0.217	3.46
7.00	0.515	17.4	0.253	4.04

in. H ₂ O	in. Hg	mbar	psi	oz./sq. in.
8.00	0.588	20.0	0.289	4.62
9.00	0.662	22.4	0.325	5.20
10.00	0.74	25.0	0.361	5.77
11.00	0.81	27.4	0.397	6.34
12.00	0.88	29.8	0.433	6.92
13.00	0.96	32.5	0.469	7.50
13.60	1.00	33.8	0.491	7.80
13.90	1.02	34.5	0.500	6.00
14.00	1.06	35.8	0.505	8.08
15.00	1.10	37.2	0.542	8.7
16.00	1.18	40.0	0.578	9.2
17.00	1.25	42.3	0.614	9.8
18.00	1.33	45.0	0.650	10.4
19.00	1.40	47.4	0.686	10.9
20.00	1.47	49.7	0.722	11.5
25.00	1.84	62.3	0.903	14.4
27.20	2.00	67.7	0.975	15.7
27.70	2.03	68.7	1.00	16.0

Pressure conversion chart

To use this chart, simply place a straightedge so that it intersects the known value and lies across the center of the bullseye. Readings on all scales will then be equivalent.

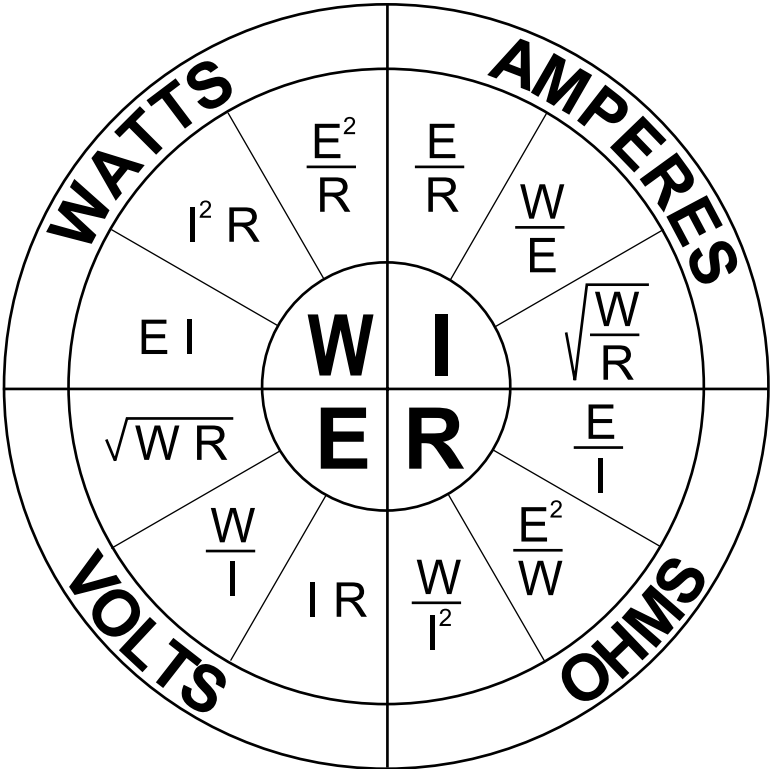


Ohm's Law equation wheel

Using this wheel, you can calculate any one of the following four basic factors of electricity, as long as two of the others are known:

- Power - Watts (W), shown as "W"
- Current - Amperes (A), shown as "A"
- Voltage - Volts (V), shown as "E"
- Resistance - Ohms (Ω), shown as "R"

Choose an equation that will give you the value that you need based on what values are already known.



Common electrical wiring diagram symbols

SWITCHES									
DISCONNECT		CIRCUIT INTERRUPTER		CIRCUIT BREAKER		LIMIT			
						NORMALLY OPEN	NORMALLY CLOSED	NEUTRAL POSITION	
									ACTUATED
LIMIT (CONTINUED)			LIQUID LEVEL		VACUUM & PRESSURE		TEMPERATURE		
MAINTAINED POSITION	PROXIMITY SWITCH		NORMALLY OPEN	NORMALLY CLOSED	NORMALLY OPEN	NORMALLY CLOSED	NORMALLY OPEN	NORMALLY CLOSED	
	CLOSED	OPEN							
FLOW(AIR, WATER ETC.)		FOOT		TOGGLE	CABLE OPERATED (EMERG.) SWITCH	PLUGGING		NON-PLUG	
NORMALLY OPEN	NORMALLY CLOSED	NORMALLY OPEN	NORMALLY CLOSED			F	F	F	
PLUGGING W/LOCK-OUT COIL	SELECTOR			ROTARY SELECTOR					
	2-POSITION		3-POSITION	† NON-BRIDGING CONTACTS		† BRIDGING CONTACTS			
			OR		OR				
† TOTAL CONTACTS TO SUIT NEEDS									
THERMOCOUPLE SWITCH		PUSHBUTTONS				CONNECTIONS, ETC.			
		SINGLE CIRCUIT	DOUBLE CIRCUIT		MAINTAINED CONTACT		CONDUCTORS		
		NORMALLY OPEN		MUSHROOM HEAD			NOT CONNECTED	CONNECTED	

Common electrical wiring diagram symbols (continued)

CONNECTIONS, ETC. (CONT'D)			CONTACTS						
GROUND	CHASSIS OR FRAME NOT NECESSARILY GROUNDED	PLUG AND RECP.	TIME DELAY AFTER COIL				RELAY, ETC.		THERMAL OVERLOAD
			ENERGIZED		DE-ENERGIZED		NORMALLY OPEN	NORMALLY CLOSED	
			NORMALLY OPEN	NORMALLY CLOSED	NORMALLY OPEN	NORMALLY CLOSED			
COILS									
RELAYS, TIMERS, ETC.	SOLENOIDS, BRAKES, ETC.				THERMAL OVERLOAD ELEMENT	CONTROL CIRCUIT TRANSFORMER			
	GENERAL	2-POSITION HYDRAULIC	3-POSITION PNEUMATIC	2-POSITION LUBRICATION					
COILS (CONTINUED)									
AUTO TRANSFORMER			LINEAR VARIABLE DIFFERENTIAL TRANSFORMER			VARIABLE AUTO-TRANSFORMER			
MOTORS									
3 PHASE MOTOR			DC MOTOR ARMATURE		DC MOTOR FIELD				
RESISTORS, CAPACITORS, ETC.									
RESISTOR		HEATING ELEMENT	TAPPED RESISTOR	RHEOSTAT		POTENTIOMETER			

Common electrical wiring diagram symbols (continued)

RESISTORS, CAPACITORS, ETC. (CONTINUED)						
CAPACITORS			METERS		METER SHUNT	FUSES (ALL TYPES)
FIXED	ADJUSTABLE	POLARIZED ELECTROLYTIC	VOLT	AMP		
RESISTORS, CAPACITORS, ETC. (CONTINUED)						
PILOT LIGHTS		HORN, SIREN ETC.	BUZZER	BELL	THERMOC'PLE	BATTERY
LETTER DENOTES COLOR						
ELECTRONIC TUBES						
COLD CATHODE VOLT. REGULATOR	DIODE	TRIODE	TETRODE	PENTODE		
● DOT IN ANY TUBE ENVELOPE DENOTES GAS						
NEON LIGHT						
AC	DC	AC W/INT. RES.				
SEMICONDUCTORS						
RECTIFIER DIODE	RECTIFIER BRIDGE	ARC SUPPRESSORS				
		AC	DC	AC AND DC		
					LIST VALUES OF RES. AND CAP.	

Common electrical wiring diagram symbols (continued)

MISCELLANEOUS								
TERMINAL BLOCK	LOCATION OF RELAY CONTACTS							
<table border="1"><tr><td>10</td></tr><tr><td>11</td></tr><tr><td>12</td></tr><tr><td>15</td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr></table>	10	11	12	15				<p>NUMBERS IN PARENTHESES DESIGNATE THE LOCATION OF RELAY CONTACTS. A LINE BENEATH A NUMBER SIGNIFIES A NORMALLY CLOSED CONTACT.</p>
10								
11								
12								
15								



Commercial Food Equipment Service Association

Middleby is proud to support the
Commercial Food Equipment Service Association (CFESA).
We recognize and applaud CFESA's ongoing efforts
to improve the quality of technical service in the industry.

© 2002 Middleby Marshall, Inc.



**Middleby
Marshall** is a registered trademark of Middleby Marshall, Inc. All rights reserved.

Middleby Cooking Systems Group • 1400 Toastmaster Drive • Elgin, IL 60120 • (847) 741-3300 • FAX (847) 741-4406 • 24-Hour Service Hotline (800) 238-8444