Troubleshooting Checklist

Fax Number US & Canada: 1-877-270-1738 | Easyheat.Technicalservices@Emerson.com

Return this completed document to your contact at Easy Heat – Warm Tiles along with photographs or sketches of the installation

Date

Troubleshooter's Name (Electrician / Contractor):

Company Name:

Office Phone Number:

Business Address:

Mobile Number:

E-mail Address:

Fax Number:

Installer's Name:

Installer's Phone Number:

Home Owner's Name:

Home Owner's Phone Number:

Home Owner's Address:

Warm Tiles®

1. When was the system installed?

2. Identify the model number(s) of each cable kit/mat that was installed. The model number appears on the factory identification tag on the cold lead, retained within the junction box or electrical connection box, behind the thermostat.

3. Provide the total square footage of the heated area.

4. What type of controller (thermostat) was used? Was a relay/contactor used? If so, what is the model number?

5. Provide the results of the Warm Tiles Cable and Mat Resistance Log from the original installation.

Catalog Number	Factory Value (appearing on tag)	Initial (out of the package)	Before floor covering (after cable installation)	Final (after floor covering)
A. Conductor Resistance				
B. Conductor and Ground Braid Continuity				
	"I" for infinity or "OL" for over load or open circuit			

Catalog Number	Factory Value (appearing on tag)	Initial (out of the package)	Before floor covering (after cable installation)	Final (after floor covering)
C. Insulation Resistance				
	Minimum of 10 Megohms, up to "I" for infinity or "OL" for over load or open circuit			
D. Sensor Wire Resistance				
	7,000 to 14,000 ohms (measured at room temperature)			

6. What is the main problem with the system?

7. Did the system operate initially? How long?

8. Does the whole floor fail to heat or just a part of it?

9. Has the cable/mat ever been altered in any way? (Cut, shortened, repaired)

10. What is the sub-floor construction (Concrete or wood)? Final floor finish?

11. What is under this floor? (Example: second floor, over crawl space, on slab, insulation)

12. For Cable Kits, what cable spacing was used?

13. What is the total height of the installation? How deep are the cables buried?

14. Have any flooring modifications or repairs recently been made in the area?

15. Was the system installed under floor obstructions? (Example: cabinets, vanity, plumbing fixtures, shower); or – were any of these installed over the heated area after the cables were embedded in mortar?

16. Is it possible that the cable/mat was damaged during installation?

17. Where is the sensor wire bulb (thermistor) placed in the floor in respect to the heating cables? Are there any heating vents or other heat sources near the sensor probe?

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A multi-meter will be required for the following test procedures:
CAUTION:
The following actions may present a shock hazard and should be done only by a qualified electrician.

THERMOSTAT TESTING PROCEDURES:

If you are concerned that the system thermostat may not be operating correctly, please provide the following information:

Carefully measure the input voltage (between Line & Neutral (120V) or L1 & L2 (240V) – LINE or INPUT POWER) of the thermostat. (Expected voltage to be approx. +120V or +240V AC):

Carefully measure the output voltage (between Line & Neutral (120V) or L1 & L2 (240V) – LOAD or TO HEATING CABLE) of the thermostat when the thermostat is energized. Output voltage should match input voltage:

Please disconnect the power to the thermostat at the breaker BEFORE proceeding!

Remove the sensor wires from the thermostat terminals and measure the resistance between the sensor conductors. **Expected range is 7,000 to 14,000 ohms** (measured at room temperature).

HEATING CABLE TESTING PROCEDURES:

If you are concerned that the floor heating cable/mat may not be operating correctly, OR if the thermostat or circuit breaker ground fault protection is tripping, please provide the following information – use a separate form for each mat/cable for which there are concerns:

Completely disconnect the heating cable from the back of the thermostat (LOAD or TO HEATING CABLE) before proceeding with multi-meter and Megger measurements:

With an Ohmmeter (Multi-meter or DMM), check for either Open Fault or Short Fault condition. Please refer to pages 5-7 for specific cable electrical specifications.

A. Check the resistance from one conductor of the heating cable/mat to the other conductor.

Value: Ohms * (Black & White for 120V AC; Black & Red for 240V AC)

B. Check the resistance from each conductor to the ground shield braid.

Value: Ohms *

Value: Ohms *

*Note: If the meter reading varies rapidly and will not stabilize, mark as “Unstable”.

CHECK THE HEATING CABLE'S PRIMARY INSULATION RESISTANCE VALUE:

C. Using a 500V DC Megger, check the insulation resistance from each conductor of the heating cable/mat to the ground braid.

Value:	MOhms *	
Value:	MOhms *	

D. If the value in (A) above exceeds 5000 ohms (5 kOhms), megger between the conductors.

Value:	MOhms *	

*Note: If the meter reading varies rapidly and will not stabilize, mark as "Unstable".

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DFT Cable Kits

DFT	Heated Area				Cable Length		Electrical					
	Standard (12 W/Ft²)		Alternating (18 W/Ft²)							Resistance (Ohms)		
Model Number	Ft²	(m²)	Ft²	(m²)	Ft	m	Watts	Volt	Amps	Min (-5%)	Normal	Max (+10%)
DFT 1011 BLUE	9–13	(0.84–1.21)	7–9	(0.65–0.84)	42	12.8	130	120	1.1	104	109	120
DFT 1016 RED	14–18	(1.30–1.67)	10–13	(0.93–1.21)	62	18.9	190	120	1.6	70.9	74.6	82.1
DFT 1022 GREEN	19–26	(1.77–2.42)	14–19	(1.30–1.77)	86	26.2	260	120	2.2	52.6	55.4	60.9
DFT 1030 YELLOW	27–34	(2.51–3.16)	20–26	(1.86–2.42)	121	36.9	360	120	3.0	37.7	39.7	43.7
DFT 1039 PURPLE	35–42	(3.25–3.90)	27–33	(2.51–3.07)	155	47.2	500	120	4.0	28.6	30.1	33.1
DFT 1048 ORANGE	43–54	(3.99–5.02)	34–39	(3.16–3.62)	190	57.9	600	120	5.1	22.4	23.6	25.9
DFT 1059 BROWN	55–65	(5.11–6.04)	40–48	(3.72–4.46)	235	71.6	800	120	6.4	17.9	18.8	20.7
DFT 1069 BEIGE	66–72	(6.13–6.69)	49–54	(4.55–5.02)	275	83.8	900	120	7.4	15.4	16.2	17.8
DFT 1079 WHITE	73–82	(6.78–7.62)	55–62	(5.11–5.76)	313	95.4	1,000	120	8.5	13.4	14.1	15.6
DFT 1088 PINK	83–92	(7.71–8.55)	63–69	(5.85–6.41)	350	106.7	1,100	120	8.8	13	13.7	15
DFT 1098 SILVER	93–102	(8.64–9.48)	70–76	(6.50–7.06)	390	118.9	1,200	120	9.6	11.9	12.5	13.7
DFT 1108 BLACK	103–113	(9.57–10.50)	77–85	(7.15–7.90)	430	131.1	1,300	120	10.7	10.6	11.2	12.3
DFT 2021 "A"	18–25	(1.67–2.32)	13–19	(1.21–1.77)	84	25.6	260	240	1.1	207	218	240
DFT 2031 "B"	26–35	(2.42–3.25)	20–27	(1.86–2.51)	124	37.8	400	240	1.6	142	149	164
DFT 2053 "C"	48–55	(4.46–5.11)	35–44	(3.25–4.09)	210	64.0	600	240	2.6	87	91.6	101
DFT 2065 "D"	60–70	(5.57–6.50)	45–54	(4.18–5.02)	258	78.6	800	240	3.3	70.1	73.8	81.2
DFT 2078 "E"	71–83	(6.60–7.71)	55–63	(5.11–5.85)	310	94.5	1,000	240	4.0	57.1	60.1	66.2
DFT 2095 "F"	90–100	(8.36–9.29)	64–75	(5.95–6.97)	380	115.8	1,200	240	5.1	44.8	47.1	51.8
DFT 2118 "G"	110–130	(10.22–12.08)	84–94	(7.80–8.73)	473	144.2	1,500	240	6.3	35.9	37.8	41.6
DFT 2137 "H"	131–145	(12.17–13.47)	95–108	(8.83–10.03)	549	167.3	1,800	240	7.4	30.7	32.3	35.5
DFT 2157 "I"	146–165	(13.56–15.33)	109–125	(10.13–11.61)	626	190.8	2,000	240	8.5	26.9	28.3	31.1
DFT 2175 "J"	166–184	(15.42–17.09)	126–138	(11.71–12.82)	700	213.4	2,100	240	8.8	25.9	27.3	30
DFT 2195 "K"	185-204	(17.19-18.95)	139-153	(12.91-14.21)	780	237.7	2,300	240	9.6	23.7	25	27.5
DFT 2215 "L"	205-224	(19.05-20.81)	154-169	(14.31-15.70)	860	262.1	2,600	240	10.7	21.2	22.4	24.6

SAM (Self-Adhesive Mats)

SAM	Heated Area (12 W/Ft²)		Mat Length	Cable Length		Electrical					
									Resistance (Ohms)		
Model Number	Ft²	(m²)	Ft	Ft	m	Watts	Volt	Amps	Min (-5%)	Normal	Max (+10%)
SAM 1010	12-15	(1.12 - 1.39)	6.7	42	12.8	152	120	1.3	89.97	94.7	104.17
SAM 1013	16-19	(1.49 - 1.77)	8.7	59	18.0	200	120	1.7	68.31	71.9	79.09
SAM 1017	20-22	(1.86 - 2.04)	11.3	76	23.2	267	120	2.2	51.30	54	59.4
SAM 1020	23-28	(2.14 - 2.60)	13.3	89	27.1	300	120	2.5	45.51	47.9	52.69
SAM 1025	29-36	(2.70 - 3.35)	16.7	109	33.2	375	120	3.1	36.48	38.4	42.24
SAM 1033	37-46	(3.44 - 4.28)	22	147	44.8	500	120	4.2	27.36	28.8	31.68
SAM 1042	47-54	(4.37 - 5.02)	28	184	56.1	637	120	5.3	21.47	22.6	24.86
SAM 1050	55-66	(5.11 - 6.13)	33.3	219	66.7	784	120	6.5	17.48	18.4	20.24
SAM 1062	67-80	(6.23 - 7.44)	41.3	276	84.1	972	120	8.1	14.06	14.8	16.28
SAM 1075	81-94	(7.53 - 8.74)	50	335	102.1	1,161	120	9.7	11.78	12.4	13.64
SAM 1087	95-106	(8.83 - 9.85)	58	383	116.7	1,386	120	11.5	9.88	10.4	11.44
SAM 1100	107-120	(9.95 - 11.15)	66.7	446	135.9	1,567	120	13.1	8.74	9.2	10.12
SAM 2010	12-15	(1.12 - 1.39)	6.7	42	12.8	155	240	0.6	352.74	371.3	408.43
SAM 2013	16-19	(1.49 - 1.77)	8.7	59	18.0	201	240	0.8	272.37	286.7	315.37
SAM 2017	20-22	(1.86 - 2.04)	11.3	76	23.2	256	240	1.1	213.56	224.8	247.28
SAM 2020	23-28	(2.14 - 2.60)	13.3	89	27.1	304	240	1.3	179.74	189.2	208.12
SAM 2025	29-36	(2.70 - 3.35)	16.7	109	33.2	374	240	1.6	146.30	154	169.4
SAM 2033	37-46	(3.44 - 4.28)	22	147	44.8	500	240	2.1	109.44	115.2	126.72
SAM 2042	47-54	(4.37 - 5.02)	28	184	56.1	663	240	2.8	82.46	86.8	95.48
SAM 2050	55-66	(5.11 - 6.13)	33.3	219	66.7	751	240	3.1	72.87	76.7	84.37
SAM 2062	67-80	(6.23 - 7.44)	41.3	276	84.1	992	240	4.1	55.10	58	63.8
SAM 2075	81-94	(7.53 - 8.74)	50	335	102.1	1,161	240	4.8	47.12	49.6	54.56
SAM 2087	95-106	(8.83 - 9.85)	58	383	116.7	1,360	240	5.7	40.28	42.4	46.64
SAM 2100	107-120	(9.94 - 11.15)	66.7	446	135.9	1,567	240	6.5	34.87	36.7	40.37

WTE (Warm Tiles Elite)

WTE	Heated Area (12 W/Ft²)		Dimension		Cable Length		Electrical					
										Resistance (Ohms)		
Model Number	Ft²	(m²)	Length (in)	Width (in)	Ft	m	Watts	Volt	Amps*	Min (-5%)	Normal	Max (+10%)
WTE0400271	7.5	0.697	40	27	37.8	11.52	105	120	0.9	134.0	141.0	155.0
WTE0400321	8.9	0.83	40	32	50.3	15.33	124	120	1.0	115.0	121.0	133.0
WTE0400401	11.1	1.03	40	40	52.7	16.06	160	120	1.3	89.2	93.9	103.0
WTE0400481	13.3	1.24	40	48	75.7	23.07	187	120	1.6	74.1	78.0	85.8
WTE0480241	8.0	0.74	48	24	37.9	11.55	115	120	1.0	117.0	124.0	136.0
WTE0480301	10.0	0.93	48	30	39.3	11.98	140	120	1.2	105.0	110.0	121.0
WTE0480361	12.0	1.11	48	36	47.3	14.42	168	120	1.4	80.0	84.2	92.6
WTE0480481	16.0	1.49	48	48	61.0	18.59	230	120	1.9	59.7	62.8	69.1
WTE0600241	10.0	0.93	60	24	57.2	17.43	140	120	1.2	96.7	102.0	112.0
WTE0600301	12.5	1.16	60	30	49.3	15.03	175	120	1.5	76.8	80.9	88.9
WTE0600361	15.0	1.39	60	26	59.3	18.07	210	120	1.8	64.2	67.6	74.4
WTE0600421	17.5	1.63	60	42	78.5	23.93	255	120	2.1	58.7	61.7	67.9
WTE0600481	20.0	1.86	60	48	116.0	35.36	280	120	2.2	50.7	53.4	58.7
WTE0600601	25.0	2.32	60	60	109.0	33.22	348	120	2.9	39.3	41.1	45.5
WTE0720241	12.0	1.11	72	24	46.4	14.14	175	120	1.5	78.4	82.5	90.8
WTE0720301	15.0	1.39	72	30	58.0	17.68	220	120	1.8	62.8	66.1	72.7
WTE0720361	18.0	1.67	72	36	71.3	21.73	252	120	2.1	53.2	56.0	61.6
WTE0720421	21.0	1.95	72	42	103.7	31.61	300	120	2.5	45.3	47.7	52.5
WTE0720481	24.0	2.23	72	48	94.7	28.86	336	120	2.7	41.4	43.6	47.9
WTE0720601	30.0	2.79	72	60	131.0	39.93	421	120	3.5	32.5	34.2	37.6
WTE0840241	14.0	1.30	84	24	54.4	16.58	205	120	1.7	67.2	70.7	77.8
WTE0840301	17.5	1.63	84	30	68.0	20.73	245	120	2.0	50.7	53.4	58.7
WTE0840361	21.0	1.95	84	36	81.7	24.9	300	120	2.4	46.7	49.2	54.1
WTE0840601	35.0	3.25	84	60	136.4	41.6	485	120	4.0	28.2	29.7	32.7
WTE0960241	16.0	1.49	96	24	77.5	23.6	235	120	2.0	57.9	60.9	67.0
WTE0960301	20.0	1.86	96	30	78.0	23.8	280	120	2.4	44.7	47.0	51.7
WTE0960361	24.0	2.23	96	36	93.7	28.6	335	120	2.8	40.9	43.1	47.4
WTE0960421	28.0	2.60	96	42	157.7	48.1	390	120	3.3	32.7	34.4	37.8
WTE0960481	32.0	2.97	96	48	186.8	56.9	460	120	3.8	29.6	31.2	34.3
WTE0960601	40.0	3.72	96	60	156.4	47.7	550	120	4.6	24.8	26.1	28.7
WTE1080241	18.0	1.67	108	24	87.9	26.8	270	120	2.3	50.3	52.9	58.2
WTE1080301	22.5	2.09	108	30	177.1	54.0	310	120	2.6	43.9	46.2	50.8
WTE1080361	27.0	2.51	108	36	175.8	53.6	375	120	3.1	36.4	38.3	42.1
WTE1080421	31.5	2.93	108	42	123.4	37.6	445	120	3.7	30.6	32.2	35.4
WTE1080481	36.0	3.34	108	48	175.4	53.5	490	120	4.1	27.8	29.3	32.2
WTE1080601	45.0	4.18	108	60	197.0	60.0	665	120	5.5	20.6	21.7	23.8
WTE1180241	19.7	1.83	118	24	134.5	41.0	280	120	2.3	48.5	51.1	56.2
WTE1180301	24.6	2.29	118	30	174.6	53.2	344	120	2.8	36.2	38.1	41.9
WTE1180361	29.5	2.74	118	36	136.5	41.6	404	120	3.4	33.9	35.6	39.2
WTE1180421	34.4	3.20	118	42	172.7	52.6	500	120	4.2	27.4	28.8	31.7
WTE1180481	39.3	3.65	118	48	154.4	47.1	560	120	4.7	24.5	25.8	28.4
WTE1180601	49.20	4.57	118	60	193.0	58.8	680	120	5.7	20.1	21.2	23.3
WTE0400272	7.5	0.70	40	27	44.9	13.7	115.0	240	0.5	486.0	512.0	563.0
WTE0400322	8.9	0.83	40	32	62.8	19.1	130.0	240	0.5	418.0	440.0	484.0
WTE0400402	11.0	1.03	40	40	64.7	19.7	160.0	240	0.7	339.0	357.0	392.0
WTE0400482	13.0	1.24	40	48	86.8	26.5	180.0	240	0.7	307.0	323.0	355.0
WTE0480242	8.0	0.74	48	24	45.5	13.9	110.0	240	0.5	493.0	519.0	571.0
WTE0480302	10.0	0.93	48	30	73.9	22.5	140.0	240	0.6	387.0	407.0	448.0
WTE0480362	12.0	1.11	48	36	90.5	27.6	170.0	240	0.7	321.0	338.0	371.0
WTE0480482	16.0	1.49	48	48	91.5	27.9	225.0	240	0.9	243.0	256.0	282.0
WTE0600242	10.0	0.93	60	24	76.1	23.2	140.0	240	0.6	393.0	413.0	455.0
WTE0600302	12.5	1.16	60	30	57.2	17.4	185.0	240	0.7	299.0	315.0	347.0
WTE0600362	15.0	1.39	60	36	86.5	26.4	205.0	240	0.9	268.0	282.0	310.0
WTE0600422	17.5	1.63	60	42	67.4	20.5	260.0	240	1.1	209.0	220.0	242.0
WTE0600482	20.0	1.86	60	48	114.8	45.0	280.0	240	1.2	194.0	204.0	225.0
WTE0600602	25.0	2.32	60	60	96.4	29.4	265.0	340	1.5	150.0	158.0	174.0
WTE0720242	12.0	1.11	72	24	57.9	17.6	180.0	240	0.8	303.0	319.0	351.0
WTE0720302	15.0	1.39	72	30	69.2	21.1	225.0	240	0.9	245.0	258.0	284.0
WTE0720362	18.0	1.67	72	36	69.7	21.2	255.0	240	1.1	216.0	227.0	250.0

WTE0720422	21.0	1.95	72	42	103.7	31.6	310.0	240	1.3	175.0	185.0	203.0
WTE0720482	24.0	2.23	72	48	93.0	28.3	350.0	240	1.4	157.0	166.0	182.0
WTE0720602	30.0	2.79	72	60	116.4	35.5	435.0	240	1.8	126.0	133.0	146.0
WTE0840242	14.0	1.30	84	24	80.7	24.6	150.0	240	0.8	286.0	301.0	331.0
WTE0840302	17.5	1.63	84	30	81.2	24.7	255.0	240	1.1	216.0	227.0	250.0
WTE0840362	21.0	1.95	84	36	81.7	24.9	295.0	240	1.2	186.0	296.0	216.0
WTE0840422	24.5	2.28	84	42	95.4	29.1	368.0	240	1.5	149.0	157.0	172.0
WTE0840482	28.0	2.60	84	48	109.0	33.2	405.0	240	1.7	315.0	142.0	156.0
WTE0840602	35.0	3.25	84	60	136.4	41.6	490.0	240	2.0	102.0	107.0	118.0
WTE0960242	16.0	1.49	96	24	93.2	28.4	220.0	240	0.9	248.0	261.0	287.0
WTE0960302	20.0	1.86	96	30	109.9	33.5	295.0	240	1.2	185.8	195.6	215.1
WTE0960362	24.0	2.23	96	36	93.7	28.6	345.0	240	1.4	158.0	167.0	182.0
WTE0960422	28.0	2.60	96	42	109.4	33.3	405.0	240	1.7	135.0	142.0	156.0
WTE0960482	32.0	2.97	96	48	155.4	47.4	470.0	240	2.0	116.0	122.0	134.0
WTE0960602	40.0	3.72	96	60	157.8	48.1	560.0	240	2.3	90.3	95.0	105.0
WTE1080242	18.0	1.67	108	24	70.4	21.5	250.0	240	1.0	218.0	229.0	252.0
WTE1080302	22.5	2.09	108	30	105.2	32.1	310.0	240	1.3	178.0	187.0	206.0
WTE1080362	27.0	2.51	108	36	142.7	43.5	390.0	240	1.6	140.0	147.0	162.0
WTE1080422	31.5	2.93	108	42	123.4	37.6	450.0	240	1.9	121.0	127.0	140.0
WTE1080482	36.0	3.34	108	48	141.0	43.0	520.0	240	2.2	105.0	111.0	122.0
WTE1080602	45.0	4.18	108	60	232.2	70.8	650.0	240	2.7	83.8	88.2	97.0
WTE1180242	19.7	1.83	118	24	115.2	351.0	280.0	240	1.2	195.0	205.0	226.0
WTE1180302	24.6	2.29	118	30	96.4	29.4	365.0	240	1.5	150.0	158.0	174.0
WTE1180362	29.5	2.74	118	36	115.7	35.3	435.0	240	1.8	125.0	132.0	145.0
WTE1180422	34.4	3.20	118	42	194.4	59.3	490.0	240	2.1	111.0	117.0	129.0
WTE1180482	39.3	3.65	118	48	175.9	53.6	544.0	240	2.3	100.6	105.9	116.5
WTE1180602	49.2	4.57	118	60	215.3	65.6	704.0	240	2.9	77.7	81.8	90.0

DMC (De-coupling Membrane Cable)

DMC										
	Subfloor Coverage (Sq. Ft)		**Cable Length**		**Electrical**					
Model Number	**Plywood (3.6" spacing)**	**Concrete (2.4" Spacing)**	**Ft**	**m**	**Watts**	**Volt**	**Amps**	**Resistance (Ohms)**		
								Min (-5%)	**Normal**	**Max (+10%)**
DMC1012	12	8	44.1	13.4	159	120	1.3	86.2	90.8	95.3
DMC1016	16	11	57.6	17.6	208	120	1.7	65.9	69.4	72.9
DMC1021	21	14	76.0	23.2	274	120	2.3	50.0	52.6	55.2
DMC1025	25	17	87.5	26.7	315	120	2.6	43.4	45.7	48.0
DMC1031	31	21	109.4	33.4	394	120	3.3	34.7	36.6	38.4
DMC1042	42	28	145.1	44.2	522	120	4.4	26.2	27.6	28.9
DMC1053	53	36	184.7	56.3	665	120	5.5	20.6	21.7	22.7
DMC1065	65	43	223.6	68.2	805	120	6.7	17.0	17.9	18.8
DMC1081	81	54	277.4	84.5	998	120	8.3	13.7	14.4	15.1
DMC1097	97	66	333.3	101.6	1200	120	10.0	11.4	12.0	12.6
DMC1114	114	77	392.2	119.6	1412	120	11.8	9.7	10.2	10.7
DMC2021	21	14	74.5	22.7	268	240	1.1	203.9	214.7	225.4
DMC2025	25	17	88.1	26.9	317	240	1.3	172.5	181.5	190.6
DMC2031	31	21	109.2	33.3	393	240	1.6	139.2	146.5	153.9
DMC2042	42	28	145.1	44.2	522	240	2.2	104.8	110.3	115.8
DMC2054	54	37	188.6	57.5	679	240	2.8	80.6	84.9	89.1
DMC2063	63	42	218.9	66.7	788	240	3.3	69.4	73.1	76.8
DMC2081	81	56	280.1	85.4	1008	240	4.2	54.3	57.1	60.0
DMC2097	97	66	333.3	101.6	1200	240	5.0	45.6	48.0	50.4
DMS2113	113	76	288.5	118.4	1399	240	5.80	39.1	41.2	43.2
DMC2131	131	88	447.2	136.3	1610	240	6.70	34.0	35.8	37.6
DMC2163	163	109	554.7	169.1	1997	240	8.30	27.4	28.8	30.2
DMC2196	195	131	666.7	203.2	2400	240	10.00	22.8	24.0	25.2
DMC2231	231	154	784.5	239.1	2824	240	11.80	19.4	20.4	21.4