

## Technical Notes

### Calculating the Pressure Drop of Runtal Radiators

Calculating the pressure drop for Runtal radiators is a simple process, if you keep the following facts in mind:

1. Do not have a flow of more than 1.5 GPM in any one tube of the radiator.
2. Virtually all of the pressure drop in a Runtal radiator occurs in getting the flow of water in and out of the headers at each end of the radiator. There is almost no pressure drop in the tubes between the headers. Therefore, a long radiator and a short radiator (with the same water flow) would have virtually the same pressure drop.
3. The pressure drops shown in the Runtal Pressure Drop Charts are per radiator, NOT per foot of radiator.
4. The total pressure drop is a combination of two components, the radiator pressure drop plus the pressure drop of the pipe connections.
5. There are 0.0244 gallons/tube per foot of radiator.
6. The pressure drops of type RS2 radiators are difficult to calculate. Contact your Runtal representative and Runtal personnel will calculate the pressure drops of RS2 radiators.

#### Example #1

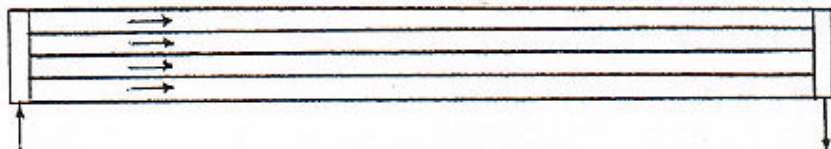
R-4 Radiator @ 10'-0" with a 170°F average water temperature and a 20°F temperature drop.

½" type "A" pipe connections.

$$\text{Capacity} = 507 \text{ BTUH/FT} \times 10 \text{ FT} = 5070 \text{ BTUH}$$

$$\text{GPM} = \frac{\text{Capacity}}{(500) \times \text{Temp. Drop}} = \frac{5070}{(500) \times (20)}$$

$$\text{GPM} = 0.507 \text{ gpm}$$



From page # TR-50, using 0.507 gpm, the pressure drop is:

$$\begin{aligned} 0.01 \text{ FOH/radiator} \times (1) \text{ radiator} &= 0.01 \text{ FOH} \\ 0.01 \text{ FOH/pipe conn.} \times (2) \text{ pipe conn.} &= \underline{0.02 \text{ FOH}} \\ \text{Total for the R-4 Radiator} &= 0.03 \text{ FOH} \end{aligned}$$

#### Example #2

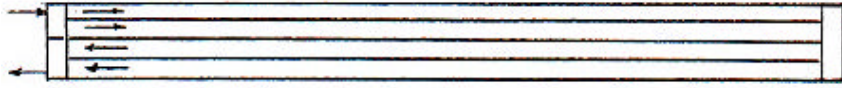
R-4 Radiator @ 10'-0" with a 170°F average water temperature and a 20°F temperature drop.

½" type "C" pipe connections.

$$\text{Capacity} = 507 \text{ BTUH/FT} \times 10 \text{ FT} = 5070 \text{ BTUH}$$

$$\text{GPM} = \frac{\text{Capacity}}{(500) \times \text{Temp. Drop}} = \frac{5070}{(500) \times (20)}$$

$$\text{GPM} = 0.507 \text{ gpm}$$



From page # TR-60, using 0.507 gpm, the pressure drop is:

$$\begin{aligned} 0.05 \text{ FOH/radiator} \times (1) \text{ radiator} &= 0.05 \text{ FOH} \\ 0.01 \text{ FOH/pipe conn.} \times (2) \text{ pipe conn.} &= \underline{0.02 \text{ FOH}} \\ \text{Total for the R-4 Radiator} &= 0.07 \text{ FOH} \end{aligned}$$

### Example #3

(3) R-4 Radiators @ 10', 8', and 12' in an opposite end series of radiators, 170°F average water temperature and a 20°F temperature drop. 3/4" type "B" pipe connections.

$$\text{Capacity} = 844 \text{ BTUH/FT} \times (10 + 8 + 12) = 25320 \text{ BTUH}$$

$$\text{GPM} = \frac{\text{Capacity}}{(500) \times \text{Temp. Drop}} = \frac{25320}{(500) \times (20)} = 2.53 \text{ gpm}$$



From TRF-50, using 2.53 gpm, the pressure drop for the three radiators is:

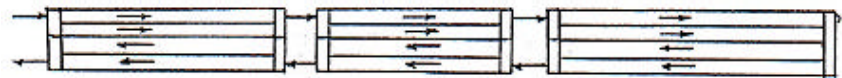
$$\begin{aligned} 0.32 \text{ FOH/radiator} \times (3) \text{ radiators} &= 0.96 \text{ FOH} \\ 0.08 \text{ FOH/pipe conn.} \times (6) \text{ pipe conn.} &= 0.48 \text{ FOH} \\ \text{Total for the 3-Radiator Series} &= 1.44 \text{ FOH} \end{aligned}$$

### Example #4

(3) R-4 Radiators @ 10', 8', and 12' in a same-end series of radiators, 170°F average water temperature and a 20°F temperature drop. 3/4" type "C" pipe connections.

$$\text{Capacity} = 844 \text{ BTUH/FT} \times (10 + 8 + 12) = 25320 \text{ BTUH}$$

$$\text{GPM} = \frac{\text{Capacity}}{(500) \times \text{Temp. Drop}} = \frac{25320}{(500) \times (20)} = 2.53 \text{ gpm}$$



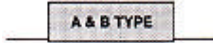
From TRF-60, using 2.53 gpm, the pressure drop for the 3-radiator same-end series is:

$$\begin{aligned} 1.21 \text{ FOH/radiator} \times (3) \text{ radiators} &= 3.63 \text{ FOH} \\ 0.08 \text{ FOH/pipe conn.} \times (10) \text{ pipe conn.} &= 0.8 \text{ FOH} \\ \text{Total for the 3-Radiator Series} &= 4.43 \text{ FOH} \end{aligned}$$

**Example #1**

**Model Type R**  
Pressure Drop: Opposite End

RADIATOR PRESSURE DROP - FOOT OF HEAD PER RADIATOR



STD PRESSURE TUBE	RADIATOR MODEL NUMBER OF TUBES FOR FLOW										CONNECTION PD	
	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-8	R-9	R-10	PER CONNECTION 1/2" CONN PD	3/4" CONN PD
?	0.05	0.21	0.05	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01
	0.75	0.45	0.12	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.03	0.01
	1.00	0.79	0.21	0.09	0.05	0.04	0.02	0.02	0.01	0.01	0.04	0.03
	1.50	1.72	0.45	0.21	0.12	0.08	0.05	0.04	0.03	0.02	0.09	0.04
	2.00	3.00	0.79	0.36	0.21	0.13	0.09	0.07	0.05	0.04	0.18	0.06
	2.50	4.61	1.21	0.55	0.32	0.21	0.15	0.11	0.08	0.07	0.25	0.08
	3.00	6.56	1.72	0.79	0.45	0.29	0.21	0.15	0.12	0.09	0.35	0.10
	3.50	8.83	2.32	1.06	0.61	0.40	0.28	0.21	0.16	0.13	0.44	0.15
	4.00	11.42	3.00	1.37	0.79	0.51	0.36	0.27	0.21	0.16	0.56	0.18
	4.50	14.34	3.76	1.72	0.99	0.64	0.45	0.34	0.26	0.21	0.63	0.20
GPM	5.00	17.57	4.61	2.11	1.21	0.79	0.55	0.41	0.32	0.25	0.80	0.25
	5.50	21.12	5.54	2.53	1.45	0.95	0.67	0.49	0.38	0.30	1.00	0.28
	6.00	24.98	6.56	3.00	1.72	1.12	0.79	0.58	0.45	0.36	1.20	0.33
	6.50	29.15	7.65	3.50	2.01	1.31	0.92	0.68	0.53	0.42	1.40	0.37
	7.00	33.64	8.83	4.04	2.32	1.51	1.06	0.79	0.61	0.48	1.50	0.42
	7.50	38.43	10.08	4.61	2.65	1.72	1.21	0.90	0.69	0.55	1.80	0.50
	8.00	43.52	11.42	5.22	3.00	1.95	1.37	1.02	0.79	0.63	1.90	0.56

**Example #2**

**Model Type R**  
Pressure Drop: Same End

RADIATOR PRESSURE DROP - FOOT OF HEAD PER RADIATOR



STD	RADIATOR MODEL NUMBER OF TUBES FOR FLOW										CONNECTION PD	
	R-2	R-4	R-6	R-8	R-10	R-12	R-14	R-16	R-18	R-20	PER CONNECTION 1/2"	3/4"

	PRESSURE TUBE	R-3	R-5	R-7	R-9	R-11	R-13	R-15	R-17	R-19	R-21	CONN PD	CONN PD	
		1	2	3	4	5	6	7	4	4	5			
?	0.50	0.21	0.05	0.02	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	
	0.75	0.45	0.12	0.05	0.03	0.02	0.01	0.01	0.03	0.03	0.02	0.03	0.01	
	1.00	0.79	0.21	0.09	0.05	0.04	0.02	0.02	0.05	0.05	0.04	0.04	0.03	
	1.50	1.72	0.45	0.21	0.12	0.08	0.05	0.04	0.12	0.12	0.08	0.09	0.04	
	2.00	3.00	0.79	0.36	0.21	0.13	0.09	0.07	0.21	0.21	0.13	0.18	0.06	
	2.50	4.61	1.21	0.55	0.32	0.21	0.15	0.11	0.32	0.32	0.21	0.25	0.08	
	3.00	6.56	1.72	0.79	0.45	0.29	0.21	0.15	0.45	0.45	0.29	0.35	0.10	
	3.50	8.83	2.32	1.06	0.61	0.40	0.28	0.21	0.61	0.61	0.40	0.44	0.15	
	GPM	4.00	11.42	3.00	1.37	0.79	0.51	0.36	0.27	0.79	0.79	0.51	0.56	0.18
		4.50	14.34	3.76	1.72	0.99	0.64	0.45	0.34	0.99	0.99	0.64	0.63	0.20
		5.00	17.57	4.61	2.11	1.21	0.79	0.55	0.41	1.21	1.21	0.79	0.80	0.25
		5.50	21.12	5.54	2.53	1.45	0.95	0.67	0.49	1.45	1.45	0.95	1.00	0.28
		6.00	24.98	6.56	3.00	1.72	1.12	0.79	0.58	1.72	1.72	1.12	1.20	0.33
		6.50	29.15	7.65	3.50	2.01	1.31	0.92	0.68	2.01	2.01	1.31	1.40	0.37
		7.00	33.64	8.83	4.04	2.32	1.51	1.06	0.79	2.32	2.32	1.51	1.60	0.42
		7.50	38.43	10.08	4.61	2.65	1.72	1.21	0.90	2.65	2.65	1.72	1.80	0.50
	8.00	43.52	11.42	5.22	3.00	1.95	1.37	1.02	3.00	3.00	1.95	1.90	0.56	

**Example #3**

**Model Type RF**  
Pressure Drop: Opposite End

RADIATOR PRESSURE DROP - FOOT OF HEAD PER RADIATOR



STD PRESSURE TUBE	RADIATOR MODEL NUMBER OF TUBES FOR FLOW										CONNECTION PD PER CONNECTION	
	RF-1	RF-2	RF-3	RF-4	RF-5	RF-6	RF-7	RF-8	RF-9	RF-10	1/2" CONN PD	3/4" CONN PD
	1	2	3	4	5	6	7	8	9	10		
0.05	0.21	0.05	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01
0.75	0.45	0.12	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.03	0.01
1.00	0.79	0.21	0.09	0.05	0.04	0.02	0.02	0.01	0.01	0.01	0.04	0.03
1.50	1.72	0.45	0.21	0.12	0.08	0.05	0.04	0.03	0.02	0.02	0.09	0.04
2.00	3.00	0.79	0.36	0.21	0.13	0.09	0.07	0.05	0.04	0.04	0.18	0.06
?	2.50	4.61	1.21	0.55	0.32	0.21	0.15	0.11	0.08	0.07	0.25	0.08
3.00	6.56	1.72	0.79	0.45	0.29	0.21	0.15	0.12	0.09	0.08	0.35	0.10
3.50	8.83	2.32	1.06	0.61	0.40	0.28	0.21	0.16	0.13	0.10	0.44	0.15
GPM	4.00	11.42	3.00	1.37	0.79	0.51	0.36	0.27	0.21	0.16	0.56	0.18

4.50	14.34	3.76	1.72	0.99	0.64	0.45	0.34	0.26	0.21	0.17	0.63	0.20
5.00	17.57	4.61	2.11	1.21	0.79	0.55	0.41	0.32	0.25	0.21	0.80	0.25
5.50	31.12	5.54	2.53	1.45	0.95	0.67	0.49	0.38	0.30	0.25	1.00	0.28
6.00	24.98	6.56	3.00	1.72	1.12	0.79	0.58	0.45	0.36	0.29	1.20	0.33
6.50	29.15	7.65	3.50	2.01	1.31	0.92	0.68	0.53	0.42	0.34	1.40	0.37
7.00	33.64	8.83	4.04	2.32	1.51	1.06	0.79	0.61	0.48	0.40	1.60	0.42
7.50	38.43	10.08	4.61	2.65	1.72	1.21	0.90	0.69	0.55	0.45	1.80	0.50
8.00	43.52	11.42	5.22	3.00	1.95	1.37	1.02	0.79	0.63	0.51	1.90	0.56

**Example #4**

**Model Type RF**  
Pressure Drop: Same End

RADIATOR PRESSURE DROP - FOOT OF HEAD PER RADIATOR



STD PRESSURE TUBE	RADIATOR MODEL NUMBER OF TUBES FOR FLOW										CONNECTION PD	
	RF-2	RF-3	RF-4	RF-5	RF-6	RF-7	RF-8	RF-9	RF-10	1/2" CONN PD	3/4" CONN PD	
	1	1	2	2	3	3	4	4	5			
0.50	0.21	0.21	0.05	0.05	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
0.75	0.45	0.45	0.12	0.12	0.05	0.05	0.03	0.03	0.02	0.03	0.03	0.01
1.00	0.79	0.79	0.21	0.21	0.09	0.09	0.05	0.05	0.04	0.04	0.03	
1.50	1.72	1.72	0.45	0.45	0.21	0.21	0.12	0.12	0.08	0.09	0.04	
2.00	3.00	3.00	0.79	0.79	0.36	0.36	0.21	0.21	0.13	0.18	0.06	
?	2.50	4.61	4.61	1.21	1.21	0.55	0.55	0.32	0.32	0.21	0.25	0.08
	3.00	6.56	6.56	1.72	1.72	0.79	0.79	0.45	0.45	0.29	0.35	0.10
	3.50	8.83	8.83	2.32	2.32	1.06	1.06	0.61	0.61	0.40	0.44	0.15
GPM	4.00	11.42	11.42	3.00	3.00	1.37	1.37	0.79	0.79	0.51	0.56	0.18
	4.50	14.34	14.34	3.76	3.76	1.72	1.72	0.99	0.99	0.64	0.63	0.20
	5.00	17.57	17.57	4.61	4.61	2.11	2.11	1.21	1.21	0.79	0.80	0.26
	5.50	21.12	21.12	5.54	5.54	2.53	2.53	1.45	1.45	0.95	1.00	0.28
	6.00	24.98	24.98	6.56	6.56	3.00	3.00	1.72	1.72	1.12	1.20	0.33
	6.50	29.15	29.15	7.65	7.65	3.50	3.50	2.01	2.01	1.31	1.40	0.37
	7.00	33.64	33.64	8.83	8.83	4.04	4.04	2.32	2.32	1.51	1.60	0.42
	7.50	38.43	38.43	10.08	10.08	4.61	4.61	2.65	2.65	1.72	1.80	0.50
	8.00	43.52	43.52	11.42	11.42	5.22	5.22	3.00	3.00	1.95	1.90	0.56