

**Given**

Po 100 psia  
 To 600 R  
 A<sub>duct</sub> 1 in<sup>2</sup>  
 P1 78.4 psia  
 P2 55.3 psia

**Find**

Q  
 M2

**At State 1**

P1/Po1 0.784  
 M1 0.6  
 T1/To1 0.93284  
 T1 559.704 R  
 To1/To'' 0.81892  
 P1/P'' 1.59574 49.13081  
 T1/T'' 0.9167

**At State 2**

P2/P'' 1.125567  
 To2/To'' 0.99195  
 To2 726.77 R  
**M2 0.8993**

**Calc Q\***

Q 30.426 Btu/lbm  
 V1 695.831 ft/sec  
 rho1 0.378082 lbm/ft<sup>3</sup>  
 m\* 1.826943 lbm/sec  
**Q\* 55.586 Btu/sec** 200110.5

<b>Given</b>		<b>Need</b>		
D	2 in	To2	x	-1 no Tbar calc
Q12	31.86 Btu/lbm	M2	x	-0.5 math/units
L23	119.17 D	P2	x	-1 wrong table
P1	61 psia	M3	x	-0.5 wrong value of 4f
To1	500 R	P3	x	-1 wrong units in Reynolds
M1	0.3			
R_gas	53.35 ft-lbf/lbm-R			

**State 1**

T1/To1	0.98232
T1	491.16 R
P1/Po1	0.93947
Po1	64.930 psia
To1/To"	0.34686
To"	1441.5 R
P1/P"	2.13144
P"	28.619 psia

**State 2**

<b>To2</b>	<b>632.75 R</b>	173.08
To2/To"	0.43895	
<b>M2</b>	<b>0.35</b>	
P2/P"	2.04866	
<b>P2</b>	<b>58.63 psia</b>	
T2/To2	0.97608	
T2	617.61 R	157.94
4fLmax/D	3.45245	
T2/T**	1.17130	
P2/P**	3.09219	18.961

rho2	0.25623 lbm/ft^3		
V2	426.38 ft/sec		
m*	2.3835 lbm/sec		
Tbar	155.23 F	*Tbar is an av of T2 & T3. Otherwise you need to recalculate	
mu	1.368E-05 lbm/ft-sec	1.3727E-05	1.3727E-05
Re	1.331E+06	1.3265E+06	1.30E+06
4f	0.011049	0.011055	0.011092

4fLmax/D	2.1357375	2.13504768
T3/T**	1.1610	
T3	612.18 R	
<b>M3</b>	<b>0.4099</b>	
P3/P**	2.62853	
<b>P3</b>	<b>49.839 psia</b>	