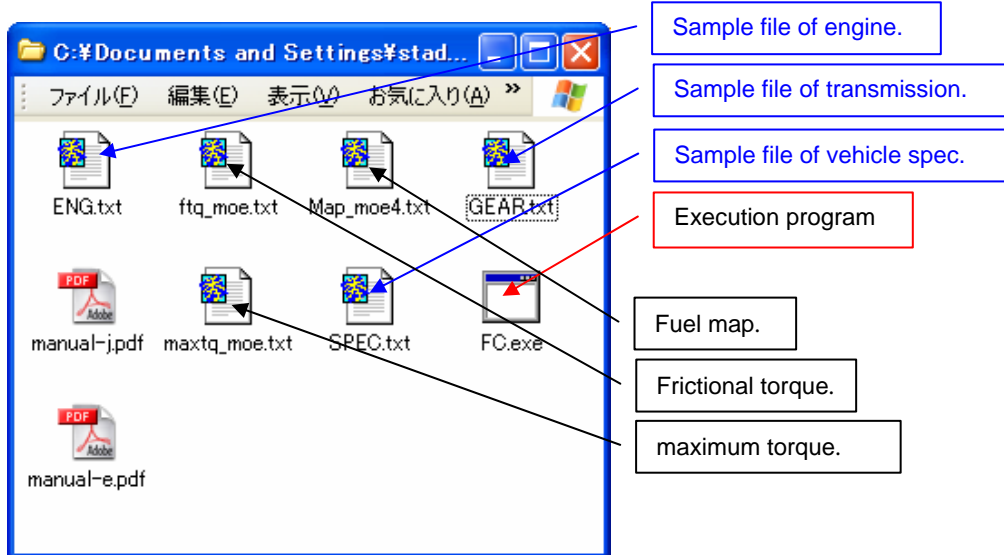


Instruction manual

1 . How to use

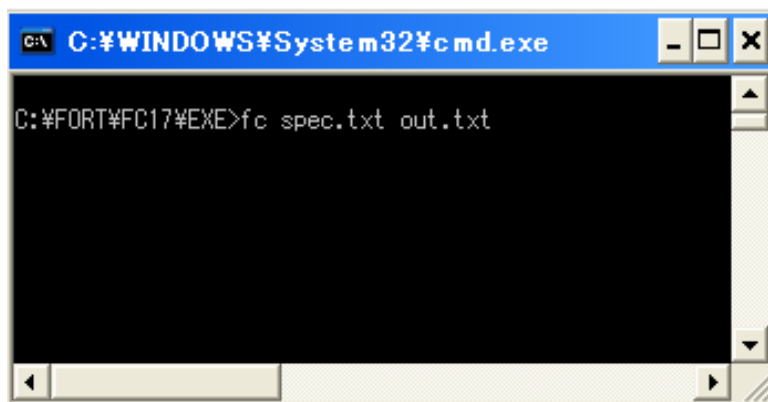
The file composition of the program is as follows.



Edit a vehicle specification, engine and transmission data file.

How to edit refers 2.

Execute program "**FC.exe**".



Command-line parameters

>> FC [VEHICLE SPEC FILE] [OUTPUT FUEL CONSUMPTION FILENAME]

ex) fc spec.txt out.txt

Output name

Input vehicle spec filename

Fuel consumption is calculated and saved to specified file.

```
C:\WINDOWS\System32\cmd.exe
C:\>fc spec.txt out.txt
-----
Vehicle Name      : TEST_VEHICLE_INPUT
Vehicle type     : TRUCK
Category        : T1
Transmission    : MT, AMT
HIGHWAY RATIO   : 10.00 [%]
-----
GVW = 3812.00 [kg]
Wcurb = 1957.00 [kg], Wtest = 2757.00 [kg]
Width = 1.695 [m], Height = 1.982 [m], Tire radius = 0.507 [m]
Crew = 3
Nidle = 480.00 [rpm], Nrate = 2200.00 [rpm], Nex = 2400.00 [rpm]
Nes = 586.00 [rpm], Nec = 548.80 [rpm]
MuAir = 0.090286 [N/(km/h)^2]
MuRoll = 0.112835 [N/kg]
NUMBER OF GEAR = 16
GEAR  RATIO  EFFICIENCY  TORQ MARGIN  DW [kg]
  1:  14.013  0.950      2.400      11865.53036
  2:  11.337  0.950      2.400      7682.20082
  3:   9.932  0.950      2.400      5928.41588
  4:   8.035  0.950      2.400      3927.36820
  5:   6.839  0.950      1.700      2882.96948
  6:   5.533  0.950      1.700      1934.18140
  7:   4.583  0.950      1.600      1370.12832
  8:   3.708  0.950      1.600      944.05560
  9:   3.057  0.950      1.600      685.64957
 10:   2.473  0.950      1.600      496.07726
 11:   2.167  0.950      1.600      412.68564
 12:   1.753  0.950      1.600      317.42756
 13:   1.492  0.950      1.600      267.68222
 14:   1.207  0.950      1.600      222.52557
 15:   1.000  0.980      1.600      195.70000
 16:   0.809  0.980      1.600      175.41458
FIN:   3.186  0.950
-----
URBAN,   FC(km/l) : 7.6578, Ave.Speed(km/h) : 27.3
HIGHWAY, FC(km/l) : 10.5736, Ave.Speed(km/h) : 80.0
AVERAGE, FC(km/l) : 7.8750
MID-TOWN, FC(km/l) : 5.4150, Ave.Speed(km/h) : 13.5
OUTPUT FILE : out.txt
complete.
C:\>
```

The output data format refers 4.

2 . Data format

(1) Input data of vehicle spec

ex) SPEC.txt

```

0  |-----|10|-----|20|-----|30|-----|40|-----|50|-----|60|-----|70|-----|
1 | TEST_VEHICLE_INPUT          | VEHICLE NAME          | See note below
2 | T1                          | CATEGORY NO.
3 | ENG.txt                     | ENGINE FILENAME
4 | GEAR.txt                    | TRANSMISSION FILENAME
5 | 3.188                       | FINAL GEAR RATIO
6 | 0.507                       | TIRE RADIUS (m)
7 | 1                            | OUTPUT OF TIME SERIES DATA 1:YES, 0:NO
8 | |

```

This value is set to 0 usually.
Set to 1 only for verification of detail output

Note) Category No. must be one of as follows.

TRUCK: T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11

TRACTOR TRUCK: TT1, TT2

ROOT BUS: BR1, BR2, BR3, BR4, BR5

GENERAL BUS: B1, B2,B3, B4, B5, B6, B7

(2) Input data of engine

ex) ENG.txt

```

0  |-----|10|-----|20|-----|30|-----|40|-----|50|-----|60|-----|70|-----|
1 | map_moe3.txt                | FUEL MAP FILENAME
2 | maxtq_moe.txt               | MAXIMUM TORQUE FILENAME
3 | frqtq_moe.txt               | FRICTIONAL TORQUE FILENAME
4 | 480                         | IDLING ENGINE SPEED (rpm)
5 | 2200                        | RATED ENGINE SPEED (rpm)
6 | 2400                        | MAXIMUM ENGINE SPEED (rpm)
7 | |
8 | |

```

(3) Input data of transmission

ex) GEAR.txt

```

0  |-----|10|-----|20|-----|30|-----|40|-----|50|-----|60|-----|70|-----|
1 | 2                            | START GEAR            | Start Gear 2
2 | 8                            | NUMBER OF GEAR (MAIN TRANSMISSION) | If torque converter AT , start gear = 1
3 | 14.013                       | GEAR RATIO 1st (MAIN)
4 | 9.932                         | 2nd
5 | 6.839                         | 3rd
6 | 4.583                         | 4th
7 | 3.057                         | 5th
8 | 2.167                         | 6th
9 | 1.492                         | 7th
10 | 1.000                        | 8th
11 | 2                            | NUMBER OF GEAR (AUXILIARY TRANSMISSION)
12 | 1                            | LOW
13 | 0.809                        | HIGH
14 | 0                            | MT,AMT=0, TORQUE CONVERTER AT=1
15 | |
16 | |

```

Input same number of gear ratio data as above

Set to 1 if vehicle does not have auxiliary transmission

Change this value and the value of start gear to 1 for torque converter AT vehicle.

Gear ratio of auxiliary transmission.
If vehicle does not have auxiliary transmission, input gear ratio 1.0 to [LOW] line, and delete [HIGH] line.

(4) Input data of maximum engine torque, frictional engine torque

ex) maxtq_moe.txt (maximum engine torque)

rev torque (rpm) (Nm)
570 1101.5
730 1305.4
1000 1460.3
1200 1516.8
1320 1506.6
1510 1429.0
1760 1319.8
2030 1184.1
2200 1088.5
2319 938.4
2407 502.3

These 2 lines are headers

Input engine speed and maximum engine torque to one line.

Data must be separated by tab

ex) ftq_moe.txt (frictional engine torque)

rev torque (rpm) (Nm)
570 -117.8
730 -126.7
1000 -142.7
1200 -160.5
1320 -172.9
1510 -190.2
1760 -224.1
2030 -252.2
2200 -279.8
2319 -291.9
2407 -310.2

These 2 lines are headers

Input engine speed and maximum engine torque to one line.

Data must be separated by tab

(5) Input data of fuel map

ex) map_moe4.txt

rev torque F.C. (rpm) (Nm) (l/h)
0 0 1.1880E+00
570 1101.5 1.7585E+01
570 938.9 1.4559E+01
570 836.5 1.2837E+01
570 731.9 1.1243E+01
570 627 9.7823E+00
570 522.4 8.2969E+00
570 418.5 6.8112E+00
570 314.2 5.4972E+00
570 208.7 4.0363E+00
570 106.8 2.7007E+00
570 7.8 1.4825E+00
730 1305.4 2.4812E+01
730 1116.8 2.1048E+01
730 993.9 1.8790E+01
730 869.8 1.6532E+01
730 746.1 1.4255E+01
730 617.6 1.2029E+01
730 497.9 9.9356E+00
730 372.4 7.8516E+00
730 249.4 5.8507E+00

These 2 lines are headers

Fuel consumption of idling, engine speed and torque value should be 0

Input engine speed and maximum engine torque, fuel consumption data to one line.

Input fuel consumption values with 5 significant digits exponential format.

Data must be separated by tab

(6) Output data

16	time(s)	Vtarget(km/h)	Vreal(km/h)	Ne(rpm)	Te(N-m)	N_norm(%)	T_norm(%)	Shift	FC(l/h)
1	0.00	0.00	480.0	0.0	0.00	0	1.188000		
2	0.00	0.00	480.0	0.0	0.00	0	1.188000		
3	0.00	0.00	480.0	0.0	0.00	0	1.188000		
4	0.00	0.00	480.0	0.0	0.00	0	1.188000		
5	0.00	0.00	480.0	0.0	0.00	0	1.188000		
6	0.00	0.00	480.0	0.0	0.00	0	1.188000		
7	0.00	0.00	480.0	0.0	0.00	0	1.188000		
8	0.00	0.00	480.0	0.0	0.00	0	1.188000		
9	0.00	0.00	480.0	0.0	0.00	0	1.188000		
10	0.00	0.00	480.0	0.0	0.00	0	1.188000		
11	0.00	0.00	480.0	0.0	0.00	0	1.188000		
12	0.00	0.00	480.0	0.0	0.00	0	1.188000		
13	0.00	0.00	480.0	0.0	0.00	0	1.188000		
14	0.00	0.00	480.0	0.0	0.00	0	1.188000		
15	0.00	0.00	480.0	0.0	0.00	0	1.188000		
16	0.00	0.00	480.0	0.0	0.00	0	1.188000		
17	0.00	0.00	480.0	0.0	0.00	0	1.188000		
18	0.00	0.00	480.0	0.0	0.00	0	1.188000		
19	0.00	0.00	480.0	0.0	0.00	0	1.188000		
20	0.00	0.00	480.0	0.0	0.00	0	1.188000		
21	0.00	0.00	480.0	0.0	0.00	0	1.188000		
22	0.00	0.00	480.0	0.0	0.00	0	1.188000		
23	0.00	0.00	480.0	0.0	0.00	0	1.188000		
24	0.00	0.00	480.0	0.0	0.00	0	1.188000		
25	0.00	0.00	480.0	0.0	0.00	0	1.188000		
26	0.00	0.00	480.0	0.0	0.00	0	1.188000		
27	0.00	0.00	480.0	0.0	0.00	0	1.188000		
28	0.00	0.00	480.0	0.0	0.00	0	1.188000		
29	0.00	0.00	480.0	0.0	0.00	0	1.188000		
30	0.00	0.00	480.0	0.0	0.00	0	1.188000		
31	0.00	0.00	480.0	0.0	0.00	0	1.188000		
32	0.00	0.00	480.0	0.0	0.00	0	1.188000		
33	0.00	0.00	480.0	0.0	0.00	0	1.188000		
34	0.00	0.00	480.0	0.0	0.00	0	1.188000		
35	0.00	0.00	480.0	0.0	0.00	0	1.188000		
36	0.00	0.00	480.0	0.0	0.00	0	1.188000		

Main part of input condition is written here

Calculation result of fuel consumption is written here

Output of time series

3 . Standard Vehicle Specification and Intercity Driving Ratio

<Truck >

(except Tractor-Trailer)

Category No	Category		Standard Vehicle Specification					Intercity Driving Ratio (%)
	GVW (t)	Payload (t)	Vehicle Weight (kg)	Maximum Payload (kg)	Crew (person)	Overall Height (m)	Overall Width (m)	
T1	3.5 < & 7.5	1.5	1,957	1,490	3	1.982	1.695	10
T2		1.5 < & 2	2,356	2,000	3	2.099	1.751	
T3		2 < & 3	2,652	2,995	3	2.041	1.729	
T4		3 <	2,979	3,749	3	2.363	2.161	
T5	7.5 < & 8	-	3,543	4,275	2	2.454	2.235	
T5	8 < & 10	-	3,659	5,789	2	2.625	2.239	
T7	10 < & 12	-	4,048	7,483	2	2.541	2.350	
T8	12 < & 14	-	4,516	7,992	2	2.572	2.379	
T9	14 < & 16	-	5,533	8,900	2	2.745	2.480	
T10	16 < & 20	-	8,688	11,089	2	3.049	2.490	
T11	20 <	-	8,765	15,530	2	2.934	2.490	30

(Tractor-Trailer)

Category No	Category		Standard Vehicle Specification				Intercity Driving Ratio (%)	
	(Tractor-Head) GVW (t)		Vehicle Weight (kg)	Maximum Payload (kg)	Crew (person)	Overall Height (m)		Overall Width (m)
TT1	20		10,525	24,000	2	2.927	2.490	20
TT2	20 <		19,028	40,000	2	2.890	2.490	10

<Bus(11persons)

(Route Bus)

Category No	Category		Standard Vehicle Specification				Intercity Driving Ratio (%)
	GVW (t)		Vehicle Weight (kg)	Crew (person)	Overall Height (m)	Overall Width (m)	
BR1	6 < & 8		5,186	39	2.880	2.072	0
BR2	8 < & 10		6,672	46	2.947	2.301	
BR3	10 < & 12		7,324	62	2.949	2.304	
BR4	12 < & 14		8,654	77	2.969	2.385	
BR5	14 <		9,790	79	2.962	2.490	

(General Bus)

Category No	Category		Standard Vehicle Specification				Intercity Driving Ratio (%)
	GVW (t)		Vehicle Weight (kg)	Crew (person)	Overall Height (m)	Overall Width (m)	
B1	3.5 < & 6		3,543	29	2.593	2.027	10
B2	6 < & 8		5,622	29	3.019	2.197	
B3	8 < & 10		6,608	49	3.105	2.314	
B4	10 < & 12		8,022	58	3.160	2.399	
B5	12 < & 14		9,774	60	3.168	2.490	
B6	14 < & 16		12,110	62	3.320	2.490	
B7	16 <		14,583	51	3.668	2.490	35