

Chart 1Heat Source Some typical temperatures.

flame temperature	1100 - 2200 °C
EXHAUST VALVE	725 - 800 °C
PISTON TOP	325 - 450 °C
UPPER CYL WALL	120 - 450
PISTON RING PIN	150 - 250
Big END BEARING	120 - 250
LOWER CYL WALL	120 - 180
OIL (No Cooler)	120 - 180
COOLANT	80 - 100

Chart 2 Basic System. - HEAT OUT. $\frac{1}{3}$ - as MECH Energy $\frac{1}{3}$ as Ex-gas. Heat. $\frac{1}{3}$ dissipated in cooling systems etc

Chart 3 Desirable operating temperature

- Wear
- fuel Economy

Too Cold

- Poor Performance
- Poor fuel Economy
- Higher Wear

Normal

okay

too Hot

- Mech tolerance Problems
- fuel Problems - Pre-ignition
- Run on

Chart 4 Choice of Coolant, water

ALCOHOL FREEZING Point Very low.

GLYCOL - additives

Chart 5 % Ethylene Glycol.

- Deionized Water - Look into your Kettle

Problem Areas

Mechanical

Rad Cap Pressure

- thermostat
 - Right temp
 - Right type
 - function correctly - Easy to test.
-

MANY TIGHT SPOTS - RAD

- HEATER RAD

Chemical MANY DEAD SPOTS - #4 WET LINER

- many types of Metal IRON, AL, CU, etc.

- ELECTROLYSIS - up to one volt - CAUSES PROBLEMS
MODERN CARS

M.P.

- Many SALTS, OXIDES, OILS } - CRUD SOOP.
- BITS OF RUBBER

PRECAUTIONS

- FLUSH & CHANGE every two years.

- NO TAP WATER - CALCIUM & OTHER MINERALS

- there are additives that can help

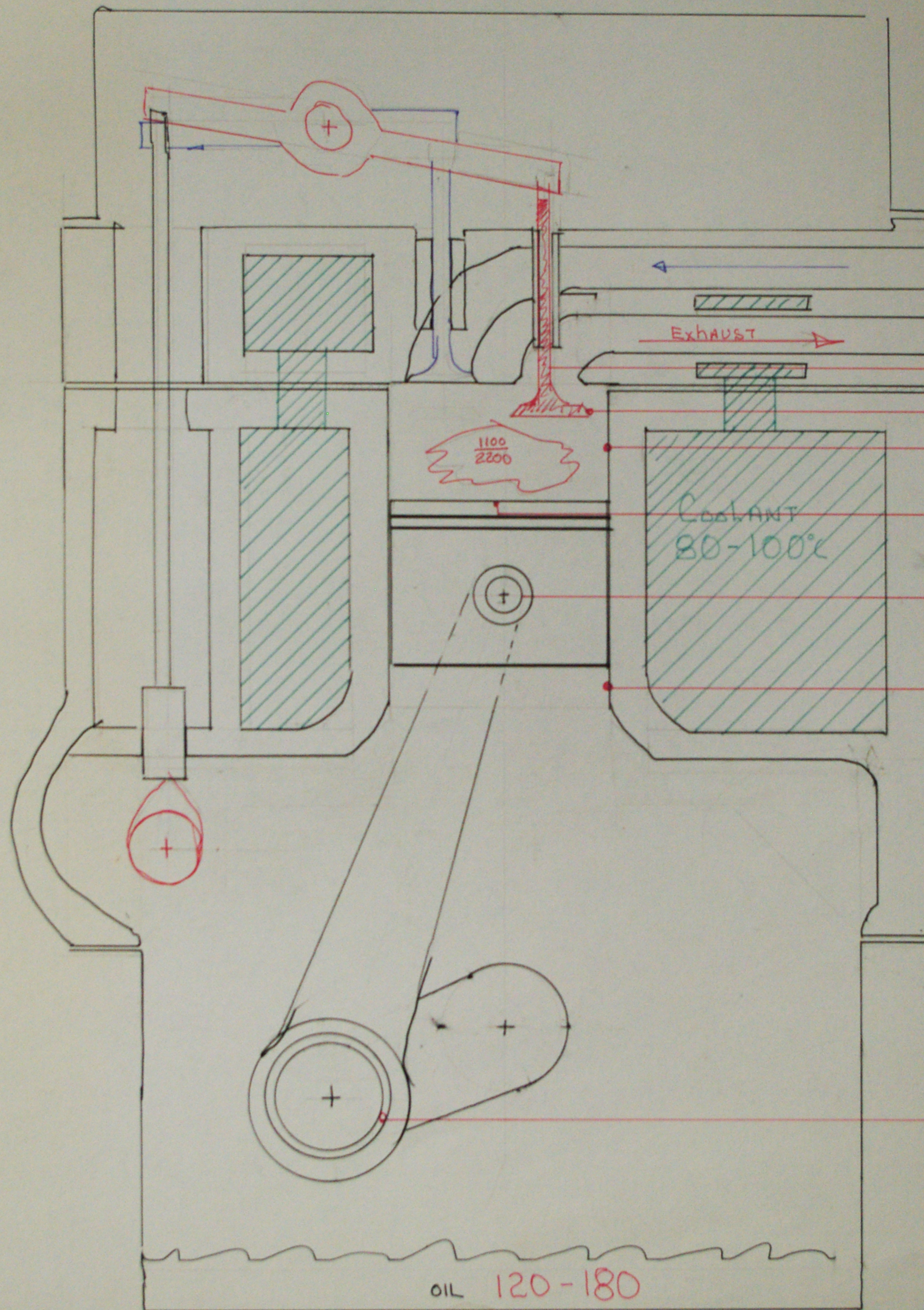
- Screw Problems - Hot tank - CAUSTIC SODA

- RADS CAN BE HOT LOCKED

OIL TEMP

- a oil Cooler helps a lot on the lower end

- can use a lighter oil - quicker protection



- EX VALVE STEM 700-800
- EX VALVE HEAD 725-800
- UPPER CYL WALL 120-450
- PISTON TOP 325-450
- PIN 150-250
- LOWER CYL WALL 120-180

POINTS TO COMMENT

- SODIUM EX VALVES
- FINNED - AL - VALVE COVER
- OIL PAN
- OIL COOLER

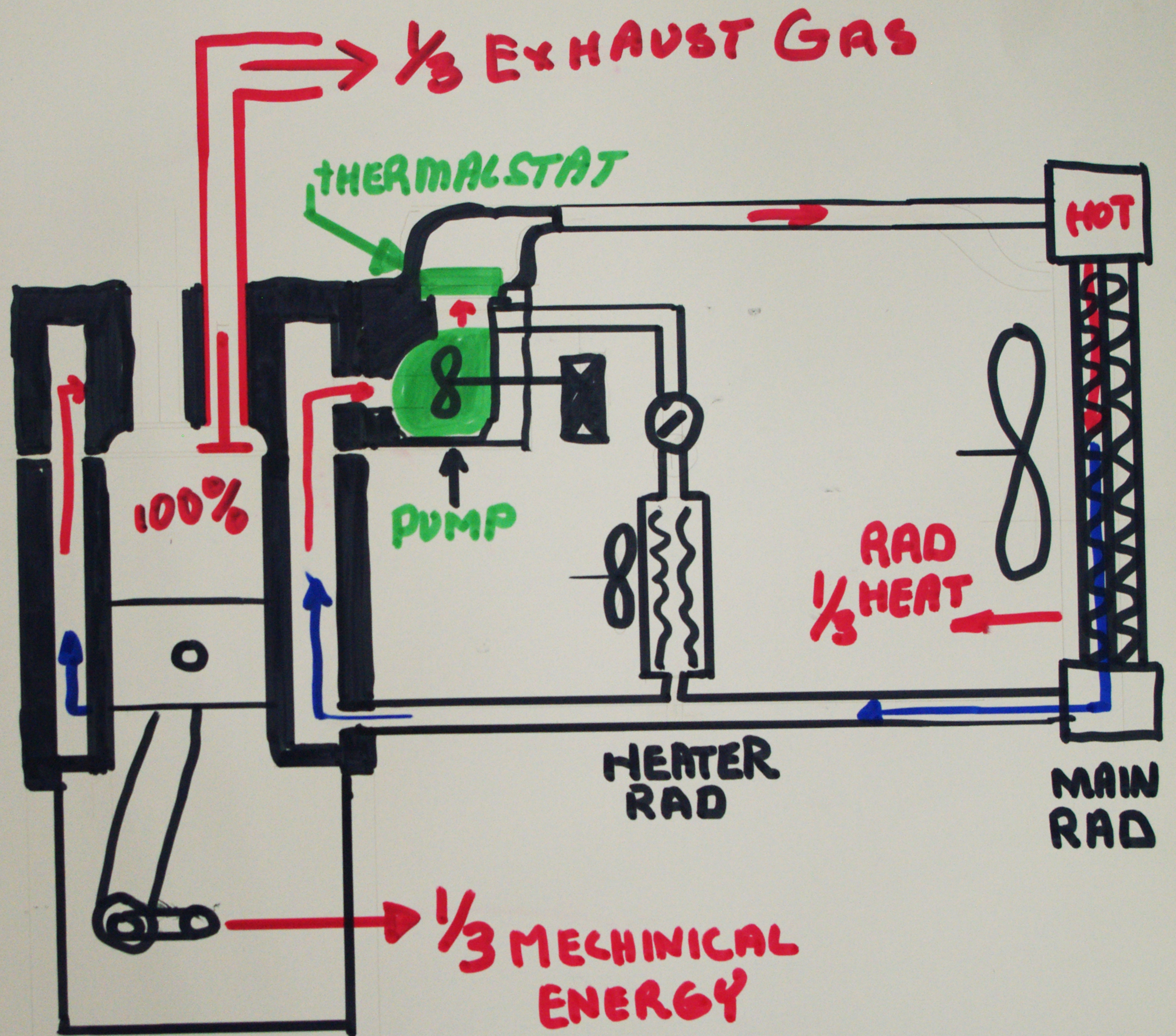
→ BIG END BEARING 120-225

OIL 120-180

COOLANT
80-100°C

1100
2200

EXHAUST



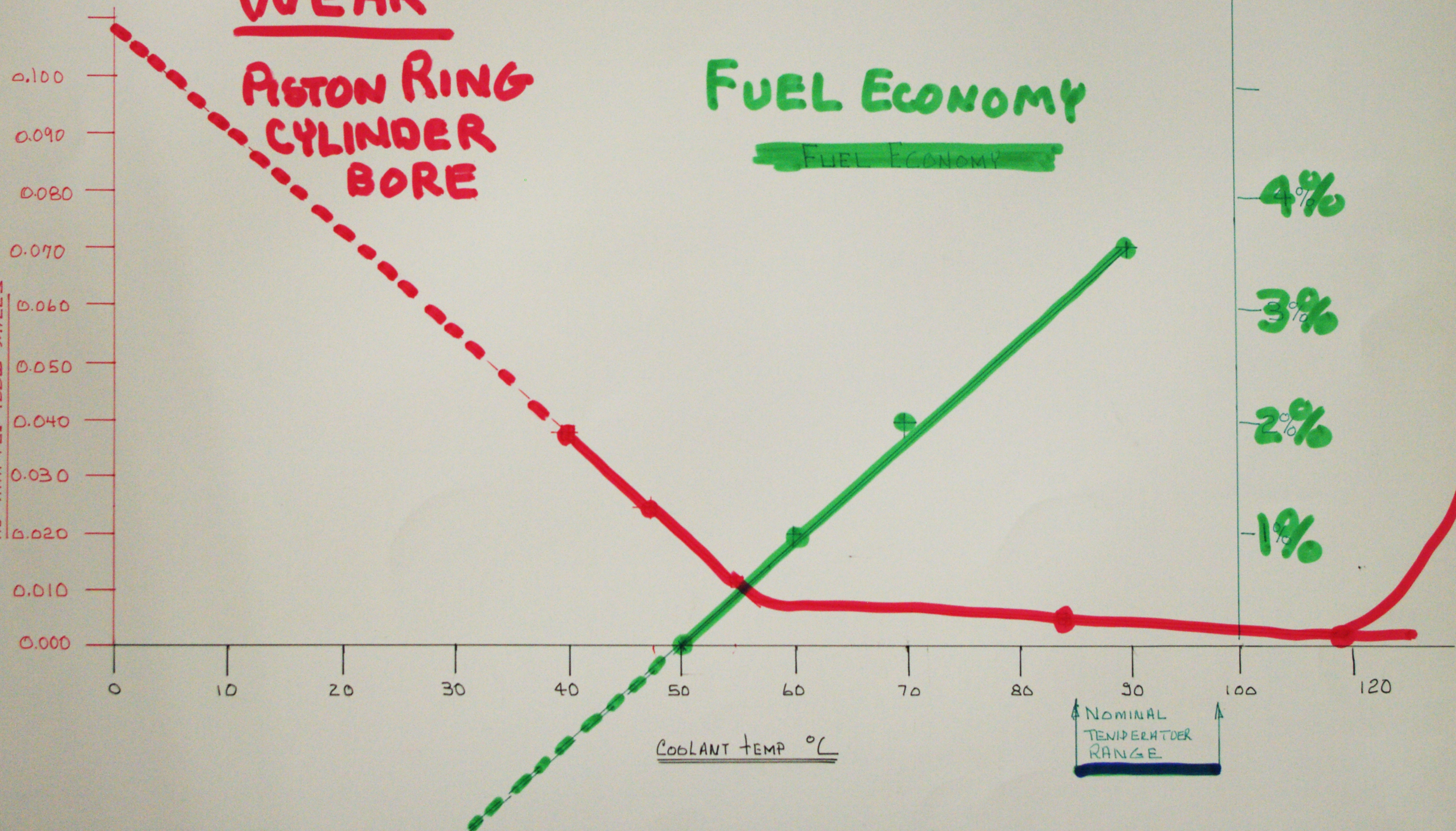
WEAR

PISTON RING CYLINDER BORE

FUEL ECONOMY

~~FUEL ECONOMY~~

WEAR
PISTON RING - CYLINDER WALL
IN MM PER 1000 MILES



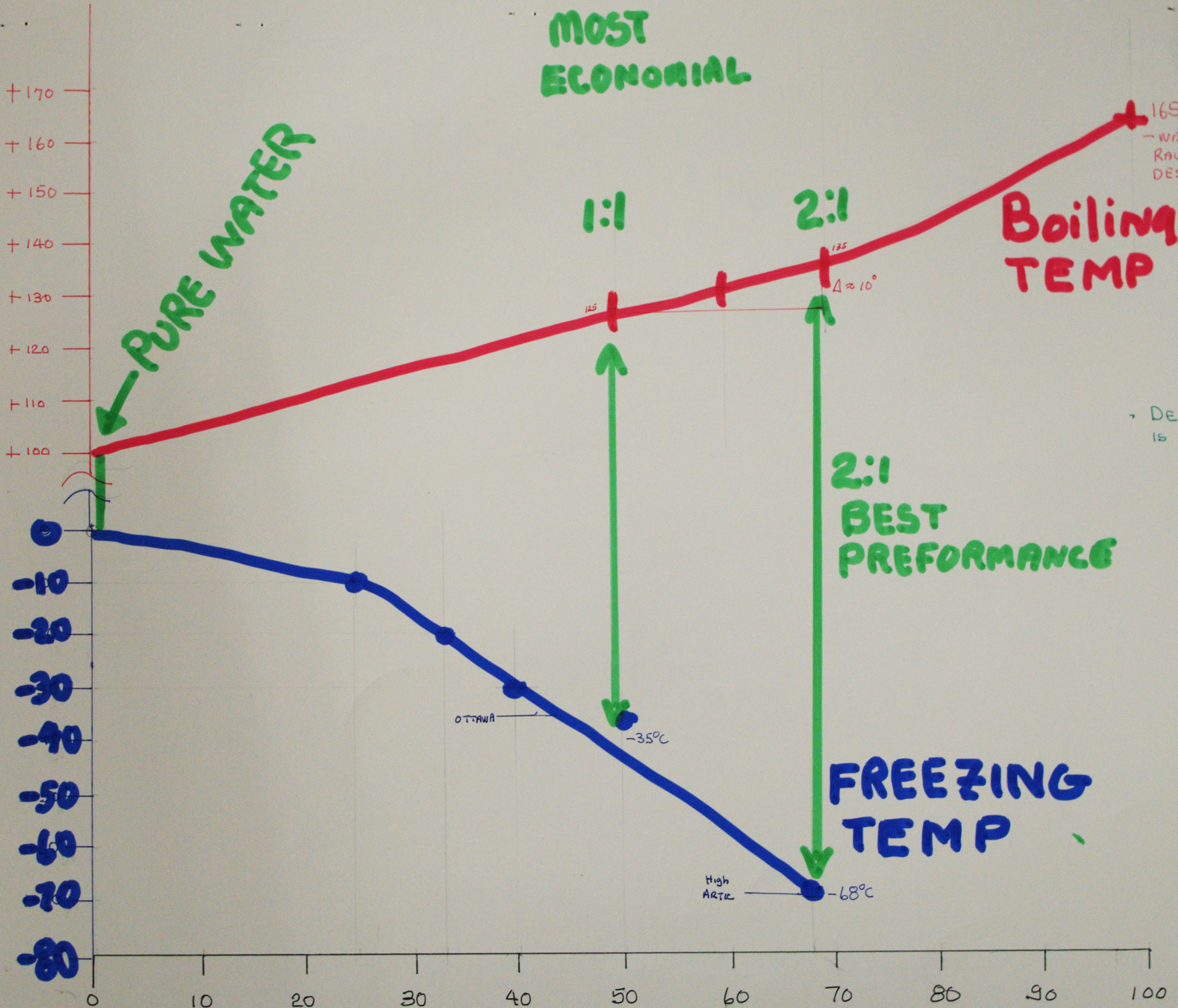
NOMINAL
TEMPERATURE
RANGE

CHOICE OF COOLANT MATERIAL

SOLUTION	BOILING TEMP	FREEZING TEMP	% EXPANDING	EVAPORIZATION	COMMENT
WATER	100°C	0°C	3 1/2% ✓	YES	-CHEAP
ETHYL ALCOHOL <small>grain ALCOHOL C₂H₅OH</small>	POOR	VERY LOW ✓	10 1/2%	YES	Illegal <small>- flammable - hard on paint - clean Cb</small>
METHYL ALCOHOL <small>wood ALCOHOL CH₃OH</small>		VERY LOW	8%	YES	HARD ON PAINT <small>- flammable - clean</small>
ETHYLENE GLYCOL 1:1 WATER	132 ✓	-35 ✓	5-6%	NO ✓	BEST CHOICE FOR OTTAWA
ETHYLENE GLYCOL 2:1 WATER	136 ✓	-70 ✓	6 1/2%	NO ✓	Good for High ARTIC

Footnote - Deionized Water Preferred over TAP WATER

MOST ECONOMIAL



PURE WATER

Boiling TEMP

2:1 BEST PERFORMANCE

FREEZING TEMP

165°C
- WANT TO GO RACING IN THE DESERT.

DEIONIZED WATER IS BEST.

% VOL - ETHYLENE GLYCOL IN AQUEOUS SOLUTION