NEVER LOSE YOUR COOL

GET YOUR TRUCK TESTED

CONVENTIONAL

Green

Is the coolant over 1 year old?

YES → Drain, flush and refill with fully formulated coolant. Service complete!

NO → Test freeze point with Penray TS200 test strip (end pad). Is the coolant between –35ºF and -50ºF?

YES → Test SCA level with Penray TS200 test strip (middle pad). Adjust per recommendation using Pencool® 3000 or a NF3000 coolant filter. Service complete!

NO → Adjust freeze point utilizing Penray coolant adjustment chart. → Test SCA level with Penray TS200 test strip (middle pad). Adjust per recommendation using Pencool® 3000 or a NF3000 coolant filter. Service complete!

FULLY FORMULATED COOLANTS

Purple | Blue | Pink | Gold | Green

Test freeze point with Penray TS200 test strip (end pad). Is the coolant between –35ºF and -50ºF?

YES → Test SCA level with Penray TS200 test strip (middle pad). Adjust per recommendation using Pencool® 3000 or a NF3000 coolant filter. Service complete!

NO → Adjust freeze point utilizing Penray coolant adjustment chart. → Test SCA level with Penray TS200 test strip (middle pad). Adjust per recommendation using Pencool® 3000 or a NF3000 coolant filter. Service complete!

ELC

Red

Test freeze point with refractometer. Is the reading at -12ºF or colder?

NO → Drain, flush & refill with ELC. Service complete!

YES → Is the coolant 300,000 miles or 3 years old?

YES → Add 1 quart of ELC extender. per manufacturer's instructions. Service complete!

NO → Using TS200 test strip, test coolant and compare to the ELC pad (closest to fingers). Does it pass or fail?

PASS → Service complete!

FAIL → Drain, flush & refill with ELC - OR - Want to convert to fully formulated? Add 2 pints of Pencool® 3000 and install Penray conversion sticker. Service complete!

Want to convert to fully formulated? Add 2 pints of Pencool® 3000 and install Penray conversion sticker. Service complete!

Brown

Drain, flush & refill with ELC. Service complete!

OR → Drain, flush & refill with ELC - OR - Want to convert to fully formulated? Add 2 pints of Pencool® 3000 and install Penray conversion sticker. Service complete!

PENRAY®

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Coolant fundamentally consists of three components:

WATER- Water is an excellent heat transfer fluid, but it can freeze, and it causes corrosion to engine components.

GLYCOL- Glycol is added to provide freeze and boil-over protection. It reduces the heat transfer capability of water. It is usually mixed 50/50 with water.

SUPPLEMENTAL COOLANT ADDITIVES (SCA's)- Fully Formulated coolants contain many of the same chemical additives, regardless of brand. Nitrites are added to coolant to protect iron and steel components from cavitation pitting and rust corrosion. Nitrates provide solder and aluminum protection. Silicate is also added to protect aluminum surfaces. Tolytriazole (TT) and sometimes Mercaptobenzothiazole (MBT) are used to protect copper and brass metals. Phosphate or Borate are pH buffers used to control alkalinity.

The WATER and GLYCOL in your coolant will remain in service indefinitely, barring any contamination. The SUPPLEMENTAL COOLANT ADDITIVES (SCA's) will become depleted and must be replaced per manufacturer's recommendation.

For a tested and proven cooling maintenance procedure, use Penray's FILL-FOR-LIFE® program. Utilize NEED-RELEASE® filters to protect your engine for 150,000 miles, or use PENCOOL® cooling system liquids and maintenance filters.

Penray Coolant Chart For Maintaining 50% Antifreeze

Freeze Point (deg. F) Vs. Percent Antifreeze

System Capacity (Gallons*)	+32 0%	+25 10%	+20 15%	+15 20%	+10 25%	+5 30%	-5 35%	-12 40%	-23 45%	-34 50%	-50 55%	-65 60%	-75 65%	-84 70%	-70 75%	-55 80%	-43 85%	-30 90%	-5 100%	System Capacity (Gallons*)
	Drain Coolant and Add Concentrated Antifreeze (Quarts)										Drain Coolant and Add Water (Quarts)									
5	10	9	8	8	7	6	4	3	2	0	2	3	4	6	7	8	8	9	10	5
6	12	11	10	9	8	7	5	4	2	0	2	4	5	7	8	9	10	11	12	6
7	14	12	11	11	9	8	6	5	2	0	2	5	6	8	9	11	11	12	14	7
8	16	14	13	12	11	9	7	5	2	0	2	5	7	9	11	12	13	14	16	8
9	18	16	15	14	12	10	8	6	3	0	3	6	8	10	12	14	15	16	18	9
10	20	18	17	15	13	11	9	7	3	0	3	7	9	11	13	15	17	18	20	10
11	22	20	19	17	15	13	9	7	3	0	3	7	9	13	15	17	19	20	22	11
12	24	22	20	18	16	14	11	8	4	0	4	8	11	14	16	18	20	22	24	12
13	26	23	22	20	17	15	12	9	4	0	4	9	12	15	17	20	22	23	26	13
14	28	25	23	22	19	16	13	9	4	0	4	9	13	16	19	22	23	25	28	14
15	30	27	24	23	20	17	14	10	5	0	5	10	14	17	20	23	24	27	30	15
16	32	28	26	24	21	18	15	11	5	0	5	11	15	18	21	24	26	28	32	16
17	34	30	28	26	23	19	15	11	6	0	6	11	15	19	23	26	28	30	34	17
18	36	32	30	27	24	21	17	12	6	0	6	12	17	21	24	27	30	32	36	18
19	38	34	32	29	26	22	18	13	7	0	7	13	18	22	26	29	32	34	38	19
20	40	36	33	30	27	23	18	13	7	0	7	13	18	23	27	30	33	36	40	20

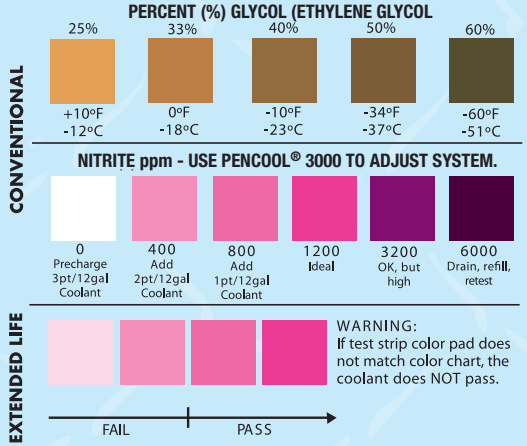
If the reading on your refractometer does not appear on the chart, the solution is over-concentrated. Drain your system and start over by adding a 50/50 mix of ***Fleetcharge***® or **DDC Powercool**® and water to your engine's system.

* 1 Gallon = 4 Quarts

Some of the different colors of coolant in the marketplace are shown below. Penray recommends the use of an antifreeze that meets TMC RP 329 or ASTM D-6210 specifications.

(OAT) Automotive | Fleetguard Compleat® | Fleetcharge® DDC POWERCOOL® CAT heavy Duty | Various Coolants | Chevron & Shell Extended Life Caterpillar ® ELC (NOAT)

Test Your Coolant With Penray Heavy-Duty Test Strips!



Coolant Misconceptions

Q: Does extended life coolant require maintenance?
A: Although it requires no addition of traditional SCA's, it does require special care. You must test the coolant regularly to confirm that it is not compromised or contaminated. You also must add an extender at the 300,000-mile interval.

Q: Does conventional coolant require a new coolant filter or a bottle of liquid SCA at every service?
A: The best way to determine if a filter or liquid SCA's are needed is to test the coolant with a test strip at each service. Variables like leaking coolant, temperatures, idle time, maintenance intervals and chemical depletion rates make each system unique.

Q: Is coolant filtration necessary?
A: Without filtration, rust, scale, and other debris can settle and accumulate resulting in plugged coolant passages and reduced coolant flow. Coolant filters effectively remove these particulates from the system and help eliminate downtime. Also, many filters today contain a single or multiple dose of SCA's that automatically maintain the cooling system balance, further reducing maintenance needs and downtime.

Q: Is more antifreeze better, especially during the winter months?
A: A properly maintained cooling system has a 50/50 mix of antifreeze and water, regardless of the outside temperature. A system that is not a 50/50 mix will not properly regulate the boiling point and freeze point or provide maximum protection against overheating and potential failure.

Q: Does automotive antifreeze work well in diesel engines?
A: While automotive antifreeze is inexpensive and readily available, it is high in phosphates and often silicates. Phosphates can lead to scale formation and overheating, plus they are the number one cause of water pump failure. Silicates and phosphates plug coolant passages and reduce coolant flow that may lead to engine failures. When choosing a coolant for your diesel engine, choose one designed for heavy-duty applications.

Q: When changing coolant, can I simply drain and refill?
A: Simply draining your coolant does little to address scale and precipitate deposits in your cooling system. When changing coolant, the most effective way to remove any build-up is to thoroughly clean your cooling system with an acid/neutralizer cleaner. Additionally, it will prepare and condition your cooling system for new coolant.

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COOLANT COACH