

The following material was sent by John Van Gardner, retyped and HTML-ized by Ed Thelen and stresses the **importance of lubrication in the 1403 Printer !!**

IBM Standard Lubricating Oils

The standard IBM oils are given in Table 1. The oils 3, 6, 7, 10, and 12 are highly refined turbine or hydraulic quality oils. These oils are deeply extracted, dewaxed, treated with highly reactive clay, neutralized and filtered through diatomaceous earth. They are then compounded with anti-oxidants and/or rust inhibitors, pour-point depressants and, usually, a few ppm of a silicone fluid. The oils are refined and compounded in this manner to reduce the emulsibility with water (for steam turbine applications) and air entrapment (for hydraulic systems). IBM #3 is used in the 1403 printer hydraulic system. A superclean version of IBM #6 is used in the 1301 Disc File hydraulic system.

Table 1 - Typical Properties

IBM NO	GENERAL DESCRIPTION AND APPLICATION	Viscosity			TEMP RANGE °F (°C)	PKG	IBM PART NO See 2.3
		SAE	SSU °F	INDEX			
3	A very low viscosity general purpose petroleum oil with excellent oxidation stability, good rust inhibition and low gum forming tendencies. For use in <u>light hydraulic systems, very light mechanisms and instruments</u> . Flash point 340°F (171°C), Pour point 25°F (-4°C).	-	80 @ 100 37 @ 210	140	25 - 175 (-4 - 80)	Pint Gal.	638026 477567
4	A light synthetic oil for applications where carbonization of oil is likely to occur, e.g. <u>near arcing contacts</u> (leaves no residue). Will react with most paints. Flash point 360°F (182°C), Pour point -35°F (-37°C).	-	170 @ 100 48 @ 210	144	-20 - 200 (-29 - 93)	Pint Qt.	450669 450670
6	<u>A LOW VISCOSITY GENERAL PURPOSE PETROLEUM OIL, FOR USE ON LIGHT MECHANISMS, E.G., SMALL JOURNALS, LINKAGES, SLIDING BEARINGS. GOOD OXIDATION RESISTANCE AND WETTABILITY. CONTAINS A RUST INHIBITOR.</u> Flash point 400°F (204°C),	10	150 @ 100 44 @ 210	100	32 - 175 (0 - 80)	4 Oz. Pint Gal.	460052 223980 450315

	Pour point 20°F (-7°C).						
7	A medium viscosity petroleum oil with qualities similar to IBM 3 and 6. <u>For use as a heavy hydraulic oil.</u> Flash point 440°F (226°C), Pour point 10°F (-10°C).	20	316 @ 100 53 @ 210	95	10 - 200 (-12 - 93)	Pint Gal.	2127714 451012
9	A medium viscosity petroleum oil. Contains a <u>tackiness agent</u> for improved adhesion to metals, but <u>restricts its use</u> to applications where a sticky residue is not objectionable. Flash point 360°F (182°C). Pour point -15°F (-26°C)	20	400 @ 100 55@ 210	80	0 - 225 (18 - 107)	Pint Qt. Gal.	450668 450678 450316
10	A <u>medium viscosity</u> petroleum oil, <u>for medium loads</u> with qualities similar to IBM 3, 6, and 7. Slightly higher viscosity than IBM 9, but no tackiness agent. Flash point 460°F (236°C). Pour point 10°F (-12°C).	30	500 @ 100 60 @ 210	95	20 - 225 (-7 - 107)	4 Oz. Pint	1280443 1280444
12	A <u>high viscosity</u> petroleum oil for use at high temperatures and <u>heavy loads</u> . Used for circulating oil systems and <u>closed gear cases</u> . Contains anti-oxidants, antifoaming agents and rust inhibitors. Flash point 500°F (260°C), Pour point 15°F (-9°C).	50	920 @ 100 88 @ 210	100	15 - 250 (-9 - 121)	Qt. Gal.	450133 450317

Although most of the IBM applications do not require the properties of turbine and hydraulic oils, the light color, good oxidation stability (Low tendency to form bums and lacquers), odor characteristics and field performance have proven that these oils are satisfactory for IBM applications. The reason for having five different oils of the same general composition in our standards is to cover the range in viscosities needed by engineering. This is illustrated in Table 2.

TABLE 2

OIL	VISCOSITY-SS/100°F
3	80
6	150
7	316

10	500
12	920

The viscosity of the oil selected for a specific application is determined by the speed and bearing size. The definition of viscosity and an explanation of how lubricants are selected will be given in subsequent sections of this report.

IBM #4 and #9 are special types of lubricants. IBM #4 is a polyalkylene glycol which is recommended for contacts. This oil does not leave as much residue and petroleum oils near arcing contacts. IBM #9 contains polyisobutylene, which is a tackiness agent. This oil is limited to applications where greater adhesion to metal is required and a sticky residue is not objectionable.

A Large number of other oils are available for special applications. These are listed by part numbers in the IBM Coded Parts List available in the local standards office.



[1403 Chain Drive Motor](#)



[1403 Printing Cartridge](#)

1. Printer Chain Drive Motor - The motor shown in Figure 30 was lubricated originally with a long-fiber sodium-soap grease selected by the manufacturer of the motor. In all bevel gear applications, oil is the preferred lubricant. In this particular application, the unit could not be properly sealed to prevent oil leakage.

The high melting grease selected by the motor vendor did not provide adequate lubrication, and the motors failed prematurely. By replacing the grease with IBM #22 (available as IBM #22 but use is being discouraged for other applications), acceptable performance was achieved. When the gears overheat, a small amount of the grease melts providing adequate lubrication.

2. Printing Cartridge - In the development stages of a printer, the type cartridge shown in Figure 31 failed in testing due to poor lubrication. The lubricant used was IBM #6. Oils of both higher and lower viscosities were tested in the early development states. It was found that oils with viscosities above 150 SSU/100°F caused the cartridge temperature to exceed the 140°F in our standards. Oils with lower viscosities generally gave lower operating temperatures, but greater wear. The failure of IBM #6 resulted from lacquer formation on the track. By changing to a 5W-20 engine oil, the problem was eliminated. The principles involved were:
 1. IBM #6 is a turbine quality oil. The demulsibility requirements for oils of this type preclude the use of surface

- active agents. When the oil overheats, lacquers are formed. These are preferentially absorbed on the track. As the lacquer deposit builds up, the friction between the type slug and the track increases, the temperature rises again, and eventually a catastrophic failure occurs.
2. Multi-viscosity engine oils contain polymeric dispersants and other surface active agents the keep the lacquers from depositing of the track keeping them in suspension. The surface active agents are preferentially absorbed on the track in place of the lacquer. The 5W-20 was selected since its viscosity at 100°F (180 SSU) was nearly equal to that of IBM #6 (150 SSU).