HP-41
Petroleum Fluids Pac
Quick Reference Card

Program Names and Titles

Name	Title
Z	Z Factor
CG	Gas Isothermal Compressibility
BG	Gas Formation Volume Factor
UG	Gas Viscosity
TcPc	Pseudocritical Temperature and Pressure From Gas Gravity
PROP	Gas Properties From Composition
CO	Oil Isothermal Compressibility
BO	Oil Formation Volume Factor
UO	Oil Viscosity
RS	Gas-Oil Ratio
PBP	Bubble Point Pressure
BT	Two-Phase Formation Volume Factor
CW	Water Isothermal Compressibility
BW	Water Formation Volume Factor
UW	Water Viscosity
RSW	Gas-Water Ratio
CFR	Rock Compressibility
CT	Total Isothermal Compressibility

Input and Output Variables

Symbol	Variable Name
BG	Gas Formation Volume Factor
BO	Oil Formation Volume Factor (above PBP)
BOBP	Oil Formation Volume Factor (at PBP)
BOb	Oil Formation Volume Factor (below PBP)
BT	Two-Phase Formation Volume Factor (above PBP)
BTBP	Two-Phase Formation Volume Factor (at PBP)
BTb	Two-Phase Formation Volume Factor (below PBP)
BW	Water Formation Volume Factor
CFR	Rock Compressibility
CG	Gas Isothermal Compressibility
CO	Oil Isothermal Compressibility (above PBP)
COb	Oil Isothermal Compressibility (below PBP)
CP	Specific Heat (constant pressure)
CT	Total Isothermal Compressibility (above PBP)
CTb	Total Isothermal Compressibility (below PBP)
CV	Specific Heat (constant volume)
CW	Water Isothermal Compressibility
CWA	Wichert-Aziz Correction
GAS G	Gas Gravity (relative to air)
GAS GS	GAS G Corrected for Separator Conditions
GHVD	Gross Heating Value (dry)

GHVW	Gross Heating Value (wet)
K	Specific Heat Ratio (CP/CV)
MW	Molecular Weight (GAS G $*$ 28.964)
NHV	Net Heating Value
OIL G	Oil Gravity (relative to water)
P	Pressure
PBP	Bubble Point Pressure
PPM	Parts Per Million (%NACL/10000)
PR	Reduced Pressure (P/Pc)
PSAT	Saturation Pressure of Water
Pc	Critical or Pseudocritical Pressure
Pc$*$	Pc Corrected for Sour Gas Content
RS	Gas-Oil Ratio (above PBP)
RSI	Initial Gas-Oil Ratio (above PBP)
RSW	Gas-Water Ratio
RSb	Gas-Oil Ratio (below PBP)
SEP P	Separator Pressure (absolute P)
SEP T	Separator Temperature
STD P	Pressure at Standard Conditions
STD T	Temperature at Standard Conditions
T	Temperature
TR	Reduced Temperature (T/Tc)
Tc	Critical or Pseudocritical Temperature
Tc$*$	Tc Corrected for Sour Gas Content
UG	Gas Viscosity
UO	Live Oil Viscosity (above PBP)
UOBP	Live Oil Viscosity (at PBP)
UOb	Live Oil Viscosity (below PBP)
UOd	Dead Oil Viscosity
UW	Water Viscosity
Z	Z Factor
%CO2	Mole Percent Carbon Dioxide
%ETH	Mole Percent Ethane

%He	Mole Percent Helium
%H2	Mole Percent Hydrogen
%H2O	Mole Percent Water Vapor
%H2S	Mole Percent Hydrogen Sulfide
%IBUT	Mole Percent Isobutane
%IPEN	Mole Percent Isopentane
%METH	Mole Percent Methane
%NACL	Weight Percent Sodium Chloride
%N2	Mole Percent Nitrogen
%N-BUT	Mole Percent N-Butane
%N-DEC	Mole Percent N-Decane
%N-HEP	Mole Percent N-Heptane
%N-HEX	Mole Percent N-Hexane
%N-NON	Mole Percent N-Nonane
%N-OCT	Mole Percent N-Octane
%N-PEN	Mole Percent N-Pentane
%O2	Mole Percent Oxygen
%POR	Percent Porosity
%PROP	Mole Percent Propane
%SG	Volume Percent Gas Saturation
%SO	Volume Percent Oil Saturation
%SW	Volume Percent Water Saturation
%TOT	Total of Mole Percentages

Yes/No Questions

Question	Meaning
CLEAR?	Yes: Clear constituent registers No: Leave constituent registers unchanged
COND?	Yes: Condensate well fluid No: Miscellaneous reservoir gas
RSW>0?	Yes: Gas-saturated water or brine No: Gas-free water or brine

SP.HTS?   Yes: Calculate CP, CV, and K

                  No: Don't calculate CP, CV, and K

Unit Management System

Selecting English or SI Default Units

If you set flag 09 (■ [SF] 09), all input and output prompts will use SI default units automatically. If you clear flag 09 (■ [CF] 09), all input and output prompts will use English default units automatically. You may want to use units that are not the English or SI default units. The available units are listed in the table of Petroleum Engineering Basic Units (shown later).

Input Prompts

When a program prompts for an input (i.e., **P=?**), respond by keying in a number and, optionally, its units. Press [ALPHA] and spell the abbreviation (up to 12 characters) for the desired units. Then press [R/S] to continue running the program.

When the prompt appears, you may press [←] to see the current value of that variable. The number you see is always in the units that are in the ALPHA register. To see if these units are acceptable, press [ALPHA]. If they are, press [R/S]. If not, key in the desired units and press [R/S]. (If the display is blank, the variable is dimensionless, and no units are required.)

If you make an error in specifying units, the letters you keyed in followed by a question mark will be displayed. Simply key in correct units and press R/S.

Each input variable has its own unique storage location, so its value only needs to be entered once. If the prompt reappears at a later time, simply press R/S, and the previously stored value will be retained.

Output Prompts

When a program beeps, stops in ALPHA mode, and shows you the output units that will be used (i.e., *BG*, *FT3/SCF?*), respond by keying in the units you want (optional), and pressing R/S. If the printer is not plugged in, the program then stops a second time to show the output value converted to the units you specified. To see the units, press ALPHA. Then press R/S to continue running the program.

If you make an error, the prompt is repeated, followed by the letters you keyed in instead of the original units. Simply key in correct units and press R/S.

If you want the program to stop and prompt for output units as described above, set flag 10 (■ SF 10). If you do not want the program to stop, clear flag 10 (■ CF 10), and either English or SI default units will be selected automatically.

Petroleum Engineering Basic Units

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Abbreviation	Name
ACRE	acre
API	degree API
ATM	atmosphere
BAR	bar
BBL	barrel of petroleum
BCF	billion SCF
BTU	British Thermal Unit
C	degree Celsius
CAL	calorie
CM	centimeter
CP	centipoise
CST	centistoke
D	darcy
DAY	day
DYNE	dyne
ERG	erg
F	degree Fahrenheit
FT	foot
FTH2O	foot of water
G	gram
GAL	gallon (U.S.)
GALUK	gallon (U.K.)
HP	horsepower
HR	hour
IN	inch
INHG	inch of mercury
INH2O	inch of water
J	joule
K	Kelvin
KCAL	kilocalorie

KG	kilogram
KGF	kilogram force
KIP	kilopound force
KJ	kilojoule
KM	kilometer
KMOL	kilomole
KPA	kilopascal
KSI	kip per square inch
KT	kilotonne
KW	kilowatt
L	liter
LBF	pound force
LBM	pound mass
M	meter
MBAR	millibar
MCF	thousand SCF
MD	millidarcy
MG	megagram
MI	mile
MIN	minute
MJ	megajoule
ML	milliliter
MM	millimeter
MMCF	million SCF
MMHG	millimeter of mercury
MN	meganewton
MO	month
MOL	mole
MPA	megapascal
MT	megatonne
MW	megawatt
N	newton
P	poise
PA	pascal
PSF	pound force per square foot
PSI	pound force per square inch

R	degree Rankine
S	second
SCF	standard cubic foot
SCM	standard cubic meter
SCMZ	standard cubic meter at 0 C
SPGR	specific gravity relative to water
ST	stoke
T	tonne (metric ton, 1000 kg)
THERM	10^5 Btu
TON	short ton (2000 lbm)
TONUK	long ton (2240 lbm)
TORR	torr
UM	micrometer
W	watt
YD	yard
YR	year

The above basic units may be combined into unit strings using unit control characters: * (multiply), / (divide), — ("converted to"), and 1-9 (exponents). A unit string can only have one divide sign; all units to the right of it are included in the denominator.

To use CON (conversion) and INCON (inverse conversion), place a unit equation (up to 24 characters) in the ALPHA register, and a number in X. The unit equation is a unit string, a dash, and another unit string. Execute CON to perform a left-to-right conversion or INCON to perform a right-to-left conversion. An invalid conversion will cause the **INVALID CONV** error message to be displayed.