



## Counterweight Position & Counterbalance Effect

### Symbol Identification

(plug-in values found in FORM: B030400)

CBT:	Counterbalance Torque (inch-lbs.)
CBTC:	Counterbalance Torque due to Cranks (inch-lbs.)
CBE:	Counterbalance Effect at Polished Rod (lbs.)
R <sub>cg</sub> :	Distance to Center of Gravity of Crank as Measured from Crank Shaft Center (inches)
SU:	Structural Unbalance (lbs.)
W:	Weight of Counterweight (lbs.) (see FORM: B060400)
CW:	Crank Weight (lbs.)
CPW:	Crank Pin Weight (lbs.)
R <sub>1,2,or 3</sub> :	API 'R', Distance from Crank Shaft Center to Crank Pin Shaft Center (inches)
N:	Number of Same Counterweights
X:	Position of Counterweight* as Measured against Scale on LS Crank Arm (inches from Crank Shaft Center)
	<i>*Position of counterweight is measured at the location of the counterweight locking cog</i>
TF@ 90°:	Torque Factor at 90 Degrees Crank Position

### Determine Counterweight Position, X, to achieve a desired CBE

Solve for CBT:	$CBT = (CBE - SU) * TF@ 90^\circ$
Solve for CBTC:	$CBTC = (2 * CW * R_{cg}) + (2 * R_{1,2,or 3} * CPW)$
Solve for X:	$X = \frac{CBT - CBTC}{N * W}$

### Determine Counterbalance Effect, CBE, at current counterweight position

Solve for CBTC:	$CBTC = (2 * CW * R_{cg}) + (2 * R_{1,2,or 3} * CPW)$
Solve for CBT:	$CBT = (X * N * W) + CBTC$
Solve for CBE:	$CBE = \frac{CBT}{TF@ 90^\circ} + SU$