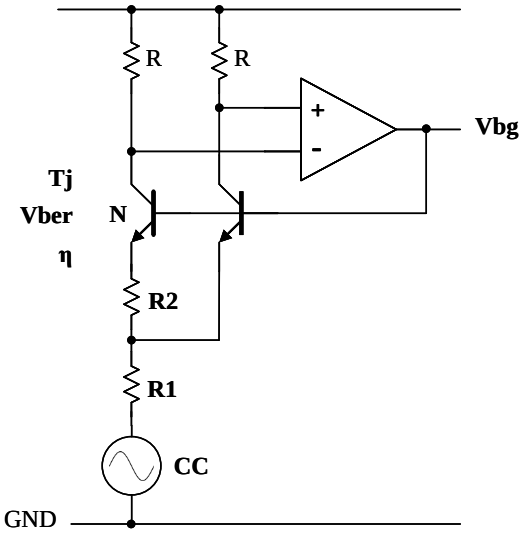
BGRC Quick Reference Guide

Bandgap Reference Calculator (BGRC) is a program for the HP50g calculator that aids in the design and analysis of a two transistor Brokaw bandgap voltage reference circuit. BGRC calculates all circuit parameters and the output voltage as a function of junction temperature and circuit parameters.

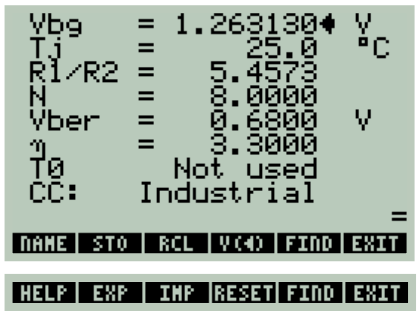
Circuit



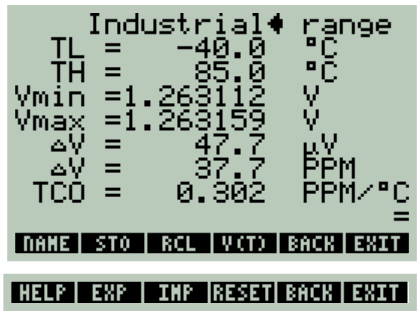
Parameters

1. Output 'bandgap' voltage, **Vbg,** in volts
2. Junction temperature, **Tj,** in °C
3. Resistor ratio, **R1/R2**
4. Transistors emitter area ratio, **N**
5. Base emitter voltage at 25°C, **Vber**, in volts
6. Process dependent parameter, **η**
7. Magic temperature, **T0**, in °C
8. Curvature Correction Type, **CC**
9. Standard Operating Range selection, **TL** and **TH**, in °C
10. Lowest operating temperature, **TL**, in °C
11. Highest operating temperature, **TH**, in °C
12. Lowest Vbg over temperature range, **Vmin**, in volts
13. Highest Vbg over temperature range, **Vmax**, in volts
14. Change in Vbg over temperature, **ΔV**, in uV and PPM
15. Temperature Coefficient, **TCO**, in PPM/°C

Parameter Displays and Commands



Circuit Parameter Display



V(T) Parameter Display

← Main Menu

← Extended Menu

Main Menu Commands

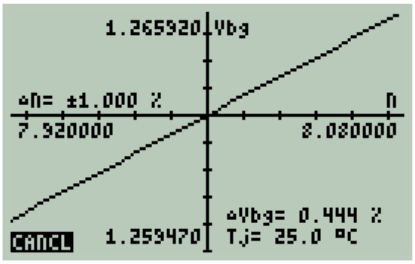
F1	(INFO)	display a description of the selected parameter in the message line
↰ F1	(INFO)	display the full precision of the selected parameter in the message line
F2	(STO)	store all parameters
F3	(RCL)	recall all stored parameters
F4	(V(T))	plot **Vbg** with respect to the selected parameter. Circuit Parameter Menu only
F4	(VTEM)	plot **Vbg** with respect to **Tj**. V(T) Parameter Menu only
F5	(FIND)	find the selected parameter. Circuit Parameter Menu only
F5	(BACK)	return to the Main Menu. V(T) Parameter Menu only
F6	(EXIT)	or ON (Cancel) exit the program
↰ F6	(EXIT)	launch the previously run calculator (for physical calculators only - requires CALC)
↱ ON		turns off the calculator

Extended Menu Commands

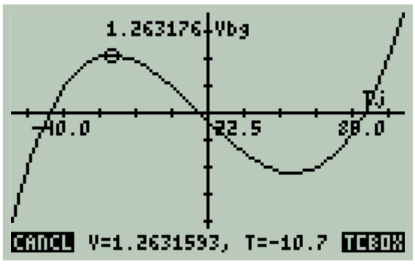
- F1 (▓▓▓▓) display the Brokaw Cell circuit and the definition of the TCO Box Method
- F2 (▓▓▓▓) export the selected parameter to the stack upon exiting.
- F3 (▓▓▓▓) import the number on level 1of the stack to the selected parameter.
- F4 (▓▓▓▓) restore all default parameter values. Parameters are not stored until ▓▓▓▓ is executed.

The equal sign (=) indicates all the parameters are consistent with each other and will appear following a F5 (▓▓▓▓) command. The not equal sign (≠) appears following an entry, indicating that the parameters may not be consistent.

Plot Displays and Commands



V(◄) Plot Display



V(T) Plot Display

V(◄) Plot Display Commands

▲	Zoom out by 2x
↰ ▲	Zoom out by 10x
▼	Zoom in by 2x
↰ ▼	Zoom in by 10x
F1 (▓▓▓▓)	Return to the Vbg(T) menu

V(T) Plot Display Commands

↱ ◄	Move the trace marker left by 1°C
◄	Move the trace marker left by 5°C
↰ ◄	Move the trace marker left to the nearest TL, TH, Peak, or 25°C temperature
↱ ►	Move the trace marker right by 1°C
►	Move the trace marker right by
►	Move the trace marker right to the nearest TL, TH, Peak, or 25°C temperature
F1 (▓▓▓▓)	Return to the Vbg(T) menu
F6 (▓▓▓▓)	Draw or remove the TCO box