HP PRIME

What's new in G2?

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With thanks to contributors on MoHPC

SOFT ROLL vs HARD ROLL

- The HP calculator group has "rolled out" updated versions of their calculators on many occasions

  - A "soft roll" is where they simply change the hardware without announcing it. The Prime and other HP calculators have soft-rolled firmware changes

  - A "hard roll" is where they announce the change - usually with a new model number.

- For a fuller description see Chapter 2, Guide to HP Calculators, Wlodek Mier-Jedrzejowicz

PREVIOUS SOFT ROLLS

• Firmware has been updated on many models to fix bugs.

• HP-41 series half-nut redesign introduced new internals and display, but performance was unchanged.

• HP-12C has had many modifications to the case, battery compartment, internals and keyboard. Improved performance was pulled after user feedback.

• HP48gII launched with 128KB RAM in 2003, but was quietly expanded to 256KB in 2007.

G2 - WHAT'S THE SAME

- The name! It's still the HP Prime

- The case, keyboard feel and display size

- Orange key legend contrast is still poor under energy saving light

- Blue key legends as per 2016 G1 Rev C

- Numeric keys are lighter grey as per 2016 G1 Rev C

- Firmware gives the same functionality regardless of version

WHAT'S CHANGED

	G1	G2	…
Introduced	2013	2018	Still actively changing firmware
CPU	ARMv5	ARMv7	~70% MIPS faster at the same clock speed
Clock	400MHz	528MHz	~30% faster clock
RAM	32MB	256MB	Larger matrix capability etc.
Storage	256MB	512MB	Way more than we need?
Battery	1500mAh	2000mAh	Approx. 15 hours
O/S	BestaOS	FreeRTOS	Less overhead
Display	-	Marginally better contrast	

WHAT THIS MEANS

- Faster boot and light sleep wake

- Potential to handle larger matrices etc.

- 2x to 3x faster in calculations

- Savage benchmark is significantly quicker…

Model	Language	Time	Source
HP-41CX	RPN Synthetics	2747.8s	Datafile V13N6P32
HP-42S	RPN	592.6s	Datafile V13N6P32
HP-48SX	RPL	195s	Datafile V34N3P21
HP-48GX	RPL	115s	Datafile V34N3P21
HP-49G	RPL	112s	Datafile V34N3P21
HP-50G	RPL	65s	Datafile V34N3P21
HP 30b	RPN	7.2s	Datafile V35N2P12
HP Prime G1	HP PPL	0.431s	Datafile V35N3P11
HP Prime G2	HP PPL	0.187s	MoHPC
DM42	RPN	6.1s (plugged-in)	SwissMicros forum
DM42	RPN	12.84s (unplugged)	SwissMicros forum
Galaxy S8+	Free42 RPN	0.25s	SwissMicros forum
TI-89	TI Basic	272s	technicalc.org
TI-92+	TI Basic	187s	technicalc.org

IMPLICATIONS FOR APPS

- Some applications may want to be hardware aware

- Developers may want behaviour to be the same across all versions, others may want to take advantage of the increased performance

- How best to do this?

  - Read the string returned by VERSION

    - G1 Rev A: "HP Prime Graphing Calculator Software Version: 2.0.0.13865 (2018 07 06) Hardware Version: A CAS Version:1.4.9 …"

    - G2 Rev D: "HP Prime Graphing Calculator Software Version: 2.0.0.13865 (2018 07 06) Hardware Version: D CAS Version:1.4.9 …"

    - macOS: "HP Prime Graphing Calculator Software Version: 2.0.0.13865 (2018 07 06) Hardware Version: Emu CAS Version:1.4.9 …"

    - iOS: "HP Prime Graphing Calculator Software Version: 2018 02 12 (13443) Hardware Version: iPhone10,6 CAS Version:1.4.9 …"

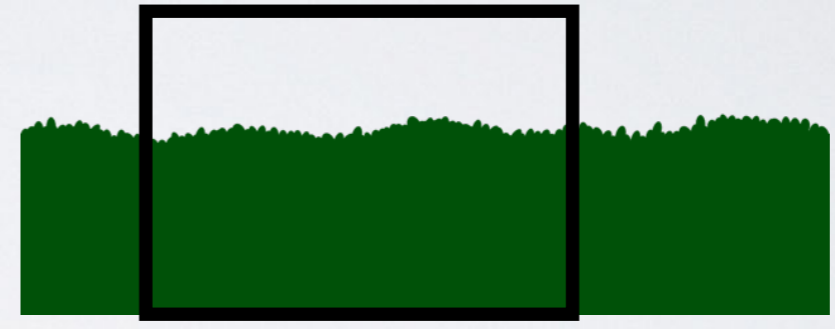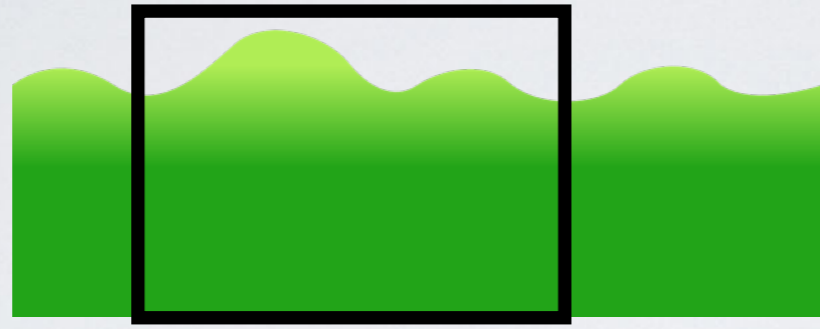 - Read the result from MEMORY - less useful?

  - Another method?

All images are loaded into separate GROBs during initialisation allowing the change from day to night mode.

Sky, hills and trees are kept separate and scrolled at different rates to create the feeling of depth and height.

All graphics are drawn into G1, "offscreen" buffer, and then moved to G0 to ensure a smooth display.

1) BLIT

2) BLIT

3) BLIT

4) 69 polygons

Multiple polygons calculated on the fly. One each for each segment of field, road, edging and centre line and number depending on drawing depth

6) BLIT

5) Scaled BLITs

RENDERING IN RACER

- UpdateWorld() is timed during game initialisation so that the time to draw a frame is known (render time)

- Refresh rate is fixed, currently to 7 fps (max for G1)

- Frame time = 1 / refresh rate, so currently 0.143s

- Wait time = frame time - render time

- Wait time is used in a busy wait to overcome difference in emulators and physical calculators

- All calculators and emulators give the same user experience

RENDER COMPARISON

7fps 0.143s/frame	Draw depth	Render time	Spare CPU time
G1	20	0.138s	0.005s
G2	20	0.052s	0.091s
G2	40	0.085s	0.058s
G2	60	0.117s	0.026s

HOW TO USE THE POWER

- Increase frame rate

- Increase draw depth

- Add new visual effects

- Add new in game objects

- Improve the physics

CONCLUSION

- Great that the Prime platform is still being actively developed

- G1 Prime is still very fast

- G2 is a useful upgrade but not essential

- Improvements can still be made to both hardware and software