GPC1 Afterword

Now that the GPC1 has been around awhile, it is time to evaluate the design and suggest changes for the future. No significant problems have arisen, but there is always room for improvement.

The main item of concern is that Philips has discontinued the P89C66X line of microcontrollers. The devices will remain available for quite some time from after-market sources, but it would be reassuring to find an active replacement. Philips is now introducing P89V66X devices, which are reported to be drop-in replacements for the P89C66X. The replacements are new and as of this writing only the P89V664 is available. It is not known if there will be a replacement for the P89C669, which is of interest because of its expanded code memory and a second RS-232 port. The P89V664 has a second I2C port and a SPI port which would ordinarily be good things, but unfortunately, the GPC1 design could not foresee or accommodate these upgrades, which use four pins which had no internal connection in the P89C668. In fact, the GPC1 design used two of these unconnected pins as tie-points for power and ground. The GPC1 did make provision to use pins 12 and 34 for the second RS-232 port of the P89C669, but pin 23 was used as a 5V tie-point and pin 1 was used as a ground tie-point. There are two ways of dealing with pin-use conflict in these four pins when using a P89V66X replacement. One would be simply to avoid code that would activate these pins and cause excessive current flow. The other way would be to cut the traces to these pins and isolate them from power and ground. Luckily, this trace cutting can be done without breaking the power or ground connections to other components. Use of the new functions for these pins would, of course, require a good bit of hand wiring. A new board design (GPC2) would allow for use of the new functions but that will have to wait until it is known what direction Philips will go with other devices in this line, such as a replacement for the P89C669.

Using the alarm interrupt of the RTC to power up the GPC1 has been very successful and has been fully demonstrated by the OS1 program. There is a potential problem though, due to the fact that a RTC alarm interrupt can only be reset by program control. This means that if the batteries are so low that the brown-out detection prevents a successful power-up, the processor will not run and the alarm interrupt will not be reset so the attempted power-up will persist until the batteries are depleted. To avoid this situation, OS1 monitors the power and takes measures when the batteries are near collapse. When the input voltage drops to 5.5V OS1 turns off the LCD backlight, if it is on, and lets the batteries recover somewhat. When the voltage again drops to 5.5V or if the backlight was already off, OS1 communicates with the RTC to disable the alarm and then turns off power by clearing port 2.1. Even with these precautions, a hung-up alarm is still a possibility and recovery may require that main power and backup power be simultaneously removed from the RTC to reset it to initial conditions. This can be done by disconnecting external power, pulling one of the NiMH batteries, and then lifting the spring clip at the top of the back-up battery. Aside from over-discharging the batteries, another consequence of a hung alarm is that the brown-out detector may force the reset high long enough to enable the sound that signals that programming mode will be entered when the reset is removed. Of course, the reset will never be removed so programming mode will not be entered, but a constant sound could result. Hopefully, a hung-up alarm will be a rare event or the result of a user program bug. As such, this fix may not be worth considering, but an extra diode in the circuit could prevent the continuous sound situation. The cathode of the new diode would be connected to the brown-out detector output like D8 and D9, and the anode would be connected to pin 9 of U5, so that C4 could never charge in a brown-out condition. If it proves useful, this diode could be easily patched in to the GPC1 board, and it could be designed into a future GTC2 board. New RTC devices are now appearing with a pulsed instead of continuous alarm output and this self-clearing interrupt might finally eliminate the possibility of a hung-up alarm.