

Build Your Own Personal Computer/X-10 Interface

It is once again my pleasure to present another innovative product that I hope you will enjoy. This project will allow you to build an interface to your personal computer which will control ALL your X-10 modules and appliances thru an X-10 PL513 interface module. Based on a PIC 16C54 (our standard workhorse chip), we've designed the circuitry to fit inside the shell of a conventional DB-25 connector. The total component count consists of 1 PIC, 1 ceramic resonator, 1 78L05 voltage regulator, 2 diodes, 2 resistors, and 1 capacitor. That's it!

WHAT'S A PL513?

It's pretty easy to guess that would be your first question. First, in case somebody missed it, let's redefine what X-10 is. It's a protocol for sending signals over your power wiring to remotely control devices in your home/business. It does this by modulating a 120 Khz. signal on the AC signal. There is a starting sequence code (2 cycles) followed by a house code (4 cycles) followed by a key or function code (5 cycles). So...an eleven bit code is sent for each command.

The PL513 module has a 4-pin RJ11 standard phone jack attached to a small case which plugs into the AC power line. A red LED illuminates when power is present and dims whenever a valid X-10 command is send. Inside the unit is a 120 Khz. oscillator which interfaces to the power wiring plug. Also contained is an opto-isolator which provides an indication of when the AC cycle crosses zero. That's all there is to the interface. For those of you with a true engineering spirit, please visit X-10's website @ <http://www.x10.com> There you will find a 12-page document free for the downloading which covers all the specifications, including schematic, for the PL513. The document is entitled Technical Note for PL513\TW523.

WHAT'S THE PIC FOR?

Another good question. Although the PL513 provides a power line interface and zero-crossing signals, it's a far cry from a smart interface. Let's go a little more in-depth into the protocol and I think you'll see what I mean. Each time a code is sent, you have to send a complementary bit immediately after each bit on each half cycle. For example, the start code is 1110 is sent as 1 0 1 0 1 0 0 1. This is true for the house codes and key/function codes as well. And you have to repeat it twice with 3 cycles of silence in between. And at least 2 repeats for each dim and brighten command CONTINUOUSLY without any missing cycles.

And for the clincher, each 1 bit must be sent three times on each cycle. This allows the system to be used on 3-phase power systems. Since a power cycle (each half) is 8.33 msec., a 1 msec. burst happens at zero crossing (within 50 usec.) and again at 2.778 msec. and again at 5.556 msec. This is all available in detail with diagrams and explanations so do your brain a favor and get the spec sheet. I guarantee it'll be a lot easier to understand!

It's pretty easy to see that this isn't a user friendly interface. But, it's nothing we can't handle. We managed this by putting bit pattern codes in a lookup table. And...as it turns out...the 4 bit pattern for house codes and the first four bits of the key/function codes happens to be the same. So here's what we do. We receive a code from the Visual Basic program thru the serial port. This code is a vector to the lookup table which loads the different subroutines with the proper info which sends the properly formatted data to the PL513.

THE HMI

As we mentioned above, a Visual Basic program which sends the commands to the PIC is available FREE. The interface consists of a HMI (Human Machine Interface) program. No, I didn't make up that term. It was derived from a MMI (Man Machine Interface) but I guess some ladies must've got offended ...so here we are. This is a generic term used in engineering to denote a program or panel which accepts commands and/or provides information to/from the end user.

Download the two self-extracting Zipped files. When they are run, they'll self-extract to a: drive and provide you with 2 diskettes which will install the program from a standard setup menu. Visual Basic 5.0-Professional Edition (which we use) has a neat utility which allows you to make you own programs installable on another computer.

When you actually run the program, you'll see 22 Icon buttons. Channels 1-16 and the standard: All Units Off, Lights On, ON, OFF, DIM, Brighten. Now, here's the really neat part. You can select any number of channels and perform simultaneous operations. Like dimming or brightening several channels at once.

Well, that's pretty much it. \$ 20.00 to X-10 will get you the PL513 delivered to your door. And \$20.00 with the order form will get you a preprogrammed PIC, ceramic resonator, and 78L05 voltage regulator delivered to your door as well. Since we expect that this system will be fairly popular...you and your friends will probably want one. We recommend that you take advantage of our volume discount pricing on the order form. Order with your friends, and you'll all be saving money...