

X-10 Data-Stream Monitor

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<http://www.cix.co.uk/~pplunkett/x10.htm>

Introduction

This document describes how the author's X-10 compatible appliance module may be used as a simple X-10 data-stream monitor. Raw X-10 data on the power-line is converted into RS232 data that may be monitored on a PC running a terminal program. In fact the 'monitor' was designed before the appliance module when it became necessary to fully understand the data format as generated by various X-10 power-line controllers. This 'earlier work' is published now at the request of some constructors. Hopefully it will also aid in analysing problems encountered when building the appliance modules. It should be read in conjunction with the earlier design article (distributed as X10AM1.ZIP).

Disclaimer

Construction of the X-10 power-line equipment should only be undertaken by an experienced constructor with access to test equipment. In use and during test the circuits are connected directly to the power-line and so danger is involved. The author accepts no liability for the health and safety of the constructor assembling or modifying his designs.

Description

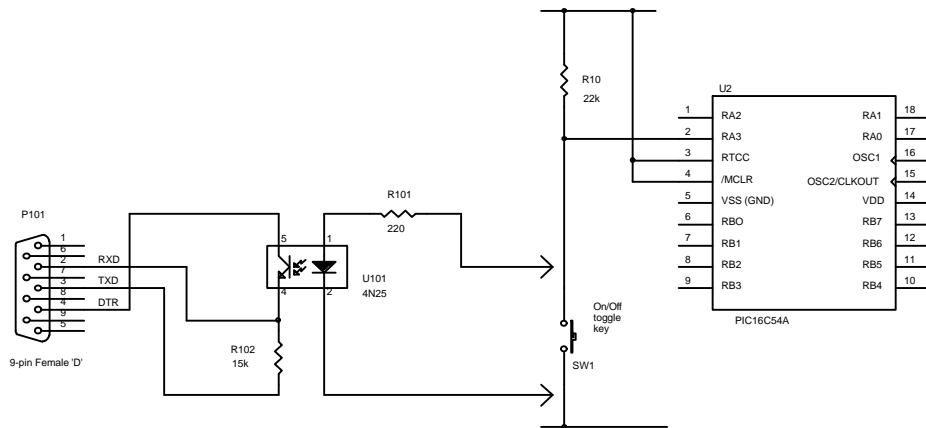
The data-stream monitor uses the same circuit board as the appliance module. The PIC16C54A micro-controller contains a different program so that instead of interpreting the X-10 data and switching a triac the PIC drives an opto-isolator with RS-232 data. The PIC16C54A does not interpret the data in any way. At each power-line zero crossing either an ASCII '0' or '1' is transmitted to indicate the absence or presence of the 120kHz carrier.

PC Software

The PC should run a terminal program set to the correct COM port, 4800 baud, and 8N1 format (eight data bits, no parity, 1 stop bit). The author used Procomm+ for DOS however Windows Hyperterminal could probably serve. Data pours out of the monitor so a terminal program that can freeze the display or capture the data to a file for examination later is most useful.

PC Interface

On the author's appliance modules the manual on/off switch is wired to the circuit board via a two-pin connector. These two pins provide a simple connection point for the RS232 data output. The monitor software in the PIC16C54A configures the RA3 port to be an output and drives the LED inside the opto-isolator. The COM port TXD and DTR lines from the PC are used to power the opto-isolator output circuit. As the PC only listens and does not transmit, the TXD line stays in the idle state and acts as a negative supply. The DTR line is normally set positive when the PC opens the COM port. It is used as a positive supply.



PIC Object Code

The object code is provided in two versions, the first for the PIC16C54A micro-controller and the second for the PIC16F84A micro-controller

The object code below should first be cut and pasted into a text file called, for example, X10DSM2.HEX and then programmed into a PIC16C54A micro-controller. The code sets the clock to 'XT', the watchdog on, and code protection off.

```
:10000000060C0500FF0C0600050568006A006B0081
:100010006C006D006900070C0200480956093009A0
:100020000307140A18090E0A16090E0A300C190AD9
:10003000310C2F00080C2E0065052A092F03030739
:100040006505030665042A09EE021E0A65042A09ED
:100050002A090008320C29000000E9022C0A0008D5
:10006000380956094507360A030500080304000845
:1000700025063E0A040025073A0A00080400250662
:100080003E0A0008060C29004D0A0F0C29004D0AF3
:100090001E0C29004D0A3D0C2900C00C2100040053
:1000A000010243074F0AE9024D0A000861000400FB
:0800B00001024306570A000893
:0203FE00000AF3
:080400000A000B000A000C00C9
:021FFE00FD0FD5
:00000001FF
```

The object code below should first be cut and pasted into a text file called, for example, X10DSMB1.HEX and then programmed into a PIC16F84A micro-controller. The code sets the clock to 'XT', the watchdog on, and code protection off.

```
:1000000006306500FF3066000514900192019301EF
:10001000940195019101073062004820562030205C
:10002000031C142818200E2816200E2830301928FA
:10003000313097000830960085152A20970C031C54
:100040008515031885112A20960B1E2885112A2054
:100050002A200034323091000000910B2C2800340B
:1000600038205620051D36280314003403100034B0
:1000700085183E286400851C3A28003464008518E1
:100080003E280034063091004D280F3091004D2855
:100090001E3091004D283D309100C0308100640039
:1000A0000108031D4F28910B4D2800348101640085
:0800B000010803195728003470
:0203FE000028D5
:084000000A000B000A000C008D
:02400E00FD3F74
:00000001FF
```

