Intelli-switch - A Serial Switching Network

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INTRODUCTION:

A simple and cheap switching network at home to control various appliances such as a TV, a radio, a washing machine, a microwave oven, etc. with PC or standard TTY type terminal on a simple basis without the need of special software running.

APPLICATION OPERATION:

System to a full extend can accept 8 intelli-switch units in a serial network fashion.

A typical system consists of minimum 1, max. 8 intelli-switch modules, a pc or a TTY terminal with RS232 interface. Control will be at 300 baud 8N1 format. Each switch in the network will have an addressing character which corresponds to a specific combination of dip switches on the intelli-switch unit. Control data sent to a intelli-switch unit will consist of an addressing character to choose the appropriate switch followed by a 0 to de-activate or 1 to activate the connected appliance. To have more than one switch with the same addressing character activate at the same time in different nodes of network is also possible.

Intelli-switch units addressing characters are A, B, C, D, E, F, G, H respectively. Dip switch settings corresponding to these letters are shown on Table 1.

To give an example of control of a switch unit with addressing character A set by dip switches on unit:
Control word will be A0 to "OFF" the load
A1 to "ON" the load

All data to be sent is corresponding ASCII numeric values of characters (e.g. 65 for A). This allows control of intelli-switch units from a simple terminal program such as procomm plus or windows hyper-terminal which send these values automatically.

Hardware of a typical Intelli-switch unit consists of a PIC12C671 processor, a SSR-solid state relay, a 3 switch dip switch or jumper for addressing settings of unit and a few passive components.

S1, S2, S3 dip switches differentiating each switch by substituting a letter in software inside the PIC12C671.

To connect intelli-switch(es) to RS232 input there is no need to level converters. In DB9 type connector connect all switch Serial inputs to pin 3 TX, Gnd to pin 5.
In DB25 type connector connect all switch Serial inputs to pin 2 TX, Gnd to pin 7.

The advantage of this type of networking is less wiring, more switching. In practice, if power supply to Intelli-switch units can be supplied from the controlled unit, the cable needed to control 8 switches is two, Serial in and GROUND, if we cannot supply the power from controlled units then one additional power cable is added. Network cable extended up to 10 meters and tested without any problem.

For the software, PICBASIC Compiler ver.1.32 from Micro Engineering Labs was used because of easy serial data implementation, instead of any assembler. Software logic is quite straight forward as can be seen in the flowchart section. One way communication was chosen in order to keep wiring a little bit simple.
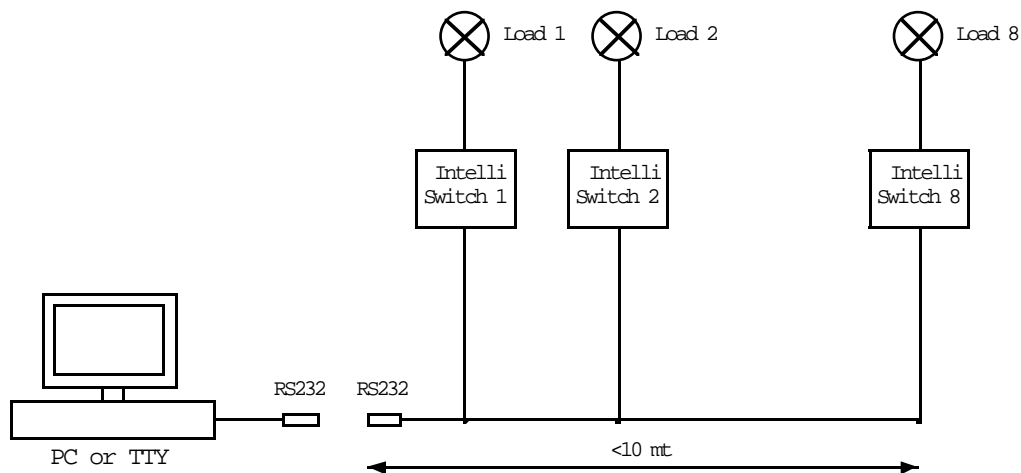
Automate the Home

Table 1:

Dip Switch Settings			Addressing Character
S3	S2	S1	
CLOSE	CLOSE	CLOSE	A
CLOSE	CLOSE	OPEN	B
CLOSE	OPEN	CLOSE	C
CLOSE	OPEN	OPEN	D
OPEN	CLOSE	CLOSE	E
OPEN	CLOSE	OPEN	F
OPEN	OPEN	CLOSE	G
OPEN	OPEN	OPEN	H

S1, S2, S3 Combination corresponding to addressing characters

Block Diagram:

Flow Chart:

As the software is rather simple, I preferred algorithm steps instead of flowcharting.

Intelli-Switch software algorithm:
1. Get addressing data in serially with 300 baud,8N1 format.
2. Check the addressing letter if it matches the dip switch settings lookup.
3. If the matching is valid, get control character. If not, reject and loop back to beginning.
4. If the character is "0", turn off. If "1", turn on
5. Then loop back to beginning and wait for the next valid addressing information.

Graphical hardware representation:
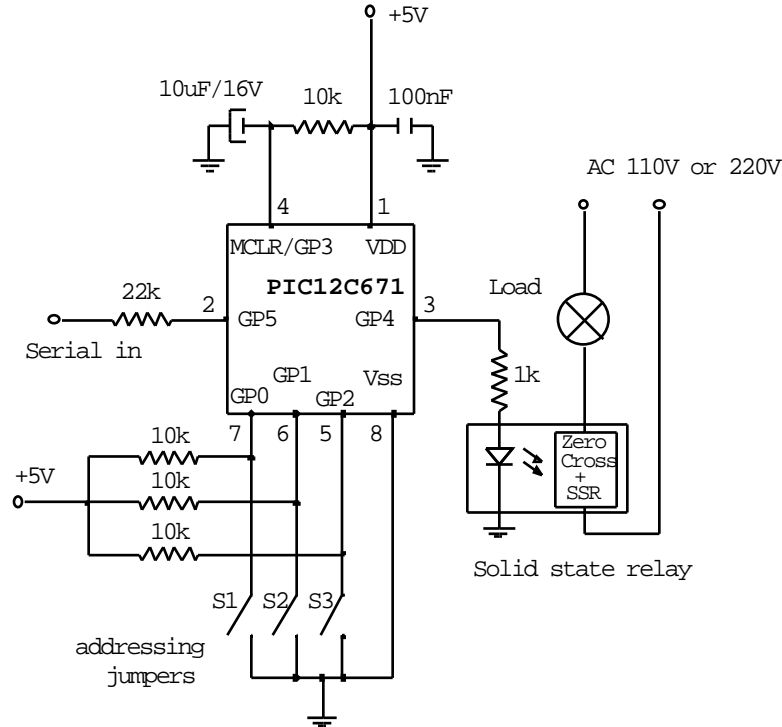
SCHEMATIC OF AN INTELLI-SWITCH UNIT

FIGURE 2

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APPENDIX A: SOURCE CODE

```
'              Barbaros ASUROGLU
'              11 November 1997
'              Switch.BAS - A serial data controlled simple switching Unit
'              Version 1.10


'---------------------------[ SYMBOLS ]-----------------------------
SYMBOL  S_In    = 5                    ' Serial Input Pin
SYMBOL  Out     = 4                    ' Solid State Relay cont. output pin
SYMBOL  char    = b1                   ' Addressing character register
SYMBOL  data    = b2                   ' Control Data Register
SYMBOL  Dipsw   = b3                   ' Dip switch position register
'---------------------[ Initialize Registers ]----------------------

Begin:
              Dirs  =  %00010000       'GP4 Out ,rest are input
              char  =  0               'initialize registers
              Dipsw = 0
              data  = 0
              Low Out                  'On POR reset "OFF" the switch for safety reasons
'-------------------[ Identify Switch Control Unit ]--------------------

Ident:        Dipsw = 0
              char  = 0

              Dipsw = Pins             'Get dip sw positions and extract lsd 3 bits
              Dipsw = Dipsw & %00000111 'by ANDing

'Choose corresponding addressing char. from lookup table
              Lookup Dipsw,("A","B","C","D","E","F","G","H"),char

'------------[ INPUT SERIAL ADDRESS & DATA Control to load  ]------------

Inp_data:
              Serin S_in,N300,(char),data 'Serial input,300Baud,8N1 format

              If data = 48 then OFF       'Off switch if data = "0", ascii 48
              If data = 49 then ON        'On switch if data = "1" ,ascii 49

              Goto Ident                  'Else return to beginning

OFF:          Low Out
              Goto Ident

ON:           High Out
              Goto Ident
'------------------------[ END OF PROGRAM ]---------------------------
```