APPLICATION OPERATION:

This device is for a remote on and off switch for up to three home devices. It consists of two separate parts, a remote control and a main unit.

The main unit is connected to a phone line. It answers a phone call (after 2, 4, 8 or 16 ring signal), receives a message and controls the energetic outputs. LED1, LED2 and LED3 are for visual control of outputs. If a receiving error has occurred, the main unit will break the connection without changing any output states. Indication of a correctly received message is a 1.8 kHz tone. The power supply is from an AC network and there is a NiCd ac charging output.

The remote control unit has three buttons and four LEDs. By using the buttons UP and DOWN, we can select a device whose state needs to change. Three green LEDs are for indication of a currently active device, and the red LED is for indication of state. The ENTER button is for changing the state of the selected device. When all LEDs are off, pressing ENTER starts a transmit sequence. After the end of the transmit sequence, a main unit sends a beep tone which can be heard in a phone receiver. Next, pressing ENTER causes the microcontroller's SLEEP state. Waking up from the SLEEP state is done by pressing any button. The remote control has a NiCd charging input.

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APPENDIX A: SOURCE CODE

;********************************************************************
; THIS IS PROGRAM FOR MAIN UNIT
;********************************************************************

w equ 0
TMR0 equ 0x01
PCL equ 0x02
STATUS equ 0x03
GPIO equ 0x06
Gp0 equ 0
Gp1 equ 1
Gp2 equ 2
Gp3 equ 3
Gp4 equ 4
Gp5 equ 5
Flag equ 0x07
Rcvd equ 0
ByteCnt equ 0x08
BitCnt equ 0x09
BeepTime equ 0x0A
NoBeep equ 0x0B
Kode equ 0x0C
Output equ 0x0D
BT ime equ 0x0E

org 0
movlw 0x06
movf GPIO
movlw 0x08
tris GPIO
clrf TMR0

;********************************************************************

Start
btfsc GPIO,Gp3
goto Start
bcf GPIO,Gp1
Start1 btfss GPIO,Gp3
goto Start1
call OutBeep
nop
waiting btfsc GPIO,Gp3
goto Waiting
call RecByte1
call RecByte2
call OutBeep
call Execute
goto Start

OutBeep
movlw 0x0F
movwf NoBeep
OutBeep0 movlw 0x0F
movwf NoBeep
OutBeep1 bcf GPIO,Gp2
movlw 0x0C
movwf TMR0
BeepLoop movf TMR0,W
subwf TMR0,W
btfsc STATUS,0
goto BeepLoop
bsf GPIO,Gp2
movlw 0x0C
movwf TMR0
```assembly
BeepLoop1 movf TMR0,W
    subwf TMR0,W
    btfsc STATUS,0
    goto BeepLoop1
    decfsz BeepTime
    goto OutBeep1
    decfsz NoBeep
    goto OutBeep0
    retlw 0
RecByte1
    movlw 0x08
    movwf BitCntr
    BLoop1 call RecBit
    btfss Flag,Rcvd
    bcf STATUS,0
    bsf STATUS,0
    rlf Kode
    decfsz BitCntr
    goto BLoop1
    movlw 0xAA
    xorwf Kode,W
    btfss STATUS,2
    goto Error
    retlw 0
RecByte2
    movlw 0x08
    movwf BitCntr
    BLoop2 call RecBit
    btfss Flag,Rcvd
    bcf STATUS,0
    bsf STATUS,0
    rlf Output
    decfsz BitCntr
    goto BLoop2
    movlw 0xA0
    xorwf Output,W
    andlw 0xF0
    btfss STATUS,Z
    goto Error
    retlw 0
RecBit
    clrf TMR0
    movf TMR0,W
RB1
    btfss GPIO,Gp3
    goto RB1
    subwf TMR0,W
    movwf BTime
    movlw 0x06
    subwf BTime,W
    btfss STATUS,0
    goto B0R
    movlw 0x0A
    subwf BTime,W
    btfss STATUS,0
    goto B1R
B0R
    bcf Flag,Rcvd
B0R1
    movf TMR0,W
    btfsc STATUS,2
    goto B0R1
    retlw 0
B1R
    bcf Flag,Rcvd
B1R1
    movf TMR0,W
    btfsc STATUS,2
    goto B1R1
    retlw 0
```
Error
  bsf    GPIO,Gp1
  goto   0

Execute
  btfss  Output,0
  bcf    GPIO,Gp5
  bsf    GPIO,Gp5
  btfss  Output,1
  bcf    GPIO,Gp4
  bsf    GPIO,Gp4
  btfss  Output,2

;********************************************************************
; THIS IS PROGRAM FOR REMOTE
; CONTROL UNIT
;
; CONFIG = 0x0A
; INTRC
; WDT disabled
; CP off
; MCLR off
;********************************************************************

W      equ    0
TMR0   EQU    0X01
PCL    EQU    0X02
STATUS EQU    0X03
FSR    EQU    0X04
OSCCAL EQU    0X05
GPIO   EQU    0X06
Gp0    equ    0
Gp1    equ    1
Gp2    equ    2
Gp3    equ    3
Gp4    equ    4
Gp5    equ    5
Flag   EQU    0X07
Send   equ    0
KeyPres equ    1
dbnce  equ    2
ok     equ    3
Debounce equ    0x08
Gp1o1  equ    0x09
Output equ    0x0A
AudOut equ    0x0B
MusCntr equ    0x0C
Temp   equ    0x0D
Delay  equ    0x0E
org    0
clw
  movwf  GPIO
  movwf  Flag
  movwf  Gp1o1
  movlw  0x07
  option
  movlw  0x16
  tris  GPIO
clrflash

Loop   call   ServKeys
       call   UpdateLed
       btfss  Flag,Send
       goto   Loop

Audio  movlw  0x08
tris GPIO
movlw 0xAA
movwf AudOut
call Music
movlw 0xA0
movwf AudOut
movf Output,W
iorwf AudOut
bsf AudOut,3
call Music
bsf Flag,ok
goto Loop

;***************************
ServKeys
movlw 0x16
tris GPIO
bcf GPIO,Gp5
movf Gpio1,W
btfsc STATUS,2
bcf GPIO,Gp0
movlw 0x02
subwf Gpio1,W
btfsc STATUS,2
goto Show2
btfss STATUS,0
goto Show1
btfss Output,Gp2
bcf GPIO,Gp0
bsf GPIO,Gp0
Continue btfss GPIO,Gp2
goto Up
btfss GPIO,Gp1
goto Down
btfss GPIO,Gp3
goto Enter
bcf Flag,KeyPres
retlw 0

Show2
btfss Output,Gp1
bcf GPIO,Gp0
bsf GPIO,Gp0
goto Continue

Show1
btfss Output,Gp0
bcf GPIO,Gp0
bsf GPIO,Gp0
goto Continue

Up
btfsc Flag,dbnce
goto DecDbnce
btfsc Flag,KeyPres
retlw 0
bsf Flag,KeyPres
movlw 0x04
movwf Debounce
bsf Flag,dbnce
bcf Flag,ok
movlw 0x03
subwf Gpio1,W
btfsc STATUS,2
goto Up2
incf Gpio1
retlw 0

Up2
clr Gpio1
retlw 0
Down

```
btfsc  Flag,dbnce
goto  DecDbnce
btfsc  Flag,KeyPres
retlw  0
bsf   Flag,KeyPres
movlw  0x04
movwf  Debounce
bsf   Flag,dbnce
bcf   Flag,ok
movf  Gpio1,W
btfsc  STATUS,2
goto  Down2
decf  Gpio1
retlw  0
```

```
Down2

movlw  0x03
movwf  Gpio1
retlw  0
```

```
Enter

```
btfsc  Flag,dbnce
goto  DecDbnce
btfsc  Flag,KeyPres
retlw  0
bsf   Flag,KeyPres
movlw  0X04
movwf  Debounce
bsf   Flag,dbnce
btfsc  STATUS,2
goto  Ent0
movlw  0x03
subwf  Gpio1,W
btfsc  STATUS,2
goto  Ent3
movlw  0x02
subwf  Gpio1,W
btfsc  STATUS,2
goto  Ent2
btfss  Output,Gp0
bsf   Output,Gp0
bcf   Output,Gp0
retlw  0
```

```
Ent2

```
btfss  Output,Gp1
bsf   Output,Gp1
bcf   Output,Gp1
retlw  0
```

```
Ent3

```
btfss  Output,Gp2
bsf   Output,Gp2
bcf   Output,Gp2
retlw  0
```

```
Ent0

```
bsf   Flag,Send
retlw  0
```

DecDbnce

```
decfsz  Debounce
retlw  0
bcf   Flag,dbnce
retlw  0
```

TxEnd

```
bsf   GPIO,Gp2
bsf   GPIO,Gp1
```
Automate the Home

bcf   GPIO,Gp0
bcf   GPIO,Gp4
bsf   GPIO,Gp3
sleep
retlw0

UpdateLed
movlw 0x18
tris  GPIO
bsf   GPIO,Gp5
movf  Gpio1,W
btfss STATUS,2
go   OffLed
movlw 0x02
subwf Gpio1,W
btfsc STATUS,2
go   On2nd
btfss STATUS,0
go   On1st
bcf   GPIO,Gp0
bcf   GPIO,Gp1
bsf   GPIO,Gp2
retlw 0

On1st
bsf   GPIO,Gp0
bcf   GPIO,Gp1
bcf   GPIO,Gp2
retlw 0

On2nd
bcf   GPIO,Gp0
bsf   GPIO,Gp1
bcf   GPIO,Gp2
retlw 0

OffLed
bcf   GPIO,Gp0
bcf   GPIO,Gp1
bcf   GPIO,Gp2
retlw 0

MusLoop
btfss  AudOut,7
call   Out0
call   Out1
btfss  AudOut,6
call   Out0
call   Out1
btfss  AudOut,5
call   Out0
call   Out1
btfss  AudOut,4
call   Out0
call   Out1
btfss  AudOut,3
call   Out0
call   Out1
btfss  AudOut,2
call   Out0
call   Out1
btfss  AudOut,1
call   Out0
call   Out1
btfss  AudOut,0
call   Out0
call   Out1
retlw 0

Out1
movlw  .32
movwf  Temp
DS40160A/7_005-page 10
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Loop1A      bsf    GPIO, Gp4
             movlw .255
             movwf Delay

Loop11      decfsz Delay
             goto Loop11
             bcf GPIO, Gp4
             movlw .254

Loop10      decfsz Delay
             goto Loop10
             decfsz Temp
             goto Loop1A
             retlw 0

Out0
             movlw .16
             movwf Temp

Loop0A      bsf GPIO, Gp4
             movlw .255
             movf Delay

Loop01      nop
             nop
             decfsz Delay
             goto Loop01
             bcf GPIO, Gp4
             movlw .254

Loop00      nop
             nop
             decfsz Delay
             goto Loop00
             nop
             decfsz Temp
             goto Loop0A
             retlw 0
             end