Design Notes
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The microprocessor runs at 4 MHz.

It is powered directly from three 1.5 V mercury button cells in series. Current draw at nominal volume is only 12 ma (idle) to 17 ma (tone being generated).

One of the 8-bit 68HC705C8 ports is wired to an R-2R resistive network made with precision 10K/20K resistors. The output of the network (input to the LM386N audio amp) is the sum of the binary-weighted output of the port (0xFF = 5 volts, 0x00 = 0 volts). It is very linear.

Each button drives an input port on the microcontroller. No keyboard scanning is used.

To generate tones, an interrupt service routine driven by an on-chip timer samples a sign wave table at 12KHz. The index amount into the table determines the frequency. Two indices are run. The retrieved values are then summed and divided by 2. The result is sent to the 8-bit output port, which generates the dual-tone waveform. Tone duration is accurate to a single sampling interval. Frequency acuracy is typically within 1 Hz.

The microcontroller automatically shuts off the amplifier and goes into low-power mode (microamps) after 5 seconds of inactivity.

Three modes of operation are supported.

In MF burst mode (power-up default) the digit buttons each generate an MF pulse of the maximum recommended duration (75 ms.). An additional button can be wired to its own pin on the micro for 2600, or * and # may be depressed together in the MF modes. 2600 plays as long as the button is depressed. The * key alone is KP. The # key alone is ST. The KP burst is timed to 120 ms. The ST burst is 75 ms. Pressing keys 1 and 3 together play the STP tone. 4 and 6 play the ST2P tone. 7 and 9 play the ST3P tone.

Depressing buttons 7 and 8 together toggle in and out of MF continuous mode. A low to high or high to low beep confirms the mode change. In continuous mode, the MF digits play as long as the key is depressed.

KEYPRESS	DIGIT OR CODE	MF FREQ IN Hz	CCITT SYS NO. 5
1	1	700 +900	
2	2	700 +1100	

3	3	900 +1100	
4	4	700 +1300	
5	5	900 +1300	
6	6	1100 +1300	
7	7	700 +1500	
8	8	900 +1500	
9	9	1100 +1500	
0	0	1300 +1500	
*	KP	1100+ 1700	KPl
#	ST	1500+ 1700	
1+3	STP	900+ 1700	Code 12
4+6	ST2P	1300+ 1700	KP2
7+9	ST3P	700+ 1700	Code 11

KP = Preparatory for digits
ST = End of pulsing
STP, ST2P, ST3P = Control codes

Depressing buttons 8 and 0 together toggle in and out of DTMF mode. Beeps confirm the mode change. In DTMF mode, the 2600 button is not active. The digit buttons play their corresponding tones in continuous mode (burst mode is not supported in DTMF mode). Depressing the first and third buttons in each row play the DTMF A, B, C, and D tones.

KEYPRESS	DIGIT OR DTMF CODE	FREQ IN Hz
1	1	697 + 12092
2	2	697 + 1336
3	3	697 + 1477
4	4	770 + 1209
5	5	770 + 1336
6	6	770 + 1477
7	7	852 + 1209
8	8	852 + 1336
9	9	852 + 1477
0	0	941 + 1336
*	*	941 + 1209
#	#	941 + 1477
1+3	A	697 + 1633
4+6	B	770 + 1633
7+9	C	852 + 1633
*+#	D	941 + 1633

Depressing buttons 8 and 9 together toggle in and out of calibration mode. Beeps confirm the mode change. In this mode buttons 1-6 play the MF master tones alone; 700, 900, 1100, 1300, 1500, and 1700. Button 8 plays a 1004 Hz test tone. *, 0, and # play nickel, dime and quarter ACTS red box tone sequences. All other buttons are not active.

A power down resets the box out of calibration mode, but the other mode settings are retained.

In any mode:

Pressing buttons 1 and 2 together generates a standard dial tone.

Pressing buttons 2 and 3 together generates a standard 2-second/4-second ringback tone.

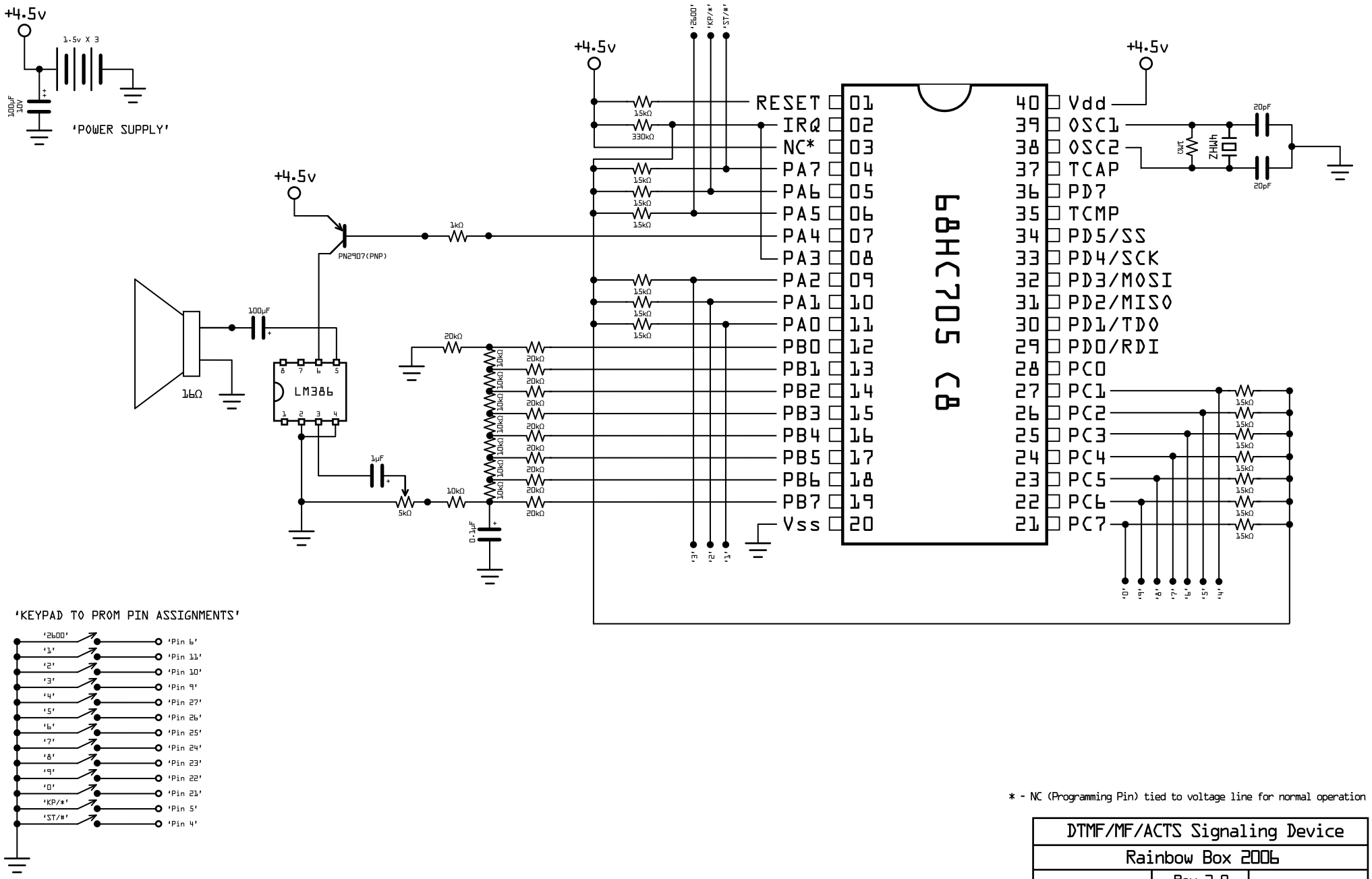
Pressing buttons 4 and 5 together generates a standard busy signal (60 ppm).

Pressing buttons 5 and 6 together generates a standard reorder (120 ppm).

Pressing buttons 4 and 7 together generates an intercept SIT tone sequence (subscriber disconnected).

Pressing buttons 5 and 8 together generates an inter-LATA all circuits busy SIT tone sequence.

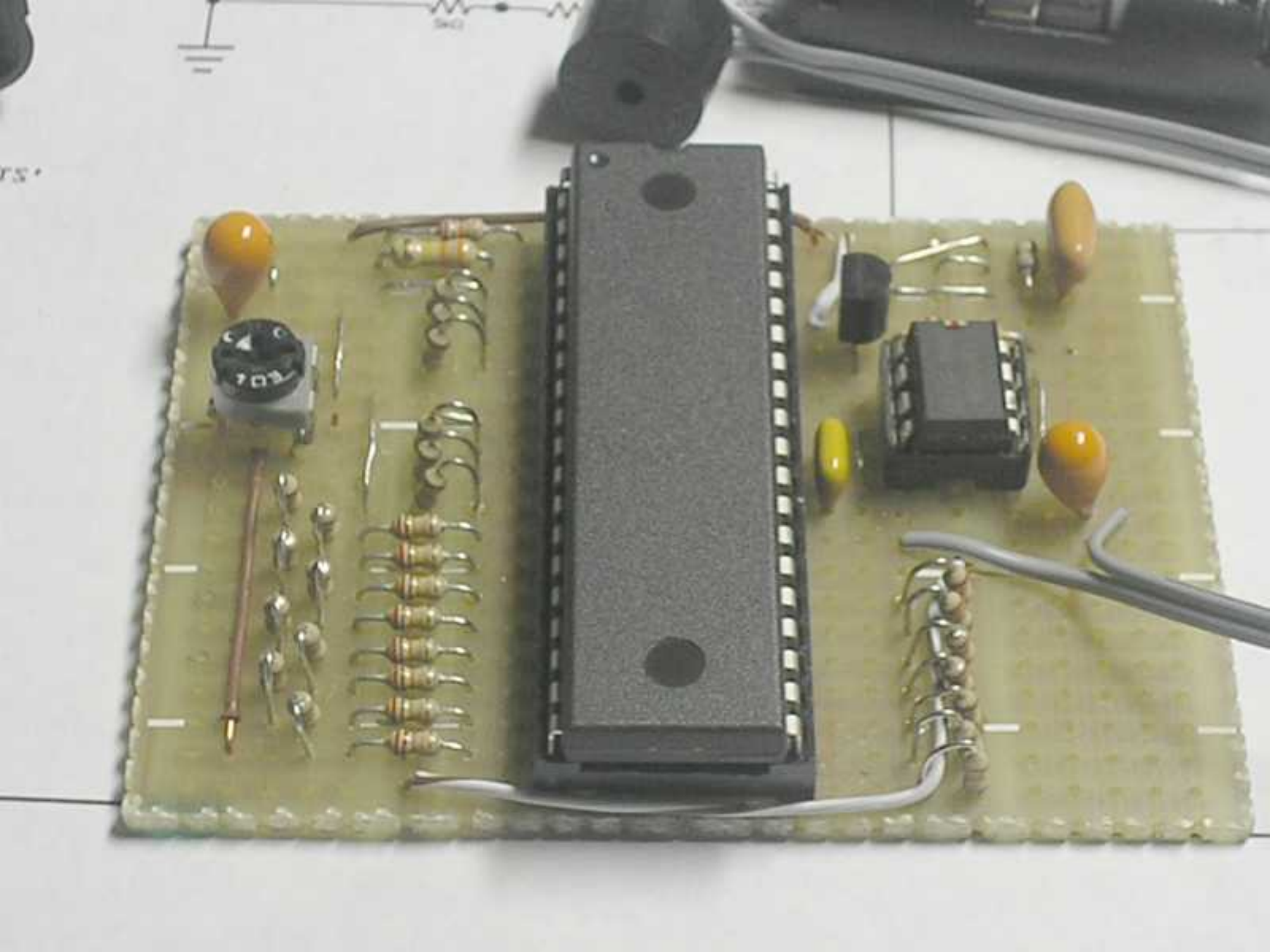
Pressing buttons 6 and 9 together generates an inter-LATA reorder SIT tone sequence (mangled MF addressing indication).



'KEYPAD TO PROM PIN ASSIGNMENTS'

* - NC (Programming Pin) tied to voltage line for normal operation

DTMF/MF/ACTS Signaling Device		
Rainbow Box 2006		
DF99	Rev 2.0 23-10-06	Number Six



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*THESE EQUATES DEFINE VARIOUS CONTROL REGISTERS

*INTERRUPT/RESET VECTORS
RESVEC EQU    $1FFE   HARD RESET VECTOR
SCIVEC EQU    $1FF6   SCI SERIAL PORT INTERRUPT VECTOR
TIMVEC EQU    $1FF8   TIMER INTERRUPT VECTOR

*MEMORY CONFIGURATION
OPTREG EQU    $1FDF   OPTION REGISTER TO SET MEMORY CONFIGURATION

*I/O PORTS
PORTA  EQU    $00     PORT A DATA REGISTER
PORTB  EQU    $01     PORT B DATA REGISTER
PORTC  EQU    $02     PORT C DATA REGISTER
PORTD  EQU    $03     PORT D FIXED INPUT REGISTER
DDRA   EQU    $04     PORT A DATA DIRECTION REGISTER
DDRB   EQU    $05     PORT B DATA DIRECTION REGISTER
DDRC   EQU    $06     PORT C DATA DIRECTION REGISTER

*SCI SERIAL PORT
BAUDRG         EQU    $0D     SCI BAUD RATE REGISTER
SCICT1 EQU    $0E     SCI CONTROL REGISTER 1
SCICT2 EQU    $0F     SCI CONTROL REGISTER 2
SCISTA EQU    $10     SCI COMMUNICATIONS STATUS REGISTER
SCIDAT EQU    $11     SCI COMMUNICATIONS DATA REGISTER

*TIMER
*WITH A 4 MHz CLOCK, EACH FREE RUNNING TIMER COUNTER DECREMENT TAKES
*2 MICROSECONDS (BEST RESOLUTION)
TIMCNT EQU    $19     TIMER COUNTER REGISTER, READ ONLY (LOW BYTE)
ACHR   EQU    $1A     ALTERNATE COUNTER HIGH REGISTER
ACLR   EQU    $1B     ALTERNATE COUNTER LOW REGISTER
OCHR   EQU    $16     OUTPUT COMPARE HIGH REGISTER
OCLR   EQU    $17     OUTPUT COMPARE LOW REGISTER
TSR    EQU    $13     TIMER STATUS REGISTER
TCR    EQU    $12     TIMER CONTROL REGISTER

SAMCNT         EQU    $25     NUMBER OF TIMER COUNTS BETWEEN INTERRUPTS FOR 12 KHZ

SEIZE  EQU    $20     PRESS VALUE FOR BUTTON 2600
KEYP   EQU    $40     PRESS VALUE FOR BUTTON KEY PULSE 1
STRT   EQU    $80     PRESS VALUE FOR BUTTON START
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MF1     EQU     $01     PRESS VALUE FOR BUTTON 1
MF2     EQU     $02     PRESS VALUE FOR BUTTON 2
MF3     EQU     $04     PRESS VALUE FOR BUTTON 3

MF4     EQU     $02     PRESS VALUE FOR BUTTON 4
MF5     EQU     $04     PRESS VALUE FOR BUTTON 5
MF6     EQU     $08     PRESS VALUE FOR BUTTON 6
MF7     EQU     $10     PRESS VALUE FOR BUTTON 7
MF8     EQU     $20     PRESS VALUE FOR BUTTON 8
MF9     EQU     $40     PRESS VALUE FOR BUTTON 9
MF0     EQU     $80     PRESS VALUE FOR BUTTON 0

DIAL    EQU     $03     PRESS VALUE FOR DIAL TONE
RING    EQU     $06     PRESS VALUE FOR RINGBACK
BUSY    EQU     $06     PRESS VALUE FOR BUSY
REORD   EQU     $0C     PRESS VALUE FOR REORDER
DTMF    EQU     $A0     PRESS VALUE TO TOGGLE DTMF MODE
AA      EQU     $05     PRESS VALUE FOR DTMF A
DD      EQU     $C0     PRESS VALUE FOR DTMF D
BB      EQU     $0A     PRESS VALUE FOR DTMF B
CC      EQU     $50     PRESS VALUE FOR DTMF C
BRST    EQU     $30     PRESS VALUE TO TOGGLE MF BURST MODE
CAL     EQU     $60     PRESS VALUE TO TOGGLE CALIBRATION MODE
SITIN   EQU     $12     PRESS VALUE FOR INTERCEPT SIT TONE
SITNC   EQU     $24     PRESS VALUE FOR NO CIRCUIT SIT TONE
SITRO   EQU     $48     PRESS VALUE FOR REORDER SIT TONE

*RAM STORAGE
PTR1LO  EQU     $30     POINTER INTO SINE TABLE FOR TONE 1
PTR1HI  EQU     $31
PTR2LO  EQU     $32     POINTER INTO SINE TABLE FOR TONE 2
PTR2HI  EQU     $33
INC1LO  EQU     $34     INCREMENT INTO SINE TABLE FOR TONE 1
INC1HI  EQU     $35
INC2LO  EQU     $36     INCREMENT INTO SINE TABLE FOR TONE 2
INC2HI  EQU     $37
SAMPLO  EQU     $38     12KHZ SAMPLE CYCLE COUNTER
SAMPHI  EQU     $39
TIMLO   EQU     $40     STORAGE FOR LOW TIMER COUNT
TIMHI   EQU     $41     STORAGE FOR HIGH TIMER COUNT
BURCNT  EQU     $42     BURST COUNTER
CTLO    EQU     $43     HIGH BYTE OF SAMPLE COUNT
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CTHI    EQU     $44     LOW BYTE OF SAMPLE COUNT
TEMP    EQU     $45     TEMPORARY BYTE STORAGE FOR TIMER SERVICING
PRESS   EQU     $46     STORAGE FOR LAST KEY PRESS
MODE    EQU     $47     STORAGE FOR MF/DTMF MODE FLAG
BSTFLG  EQU     $48     STORAGE FOR MF BURST MODE FLAG
TEMP1   EQU     $49     TEMPORARY STORAGE FOR DEBOUNCE DELAY
PWRTIM  EQU     $50     COUNTER FOR POWER OFF TIMER
CALFLG  EQU     $51     STORAGE FOR CALIBRATION MODE FLAG

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* INITIALIZATION

        ORG     $1FF4   BEGINNING OF INTERRUPT VECTORS

        FDB     START   SPI VECTOR POINTS TO INIT
        FDB     START   SCI VECTOR POINTS TO INIT
        FDB     TIMISR  TIMER VECTOR POINTS TO TIMER ISR
        FDB     SWITCH  IRQ LINE VECTOR POINTS TO ISR
        FDB     START   SWI VECTOR POINTS TO INIT
        FDB     START   RESET VECTOR POINTS TO INIT

        ORG     $0160   BEGINNING OF USER EPROM, MEMORY MAP 4

START   EQU     *
        SEI             DISABLE INTERRUPTS
        LDA     #$C0    SET FOR MEMORY MAP 4, EDGE IRQ DETECT
        STA     OPTREG
        LDA     #$10    SET PORTA FOR SWITCHES AND AMPLIFIER SWITCH
        STA     DDRA
        BSET    3,PORTAPRESET LATCH FOR PULL-UP V SOURCE
        LDA     #$FF    INITIALIZE PORT B FOR D/A
        STA     DDRB
        CLR     PORTB   INITIALIZE D/A FOR NO OUTPUT
        LDA     #$01    INITIALIZE SECOND SWITCH PORT FOR 7 INPUTS
        STA     DDRC    SET 2ND SWITCH PORT FOR 7 INPUTS
        CLR     MODE    INITIALIZE TO MF MODE
        CLR     BSTFLG  INITIALIZE TO MF BURST MODE
        CLR     CALFLG  INITIALIZE CALIBRATION MODE OFF
INIT    CLI             ENABLE INTERRUPTS

MAIN    EQU     *
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* WAIT FOR KEY RELEASE
        BSET    3,DDRA  TURN ON PULL-UP VOLTAGE
        BSET    3,PORTA
        LDA     #$FF    WAIT FOR VOLTAGE TO STABILIZE
AGAIN   DECA
        BNE     AGAIN
NONE    LDA     PORTA   GET INPUTS FROM SWITCH PORT
        COMA            TAKE THE COMPLEMENT FOR EASIER PROCESSING
        AND     #$E7    MASK ALL BUT THE SWITCH INPUTS
        BNE     NONE    STILL PRESSED, WAIT
NONE2   LDA     PORTC   GET INPUTS FROM SECOND SWITCH PORT
        COMA            TAKE THE COMPLEMENT FOR EASIER PROCESSING
        AND     #$FE    MASK ALL BUT THE SWITCH INPUTS
        BNE     NONE2   STILL PRESSED, WAIT
        BCLR    3,DDRA  IF RELEASED, SHUT OFF PULL-UP VOLTAGE

* 5 SECOND POWER DOWN TIMER ROUTINE
        LDA     #$25    SET UP OVERFLOW EVENT COUNTER
        STA     PWRTIM  SAVE IT
PWRDWN          LDA     TSR     CLEAR TIMER OVERFLOW FLAG
        LDA     TIMCNT
HOLD    BIL     PWRUP   IF IRQ LOW, CONTINUE
        BRCLR   5,TSR,HOLD      LOOP UNTIL OVERFLOW SET
        DEC     PWRTIM  DECREMENT POWER OFF TIMER
        BNE     PWRDWN          DO AGAIN, IF NOT 5 SECONDS


        CLR     PORTB   SET D/A PORT FOR NO OUTPUT
        BSET    4,PORTA TURN OFF AMPLIFIER
        CLR     CALFLG  TURN CALIBRATION MODE OFF
        STOP            ENTER LOW POWER MODE AND WAIT FOR IRQ

PWRUP   SEI             DISABLE INTERRUPTS
        BCLR    4,PORTA TURN ON AMPLIFIER
        BSET    3,DDRA  TURN ON PULL-UP VOLTAGE
        BSET    3,PORTA
        LDA     #$FF    WAIT FOR VOLTAGE TO STABILIZE
AGAIN1  DECA
        BNE     AGAIN1

* GET AND DEBOUNCE SWITCH INPUTS
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DBNCE   LDA     PORTA   GET INPUTS FROM SWITCH PORT
        COMA            TAKE THE COMPLEMENT FOR EASIER PROCESSING
        AND     #$E7    MASK ALL BUT THE SWITCH INPUTS
        BEQ     DBNCE2  NO PRESS, CHECK NEXT SWITCH PORT
        STA     PRESS   OTHERWISE, STORE VALUE IN REGISTER
        JSR     WAIT    WAIT FOR DEBOUNCE TIME
        LDA     PORTA   GET SWITCH VALUE AGAIN
        COMA            TAKE THE COMPLEMENT FOR EASIER PROCESSING
        AND     #$E7    MASK ALL BUT THE SWITCH INPUTS
        CMP     PRESS   SEE IF VALUE IS THE SAME AFTER DEBOUNCE
        BNE     DBNCE   IF NOT, TRY AGAIN UNTIL NONE PRESSED
        BCLR    3,DDRA  IF GOOD PRESS, SHUT OFF PULL-UP VOLTAGE
        CLI             RE-ENABLE INTERRUPTS
        BRA     DECODE          GO TO KEY DECODE

DBNCE2  LDA     PORTC   GET INPUTS FROM SWITCH PORT
        COMA            TAKE THE COMPLEMENT FOR EASIER PROCESSING
        AND     #$FE    MASK ALL BUT THE SWITCH INPUTS
        BEQ     MAIN    NO PRESS, START OVER
        STA     PRESS   OTHERWISE, STORE VALUE IN REGISTER
        JSR     WAIT    WAIT FOR DEBOUNCE TIME
        LDA     PORTC   GET SWITCH VALUE AGAIN
        COMA            TAKE THE COMPLEMENT FOR EASIER PROCESSING
        AND     #$FE    MASK ALL BUT THE SWITCH INPUTS
        CMP     PRESS   SEE IF VALUE IS THE SAME AFTER DEBOUNCE
        BNE     DBNCE2  IF NOT, TRY AGAIN UNTIL NONE PRESSED
        BCLR    3,DDRA  IF GOOD PRESS, SHUT OFF PULL-UP VOLTAGE
        CLI             RE-ENABLE INTERRUPTS
        JMP     NEXT10  JUMP TO KEY DECODE FOR PORTC

* DECODE BUTTON 2600
DECODE          CMP     #SEIZE  SEE IF THE 2600 BUTTON IS PRESSED
        BNE     NEXT01  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL08  CONTINUE IF NOT CAL MODE
        JSR     BEEP    PLAY 2600
        BRA     SKIP01
NCAL08  LDA     MODE    GET MF/DTMF MODE
        BNE     SKIP01  DO NOTHING IF IN DTMF MODE
        JSR     BEEP    PLAY 2600
SKIP01  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT
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* DECODE BUTTON KEY PULSE 1
NEXT01  CMP     #KEYP   SEE IF THE TWO BUTTON IS PRESSED
        BNE     NEXT02  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL09  CONTINUE IF NOT CAL MODE
        JSR     NICK    PLAY NICKEL TONE
        BRA     SKIP03
NCAL09  LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP02
        JSR     STAR    PLAY DTMF * IF DTMF MODE
        BRA     SKIP03  BRANCH AROUND MF IF DTMF MODE
SKIP02  JSR     KP1     PLAY MF KP1
SKIP03  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON START
NEXT02  CMP     #STRT   SEE IF THE START BUTTON IS PRESSED
        BNE     NEXT03  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL10  CONTINUE IF NOT CAL MODE
        JSR     QUART   PLAY QUARTER TONE
        BRA     SKIP05
NCAL10  LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP04
        JSR     POUND   PLAY DTMF # if DTMF MODE
        BRA     SKIP05  BRANCH AROUND MF IF DTMF MODE
SKIP04  JSR     ST      PLAY MF ST
SKIP05  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON MF1
NEXT03  CMP     #MF1    SEE IF THE PORTA 0 BUTTON IS PRESSED
        BNE     NEXT04  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL01  CONTINUE IF NOT CAL MODE
        JSR     T0700   PLAY 700 CAL TONE
        BRA     SKIP07
NCAL01  LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP06
        JSR     DIONE   PLAY DTMF 1 if DTMF MODE
        BRA     SKIP07  BRANCH AROUND MF IF DTMF MODE
SKIP06  JSR     MFONE   PLAY MF ONE
SKIP07  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT
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* DECODE BUTTON MF2
NEXT04  CMP     #MF2    SEE IF THE PORT A 1 BUTTON IS PRESSED
        BNE     NEXT05  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL02  CONTINUE IF NOT CAL MODE
        JSR     T0900   PLAY 900 CAL TONE
        BRA     SKIP09
NCAL02  LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP08
        JSR     DITWO   PLAY DTMF 2 if DTMF MODE
        BRA     SKIP09  BRANCH AROUND MF IF DTMF MODE
SKIP08  JSR     MFTWO   PLAY MF TWO
SKIP09  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON MF3
NEXT05  CMP     #MF3    SEE IF THE PORT A 2 BUTTON IS PRESSED
        BNE     NEXT06  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL03  CONTINUE IF NOT CAL MODE
        JSR     T1100   PLAY 1100 CAL TONE
        BRA     SKIP11
NCAL03  LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP10
        JSR     DITHREE         PLAY DTMF 3 if DTMF MODE
        BRA     SKIP11  BRANCH AROUND MF IF DTMF MODE
SKIP10  JSR     MFTHREE         PLAY MF THREE
SKIP11  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON DTMF A
NEXT06  CMP     #AA     SEE IF THE PORT A 1 AND 3 BUTTON IS PRESSED
        BNE     NEXT07  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION MODE FLAG
        BNE     SKIP12  DO NOTHING IF IN CALIBRATION MODE
        LDA     MODE    CHECK MF/DTMF MODE
        BEQ     HOP01
        JSR     AAA     PLAY DTMF A IF DTMF MODE
        BRA     SKIP12  BRANCH AROUND DTMF IF MF MODE
HOP01   JSR     STP     PLAY MF STP
SKIP12  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON DTMF D
NEXT07  CMP     #DD     SEE IF THE PORT A KP AND ST BUTTON IS PRESSED
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        BNE     NEXT08  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION MODE FLAG
        BNE     SKIP99  DO NOTHING IF IN CALIBRATION MODE
        LDA     MODE    CHECK MF/DTMF MODE
        BEQ     HOP02
        JSR     DDD     PLAY DTMF D if DTMF MODE
        BRA     SKIP99  BRANCH AROUND DTMF IF MF MODE
HOP02   JSR     BEEP    PLAY 2600
SKIP99  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

*DECODE BUTTON FOR DIALTONE
NEXT08  CMP     #DIAL   SEE IF THE PORT A 1 AND 2 BUTTON IS PRESSED
        BNE     NEXT09  IF NOT, TRY THE NEXT
        JSR     DIALTN  PLAY DIAL TONE
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

*DECODE BUTTON FOR RINGBACK
NEXT09  CMP     #RING   SEE IF THE PORT A 2 BUTTON IS PRESSED
        BNE     NEXT99  IF NOT, TRY THE NEXT
        JSR     RINGBK  PLAY RINGBACK
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

NEXT99  JMP     MAIN    INVALID KEY PRESS, POWER DOWN AND WAIT FOR NEXT

*END OF DECODE SCAN FOR PORTA

* DECODE BUTTON MF4
NEXT10  CMP     #MF4    SEE IF THE PORTC BIT1 BUTTON IS PRESSED
        BNE     NEXT11  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL04  CONTINUE IF NOT CAL MODE
        JSR     T1300   PLAY 1300 CAL TONE
        BRA     SKIP14
NCAL04  LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP13
        JSR     DIFOUR  PLAY DTMF 4 if DTMF MODE
        BRA     SKIP14  BRANCH AROUND MF IF DTMF MODE
SKIP13  JSR     MFFOUR          PLAY MF FOUR
SKIP14  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON MF5
NEXT11  CMP     #MF5    SEE IF THE PORTC BIT2 BUTTON IS PRESSED
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        BNE     NEXT12  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL05  CONTINUE IF NOT CAL MODE
        JSR     T1500   PLAY 1500 CAL TONE
        BRA     SKIP16
NCAL05  LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP15
        JSR     DIFIVE  PLAY DTMF 5 if DTMF MODE
        BRA     SKIP16  BRANCH AROUND MF IF DTMF MODE
SKIP15  JSR     MFFIVE  PLAY MF FIVE
SKIP16  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON MF6
NEXT12  CMP     #MF6    SEE IF THE PORTC BIT3 BUTTON IS PRESSED
        BNE     NEXT13  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL06  CONTINUE IF NOT CAL MODE
        JSR     T1700   PLAY 1700 CAL TONE
        BRA     SKIP18
NCAL06  LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP17
        JSR     DISIX   PLAY DTMF 6 if DTMF MODE
        BRA     SKIP18  BRANCH AROUND MF IF DTMF MODE
SKIP17  JSR     MFSIX   PLAY MF SIX
SKIP18  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON MF7
NEXT13  CMP     #MF7    SEE IF THE PORTC BIT4 BUTTON IS PRESSED
        BNE     NEXT14  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION MODE FLAG
        BNE     SKIP20  DO NOTHING IF IN CALIBRATION MODE
        LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP19
        JSR     DISEVEN         PLAY DTMF 7 if DTMF MODE
        BRA     SKIP20  BRANCH AROUND MF IF DTMF MODE
SKIP19  JSR     MFSEVEN         PLAY MF SEVEN
SKIP20  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON MF8
NEXT14  CMP     #MF8    SEE IF THE PORTC BIT5 BUTTON IS PRESSED
        BNE     NEXT15  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION MODE FLAG
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        BEQ     HOP05
        JSR     T1004   PLAY 1004 HZ CAL TONE
        BRA     SKIP22
HOP05   LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP21
        JSR     DIEIGHT PLAY DTMF 8 if DTMF MODE
        BRA     SKIP22  BRANCH AROUND MF IF DTMF MODE
SKIP21  JSR     MFEIGHT         PLAY MF EIGHT
SKIP22  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON MF9
NEXT15  CMP     #MF9    SEE IF THE PORTC BIT6 BUTTON IS PRESSED
        BNE     NEXT16  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION MODE FLAG
        BNE     SKIP24  DO NOTHING IF IN CALIBRATION MODE
        LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP23
        JSR     DININE  PLAY DTMF 9 if DTMF MODE
        BRA     SKIP24  BRANCH AROUND MF IF DTMF MODE
SKIP23  JSR     MFNINE  PLAY MF NINE
SKIP24  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON MF0
NEXT16  CMP     #MF0    SEE IF THE PORTC BIT7 BUTTON IS PRESSED
        BNE     NEXT17  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION FLAG
        BEQ     NCAL07  CONTINUE IF NOT CAL MODE
        JSR     DIME    PLAY DIME TONE IN CAL MODE
        BRA     SKIP26
NCAL07  LDA     MODE    CHECK MF/DTMF MODE
        BEQ     SKIP25
        JSR     DIZERO  PLAY DTMF 0 if DTMF MODE
        BRA     SKIP26  BRANCH AROUND MF IF DTMF MODE
SKIP25  JSR     MFZEROPLAY MF ZERO
SKIP26  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON BUSY
NEXT17  CMP     #BUSY   SEE IF THE BUTTONS 4 AND 5 ARE PRESSED
        BNE     NEXT18  IF NOT, TRY THE NEXT
        JSR     BUSYTN PLAY BUSY SIGNAL
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT
```

```
* DECODE BUTTON REORDER
NEXT18  CMP     #REORD  SEE IF THE BUTTONS 5 AND 6 ARE PRESSED
        BNE     NEXT19  IF NOT, TRY THE NEXT
        JSR     REORDTN         PLAY REORDER
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON DTMF B
NEXT19  CMP     #BB     SEE IF THE PORT A KP AND ST BUTTON IS PRESSED
        BNE     NEXT20  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION MODE FLAG
        BNE     SKIP27  DO NOTHING IF IN CALIBRATION MODE
        LDA     MODE    CHECK MF/DTMF MODE
        BEQ     HOP03   BRANCH AROUND DTMF IF MF MODE
        JSR     BBB     PLAY DTMF B if DTMF MODE
        BRA     SKIP27
HOP03   JSR     ST2P    PLAY MF ST2P
SKIP27  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON DTMF C
NEXT20  CMP     #CC     SEE IF THE PORT A KP AND ST BUTTON IS PRESSED
        BNE     NEXT21  IF NOT, TRY THE NEXT
        LDA     CALFLG  GET CALIBRATION MODE FLAG
        BNE     SKIP28  DO NOTHING IF IN CALIBRATION MODE
        LDA     MODE    CHECK MF/DTMF MODE
        BEQ     HOP04   BRANCH AROUND DTMF IF MF MODE
        JSR     CCC     PLAY DTMF C if DTMF MODE
        BRA     SKIP28
HOP04   JSR     ST3P    PLAY MF ST3P
SKIP28  JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON FOR MF/DTMF TOGGLE
NEXT21  CMP     #DTMF   SEE IF THE BUTTONS 5 AND 6 ARE PRESSED
        BNE     NEXT22  IF NOT, TRY THE NEXT
        JSR     TOGGLE TOGGLE MF/DTMF MODE
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON FOR MF BURST MODE
NEXT22  CMP     #BRST   SEE IF THE BUTTONS 7 AND 8 ARE PRESSED
        BNE     NEXT23  IF NOT, TRY THE NEXT
        JSR     BURST   TOGGLE MF BURST MODE
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT
```

```
* DECODE BUTTON FOR CALIBRATION MODE
NEXT23  CMP     #CAL    SEE IF THE BUTTONS 8 AND 9 ARE PRESSED
        BNE     NEXT24  IF NOT, TRY THE NEXT
        JSR     CALIB   TOGGLE CALIBRATION MODE
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON SIT1
NEXT24  CMP     #SITIN  SEE IF THE BUTTONS 4 AND 7 ARE PRESSED
        BNE     NEXT25  IF NOT, TRY THE NEXT
        JSR     SIT1    PLAY SIT1
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON SIT2
NEXT25  CMP     #SITNC  SEE IF THE BUTTONS 5 AND 8 ARE PRESSED
        BNE     NEXT26  IF NOT, TRY THE NEXT
        JSR     SIT2    PLAY SIT2
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

* DECODE BUTTON SIT3
NEXT26  CMP     #SITRO  SEE IF THE BUTTONS 6 AND 9 ARE PRESSED
        BNE     NEXT27  IF NOT, TRY THE NEXT
        JSR     SIT3    PLAY SIT3
        JMP     MAIN    POWER DOWN AND WAIT FOR NEXT

NEXT27  JMP     MAIN    INVALID KEY PRESS, POWER DOWN AND WAIT FOR NEXT

* SUBROUTINE TO PLAY A TONE OF SPECIFIED FREQUENCIES AND DURATION
PLAY    EQU     *
        JSR     CLRTON CLEAR TONE COUNTERS
        JSR     SETTIM  SET UP TIMER FOR SAMPLING AT 12 KHZ
        BSET    6,TCR   ENABLE TIMER INTERRUPTS
        JSR     CHKCNTSEE IF CORRECT NUMBER OF SAMPLES TIMED
        BCLR    6,TCR   DISABLE INTERRUPTS WHEN COUNT COMPLETE
        RTS

* SUBROUTINE TO PLAY A TONE OF SPECIFIED FREQUENCIES AND DURATION + SILENCE
PLAY2   EQU     *
        JSR     CLRTON CLEAR TONE COUNTERS
        JSR     SETTIM  SET UP TIMER FOR SAMPLING AT 12 KHZ
        BSET    6,TCR   ENABLE TIMER INTERRUPTS
        JSR     CHKCNTSEE IF CORRECT NUMBER OF SAMPLES TIMED
        BCLR    6,TCR   DISABLE INTERRUPTS WHEN COUNT COMPLETE
```

```
        JSR     CLRTON CLEAR TONE COUNTERS
        JSR     NOTONESET FOR SILENCE
        JSR     SETTIM  SET UP TIMER FOR SAMPLING AT 12 KHZ
        BSET    6,TCR   ENABLE TIMER INTERRUPTS
        JSR     CHKCNTSEE IF CORRECT NUMBER OF SAMPLES TIMED
        BCLR    6,TCR   DISABLE INTERRUPTS WHEN COUNT COMPLETE
        RTS

* SUBROUTINE TO PLAY A TONE OF SPECIFIED FREQUENCIES WHILE BUTTON DOWN
PLAY3   EQU     *
        JSR     CLRTON CLEAR TONE COUNTERS
        JSR     SETTIM  SET UP TIMER FOR SAMPLING AT 12 KHZ
        BSET    6,TCR   ENABLE TIMER INTERRUPTS
HOLD2   BIL     HOLD2   PLAY WHILE BUTTON IS DOWN
        BCLR    6,TCR   DISABLE INTERRUPTS WHEN COUNT COMPLETE
        RTS

*TIMER INTERRUPT SERVICE ROUIINE

*SET UP TIMER FOR NEXT SAMPLING PERIOD
TIMISR  EQU     *
        LDA     TSR     CLEAR OUTPUT COMPARE FLAG
        LDA     ACHR    GET HIGH BYTE OF CURRENT TIMER COUNT
        STA     TIMHI   SAVE IT
        LDA     ACLR    GET LOW BYTE OF CURRENT TIMER COUNT
        ADD     #SAMCNT ADD OFFSET FOR 12KHZ SAMPLING RATE
        STA     TIMLO   SAVE IT
        CLRA
        ADC     TIMHI   ADD CARRY BIT TO HIGH COUNT
        STA     OCHR    STORE HIGH BYTE OF COMPARE REG
        LDA     TIMLO   GET LOW TIMER VALUE
        STA     OCLR    FINISH OUTPUT COMPARE WRITE

*DON'T MESS WITH ANYTHING IN THE ISR ABOVE THIS LINE!

        LDA     INC1LO  GET LO INCREMENT FOR TONE 1
        ADD     PTR1LO  ADD IT TO THE LO TONE 1 COUNTER
        STA     PTR1LO  SAVE IT BACK
        LDA     INC1HI  GET HI INCREMENT FOR TONE 1
        ADC     PTR1HI  ADD IT TO THE HI TONE 1 COUNTER
        STA     PTR1HI  SAVE IT BACK
```

```
        LDA     INC2LO  GET LO INCREMENT FOR TONE 2
        ADD     PTR2LO  ADD IT TO THE LO TONE 2 COUNTER
        STA     PTR2LO  SAVE IT BACK
        LDA     INC2HI  GET HI INCREMENT FOR TONE 2
        ADC     PTR2HI  ADD IT TO THE HI TONE 2 COUNTER
        STA     PTR2HI  SAVE IT BACK

        LDX     PTR1HI          GET THE TONE 1 TABLE INDEX
        LDA     SINTBL,X        GET TONE 1 TABLE VALUE
        STA     TEMP            SAVE IT
        LDX     PTR2HI          GET THE TONE 2 TABLE INDEX
        LDA     SINTBL,X        GET TONE 2 TABLE VALUE
        ADD     TEMP            SUM THE VALUES
        RORA                    DIVIDE BY TWO FOR THE MEAN VALUE
        STA     PORTB           SEND IT TO THE D/A PORT

        INC     SAMPLO INCREMENT THE SAMPLE COUNTER
        BNE     NEXT    RETURN, IF NOT GREATER THAN FF
        INC     SAMPHI  IF ROLLED OVER, INC HI BYTE
NEXT    RTI

*SEE IF CORRECT NUMBER OF SAMPLES COUNTED FOR TONE BURST
CHKCNTEQU       *
        LDA     SAMPHI  GET HI BYTE OF SAMPLING COUNT
        CMP     CTHI    CHECK WITH HI BYTE OF LIMIT
        BLO     CHKCNT  DO AGAIN IF NO MATCH
CHKLO   LDA     SAMPLO  GET LO BYTE OF SAMPLING COUNT
        CMP     CTLO    CHECK WITH LO BYTE OF LIMIT
        BLO     CHKLO   DO AGAIN IF NO MATCH
        RTS             RETURN WHEN CYCLE COUNTS MATCH

*SET UP TIMER FOR NEXT SAMPLING PERIOD
SETTIM  EQU     *
        LDA     TSR     CLEAR OUTPUT COMPARE FLAG
        LDA     ACHR    GET HIGH BYTE OF CURRENT TIMER COUNT
        STA     TIMHI   SAVE IT
        LDA     ACLR    GET LOW BYTE OF CURRENT TIMER COUNT
        ADD     #SAMCNT ADD OFFSET FOR 12KHZ SAMPLING RATE
        STA     TIMLO   SAVE IT
        CLRA
        ADC     TIMHI   ADD CARRY BIT TO HIGH COUNT
```

```
        STA     OCHR    STORE HIGH BYTE OF COMPARE REG
        LDA     TIMLO   GET LOW TIMER VALUE
        STA     OCLR    FINISH OUTPUT COMPARE WRITE
        RTS

* CLEAR TONE GENERATION REGISTERS
CLRTON  EQU     *
        CLR     PTR1LO  CLEAR TONE 1 POINTER
        CLR     PTR1HI
        CLR     PTR2LO  CLEAR TONE 2 POINTER
        CLR     PTR2HI
        CLR     SAMPLO  CLEAR SAMPLING COUNTER
        CLR     SAMPHI
        RTS

NOTONE  EQU     *
        CLR     INC1LO
        CLR     INC1HI
        CLR     INC2LO
        CLR     INC2HI
        RTS

SWITCH  EQU     *       IRQ ISR FOR SWITCH PRESS DETECT
        RTI             JUST RESTORE THE STACK AND CONTINUE

WAIT    EQU     *       37 MS DELAY FOR SWITCH DEBOUNCE
        LDA     #$63    SET OUTER LOOP VALUE
        STA     TEMP1
LOOP1   LDA     #$FF    SET INNER LOOP VALUE
LOOP    DECA            DECREMENT
        BNE     LOOP    LOOP TO ZERO
        DEC     TEMP1   DECREMENT OUTER LOOP
        BNE     LOOP1   LOOP TO ZERO
        RTS

TOGGLE  EQU     *       SUBROUTINE TO TOGGLE BETWEEN MF and DTMF MODES
        LDA     MODE    GET CURRENT MODE
        BEQ     TODTMF  SET TO DTMF IF MF MODE
        CLR     MODE    SET TO MF IF DTMF MODE
        JSR     HILO    BEEP TO INDICATE MODE CHANGE
        RTS
TODTMF  LDA     #$01    SET TO DTMF MODE
```

```
        STA     MODE
        JSR     LOHI    BEEP TO INDICATE MODE CHANGE
        RTS

BURST   EQU     *       ROUTINE TO TOGGLE MF BURST MODE
        LDA     BSTFLG  GET CURRENT MODE
        BEQ     TOCONT  SET TO CONTINUOUS IF BURST MODE
        CLR     BSTFLG  SET TO BURST IF CONTINUOUS MODE
        JSR     HILO    BEEP TO INDICATE MODE CHANGE
        RTS
TOCONT  LDA     #$01    SET TO CONTINUOUS MODE
        STA     BSTFLG
        JSR     LOHI    BEEP TO INDICATE MODE CHANGE
        RTS

CALIB   EQU     *       ROUTINE TO TOGGLE CALIBRATION MODE
        LDA     CALFLG  GET CURRENT MODE
        BEQ     TOCAL   SET TO CALIBRATE MODE IF NOT
        CLR     CALFLG  SET TO MF IF DTMF MODE
        JSR     HILO    BEEP TO INDICATE MODE CHANGE
        RTS
TOCAL   LDA     #$01    SET TO CALIBRATE MODE
        STA     CALFLG
        JSR     LOHI    BEEP TO INDICATE MODE CHANGE
        RTS

MF      EQU     *       ROUTINE TO PLAY MF DIGIT AT 75 MS DURATION
        LDA     #$7E
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$03    OF 75 MS (VALID RANGE IS 58 TO 75 MS):
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        LDA     BSTFLG  GET MF BURST MODE FLAG
        BEQ     PLAYBST         PLAY BURST IF IN BURST MODE
        JSR     PLAY3   IF IN CONTINUOUS MODE, PLAY WHILE KEY DOWN
        RTS
PLAYBST         JSR     PLAY    PLAY IT
        RTS

BLEEP   EQU     *       ROUTINE TO PLAY TONE AT 75 MS DURATION
        LDA     #$7E
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$03    OF 75 MS (VALID RANGE IS 58 TO 75 MS):
```

```
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        RTS

MFONE   LDA     #$0A    LOW BYTE FOR TONE 1, 700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0F    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$57    LOW BYTE FOR TONE 2, 900 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$13    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

MFTWO   LDA     #$0A    LOW BYTE FOR TONE 1, 700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0F    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$A3    LOW BYTE FOR TONE 2, 1100 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$17    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

MFTHREE         LDA     #$57    LOW BYTE FOR TONE 1, 900 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$13    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$A3    LOW BYTE FOR TONE 2, 1100 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$17    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

MFFOUR          LDA     #$0A    LOW BYTE FOR TONE 1, 700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0F    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$EF    LOW BYTE FOR TONE 2, 1300 HZ (5.5006 x f)
```

```
        STA     INC2LO
        LDA     #$1B    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

MFFIVE  LDA     #$57    LOW BYTE FOR TONE 1, 900 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$13    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$EF    LOW BYTE FOR TONE 2, 1300 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1B    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

MFSIX   LDA     #$A3    LOW BYTE FOR TONE 1, 1100 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$17    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$EF    LOW BYTE FOR TONE 2, 1300 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1B    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

MFSEVEN         LDA     #$0A    LOW BYTE FOR TONE 1, 700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0F    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$3B    LOW BYTE FOR TONE 2, 1500 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$20    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

MFEIGHT         LDA     #$57    LOW BYTE FOR TONE 1, 900 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$13    HI BYTE FOR TONE 1
```

```
        STA     INC1HI
        LDA     #$3B    LOW BYTE FOR TONE 2, 1500 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$20    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

MFNINE  LDA     #$A3    LOW BYTE FOR TONE 1, 1100 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$17    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$3B    LOW BYTE FOR TONE 2, 1500 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$20    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

KP1     LDA     #$A3    LOW BYTE FOR TONE 1, 1100 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$17    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$87    LOW BYTE FOR TONE 2, 1700 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$24    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$96
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$05    OF 120 MS (VALID KP RANGE IS 90 TO 120 MS)
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        LDA     BSTFLG  GET MF BURST MODE FLAG
        BEQ     BST     PLAY BURST IF IN BURST MODE
        JSR     PLAY3   IF IN CONTINUOUS MODE, PLAY WHILE KEY DOWN
        RTS
BST     JSR     PLAY    PLAY IT
        RTS

MFZEROLDA       #$EF    LOW BYTE FOR TONE 1, 1300 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$1B    HI BYTE FOR TONE 1
        STA     INC1HI
```

```
        LDA     #$3B    LOW BYTE FOR TONE 2, 1500 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$20    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

ST      LDA     #$3B    LOW BYTE FOR TONE 1, 1500 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$20    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$87    LOW BYTE FOR TONE 2, 1700 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$24    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

STP     LDA     #$57    LOW BYTE FOR TONE 1, 900 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$13    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$87    LOW BYTE FOR TONE 2, 1700 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$24    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

ST2P    LDA     #$EF    LOW BYTE FOR TONE 1, 1300 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$1B    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$87    LOW BYTE FOR TONE 2, 1700 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$24    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

ST3P    LDA     #$0A    LOW BYTE FOR TONE 1, 700 HZ (5.5006 x f)
        STA     INC1LO
```

```
        LDA     #$0F    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$87    LOW BYTE FOR TONE 2, 1700 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$24    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     MF
        RTS

* 2600 BEEP ROUTINE
BEEP    EQU     *       BEEP ROUTINE, 2600 HZ
        LDA     #$DE    LOW BYTE FOR TONE 1, 2600 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$37    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$DE    LOW BYTE FOR TONE 2, 2600 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$37    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$8A
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION (NOT USED)
        LDA     #$2E    OF 1000 MS:
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY3   PLAY IT WHILE BUTTON DOWN
        RTS

* DIALTONE ROUTINE
DIALTN  LDA     #$85    LOW BYTE FOR TONE 1, 350 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$07    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$74    LOW BYTE FOR TONE 2, 440 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$09    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

* RING TONE ROUTINE
RINGBK  LDA     #$74    LOW BYTE FOR TONE 1, 440 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$09    HI BYTE FOR TONE 1
```

```
        STA     INC1HI
        LDA     #$50    LOW BYTE FOR TONE 2, 480 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$0A    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$15
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$5D    OF 2000 MS:
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        JSR     NOTONE  SET FOR SILENCE
        LDA     #$29
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$BA    OF 4000 MS:
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        BIL     RINGBK  REPEAT UNTIL KEY RELEASED
        RTS

* BUSY TONE ROUTINE
BUSYTN  LDA     #$50    LOW BYTE FOR TONE 1, 480 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0A    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$52    LOW BYTE FOR TONE 2, 620 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$0D    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$45
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$17    OF 500 MS:
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY2
        BIL     BUSYTN  REPEAT UNTIL KEY RELEASED
        RTS

* REORDER TONE ROUTINE
REORDTN         LDA     #$50    LOW BYTE FOR TONE 1, 480 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0A    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$52    LOW BYTE FOR TONE 2, 620 HZ (5.5006 x f)
```

```
        STA     INC2LO
        LDA     #$0D    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$A3
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$0B    OF 250 MS:
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY2
        BIL     REORDTN         REPEAT UNTIL KEY RELEASED
        RTS

DIONE   LDA     #$FA    LOW BYTE FOR TONE 1, 697 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0E    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$FA    LOW BYTE FOR TONE 2, 1209 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$19    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DITWO   LDA     #$FA    LOW BYTE FOR TONE 1, 697 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0E    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$B5    LOW BYTE FOR TONE 2, 1336 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1C    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DITHREE         LDA     #$FA    LOW BYTE FOR TONE 1, 697 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0E    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$BC    LOW BYTE FOR TONE 2, 1477 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1F    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
```

```
        RTS

AAA     LDA     #$FA    LOW BYTE FOR TONE 1, 697 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0E    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$16    LOW BYTE FOR TONE 2, 1633 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$23    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DIFOUR  LDA     #$8B    LOW BYTE FOR TONE 1, 770 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$10    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$FA    LOW BYTE FOR TONE 2, 1209 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$19    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DIFIVE  LDA     #$8B    LOW BYTE FOR TONE 1, 770 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$10    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$B5    LOW BYTE FOR TONE 2, 1336 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1C    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DISIX   LDA     #$8B    LOW BYTE FOR TONE 1, 770 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$10    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$BC    LOW BYTE FOR TONE 2, 1477 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1F    HI BYTE FOR TONE 2
```

```
        STA     INC2HI
        JSR     PLAY3
        RTS

BBB     LDA     #$8B    LOW BYTE FOR TONE 1, 770 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$10    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$16    LOW BYTE FOR TONE 2, 1633 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$23    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DISEVEN         LDA     #$4F    LOW BYTE FOR TONE 1, 852 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$12    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$FA    LOW BYTE FOR TONE 2, 1209 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$19    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DIEIGHT LDA     #$4F    LOW BYTE FOR TONE 1, 852 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$12    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$B5    LOW BYTE FOR TONE 2, 1336 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1C    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DININE  LDA     #$4F    LOW BYTE FOR TONE 1, 852 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$12    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$BC    LOW BYTE FOR TONE 2, 1477 HZ (5.5006 x f)
```

```
        STA     INC2LO
        LDA     #$1F    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

CCC     LDA     #$4F    LOW BYTE FOR TONE 1, 852 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$12    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$16    LOW BYTE FOR TONE 2, 1633 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$23    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

STAR    LDA     #$38    LOW BYTE FOR TONE 1, 941 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$14    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$FA    LOW BYTE FOR TONE 2, 1209 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$19    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DIZERO  LDA     #$38    LOW BYTE FOR TONE 1, 941 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$14    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$B5    LOW BYTE FOR TONE 2, 1336 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1C    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

POUND   LDA     #$38    LOW BYTE FOR TONE 1, 941 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$14    HI BYTE FOR TONE 1
```

```
        STA     INC1HI
        LDA     #$BC    LOW BYTE FOR TONE 2, 1477 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1F    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

DDD     LDA     #$38    LOW BYTE FOR TONE 1, 941 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$14    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$16    LOW BYTE FOR TONE 2, 1633 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$23    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

LOHI    LDA     #$EF    LOW BYTE FOR TONE 1, 1300 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$1B    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$EF    LOW BYTE FOR TONE 2, 1300 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1B    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     BLEEP
        LDA     #$87    LOW BYTE FOR TONE 1, 1700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$24    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$87    LOW BYTE FOR TONE 2, 1700 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$24    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     BLEEP
        RTS

HILO    LDA     #$87    LOW BYTE FOR TONE 1, 1700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$24    HI BYTE FOR TONE 1
```

```
        STA     INC1HI
        LDA     #$87    LOW BYTE FOR TONE 2, 1700 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$24    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     BLEEP
        LDA     #$EF    LOW BYTE FOR TONE 1, 1300 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$1B    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$EF    LOW BYTE FOR TONE 2, 1300 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1B    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     BLEEP
        RTS

T0700   LDA     #$0A    LOW BYTE FOR TONE 1, 700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$0F    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$0A    LOW BYTE FOR TONE 2, 700 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$0F    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

T0900   LDA     #$57    LOW BYTE FOR TONE 1, 900 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$13    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$57    LOW BYTE FOR TONE 2, 900 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$13    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

T1100   LDA     #$A3    LOW BYTE FOR TONE 1, 1100 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$17    HI BYTE FOR TONE 1
```

```
        STA     INC1HI
        LDA     #$A3    LOW BYTE FOR TONE 2, 1100 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$17    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

T1300   LDA     #$EF    LOW BYTE FOR TONE 1, 1300 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$1B    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$EF    LOW BYTE FOR TONE 2, 1300 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1B    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

T1500   LDA     #$3B    LOW BYTE FOR TONE 1, 1500 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$20    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$3B    LOW BYTE FOR TONE 2, 1500 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$20    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

T1700   LDA     #$87    LOW BYTE FOR TONE 1, 1700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$24    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$87    LOW BYTE FOR TONE 2, 1700 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$24    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

T1004   LDA     #$93    LOW BYTE FOR TONE 1, 1004 HZ (5.5006 x f)
```

```
        STA     INC1LO
        LDA     #$15    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$93    LOW BYTE FOR TONE 2, 1004 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$15    HI BYTE FOR TONE 2
        STA     INC2HI
        JSR     PLAY3
        RTS

NICK    EQU     *
        LDA     #$87    LOW BYTE FOR TONE 1, 1700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$24    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$45    LOW BYTE FOR TONE 2, 2200 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$2F    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$06
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$03    OF 65 MS :
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY2   PLAY IT
        RTS

DIME    EQU     *
        LDA     #$02    SET UP BURST COUNTER
        STA     BURCNT
MORE1   LDA     #$87    LOW BYTE FOR TONE 1, 1700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$24    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$45    LOW BYTE FOR TONE 2, 2200 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$2F    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$06
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$03    OF 65 MS :
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY2   PLAY IT
```

```
        DEC     BURCNT  PLAY AGAIN, IF NEEDED
        BNE     MORE1
        RTS

QUART   EQU     *
        LDA     #$05    SET UP BURST COUNTER
        STA     BURCNT
MORE2   LDA     #$87    LOW BYTE FOR TONE 1, 1700 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$24    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$45    LOW BYTE FOR TONE 2, 2200 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$2F    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$DD
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$01    OF 40 MS :
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY2   PLAY IT
        DEC     BURCNT  PLAY AGAIN, IF NEEDED
        BNE     MORE2
        RTS

*ROUTINE TO PLAY INTERCEPT SIT TONES
SIT1    LDA     #$A2    LOW BYTE FOR TONE 1, 913.8 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$13    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$A2    LOW BYTE FOR TONE 2, 913.8 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$13    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$C1
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$0C    OF 274 MS
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        LDA     #$73    LOW BYTE FOR TONE 1, 1370.6 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$1D    HI BYTE FOR TONE 1
        STA     INC1HI
```

```
        LDA     #$73    LOW BYTE FOR TONE 2, 1370.6 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1D    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$C1
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$0C    OF 274 MS
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        LDA     #$2D    LOW BYTE FOR TONE 1, 1776.7 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$26    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$2D    LOW BYTE FOR TONE 2, 1776.7 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$26    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$AF
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$11    OF 380 MS (VALID KP RANGE IS 90 TO 120 MS)
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        RTS

*ROUTINE TO PLAY INTER-LATA NO CIRCUIT SIT TONES
SIT2    LDA     #$A2    LOW BYTE FOR TONE 1, 913.8 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$13    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$A2    LOW BYTE FOR TONE 2, 913.8 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$13    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$AF
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$11    OF 380 MS
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        LDA     #$73    LOW BYTE FOR TONE 1, 1370.6 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$1D    HI BYTE FOR TONE 1
        STA     INC1HI
```

```
        LDA     #$73    LOW BYTE FOR TONE 2, 1370.6 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1D    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$AF
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$11    OF 380 MS
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        LDA     #$2D    LOW BYTE FOR TONE 1, 1776.7 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$26    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$2D    LOW BYTE FOR TONE 2, 1776.7 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$26    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$AF
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$11    OF 380 MS (VALID KP RANGE IS 90 TO 120 MS)
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        RTS

*ROUTINE TO PLAY INTER-LATA REORDER SIT TONES
SIT3    LDA     #$2B    LOW BYTE FOR TONE 1, 985.2 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$15    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$2B    LOW BYTE FOR TONE 2, 985.2 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$15    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$C1
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$0C    OF 274 MS
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        LDA     #$73    LOW BYTE FOR TONE 1, 1370.6 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$1D    HI BYTE FOR TONE 1
        STA     INC1HI
```

```
        LDA     #$73    LOW BYTE FOR TONE 2, 1370.6 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$1D    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$AF
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$11    OF 380 MS
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        LDA     #$2D    LOW BYTE FOR TONE 1, 1776.7 HZ (5.5006 x f)
        STA     INC1LO
        LDA     #$26    HI BYTE FOR TONE 1
        STA     INC1HI
        LDA     #$2D    LOW BYTE FOR TONE 2, 1776.7 HZ (5.5006 x f)
        STA     INC2LO
        LDA     #$26    HI BYTE FOR TONE 2
        STA     INC2HI
        LDA     #$AF
        STA     CTLO    SAMPLE COUNT FOR REQUIRED TONE DURATION
        LDA     #$11    OF 380 MS (VALID KP RANGE IS 90 TO 120 MS)
        STA     CTHI    COUNT = TIME / 83.933 MICROSECS
        JSR     PLAY    PLAY IT
        RTS

* Sine wave table: 256 elements, beginning at 2.5 volts, to 5 volts to 0, then
SINTBL  EQU     *
        FCB     128
        FCB     131
        FCB     134
        FCB     137
        FCB     140
        FCB     144
        FCB     147
        FCB     150
        FCB     153
        FCB     156
        FCB     159
        FCB     162
        FCB     165
        FCB     168
        FCB     171
        FCB     174
```

```
FCB     177
FCB     179
FCB     182
FCB     185
FCB     188
FCB     191
FCB     193
FCB     196
FCB     199
FCB     201
FCB     204
FCB     206
FCB     209
FCB     211
FCB     213
FCB     216
FCB     218
FCB     220
FCB     222
FCB     224
FCB     226
FCB     228
FCB     230
FCB     232
FCB     234
FCB     235
FCB     237
FCB     239
FCB     240
FCB     241
FCB     243
FCB     244
FCB     245
FCB     246
FCB     248
FCB     249
FCB     250
FCB     250
FCB     251
FCB     252
FCB     253
FCB     253
```

```
FCB     254
FCB     254
FCB     254
FCB     255
FCB     255
FCB     255
FCB     255
FCB     255
FCB     255
FCB     255
FCB     254
FCB     254
FCB     254
FCB     253
FCB     253
FCB     252
FCB     251
FCB     250
FCB     250
FCB     249
FCB     248
FCB     246
FCB     245
FCB     244
FCB     243
FCB     241
FCB     240
FCB     239
FCB     237
FCB     235
FCB     234
FCB     232
FCB     230
FCB     228
FCB     226
FCB     224
FCB     222
FCB     220
FCB     218
FCB     216
FCB     213
FCB     211
```

```
FCB     209
FCB     206
FCB     204
FCB     201
FCB     199
FCB     196
FCB     193
FCB     191
FCB     188
FCB     185
FCB     182
FCB     179
FCB     177
FCB     174
FCB     171
FCB     168
FCB     165
FCB     162
FCB     159
FCB     156
FCB     153
FCB     150
FCB     147
FCB     144
FCB     140
FCB     137
FCB     134
FCB     131
FCB     128
FCB     125
FCB     122
FCB     119
FCB     116
FCB     112
FCB     109
FCB     106
FCB     103
FCB     100
FCB     97
FCB     94
FCB     91
FCB     88
```

```
FCB     85
FCB     82
FCB     79
FCB     77
FCB     74
FCB     71
FCB     68
FCB     65
FCB     63
FCB     60
FCB     57
FCB     55
FCB     52
FCB     50
FCB     47
FCB     45
FCB     43
FCB     40
FCB     38
FCB     36
FCB     34
FCB     32
FCB     30
FCB     28
FCB     26
FCB     24
FCB     22
FCB     21
FCB     19
FCB     17
FCB     16
FCB     15
FCB     13
FCB     12
FCB     11
FCB     10
FCB     8
FCB     7
FCB     6
FCB     6
FCB     5
FCB     4
```

```
FCB     3
FCB     3
FCB     2
FCB     2
FCB     2
FCB     1
FCB     1
FCB     1
FCB     1
FCB     1
FCB     1
FCB     1
FCB     2
FCB     2
FCB     2
FCB     3
FCB     3
FCB     4
FCB     5
FCB     6
FCB     6
FCB     7
FCB     8
FCB     10
FCB     11
FCB     12
FCB     13
FCB     15
FCB     16
FCB     17
FCB     19
FCB     21
FCB     22
FCB     24
FCB     26
FCB     28
FCB     30
FCB     32
FCB     34
FCB     36
FCB     38
FCB     40
```

```
FCB     43
FCB     45
FCB     47
FCB     50
FCB     52
FCB     55
FCB     57
FCB     60
FCB     63
FCB     65
FCB     68
FCB     71
FCB     74
FCB     77
FCB     79
FCB     82
FCB     85
FCB     88
FCB     91
FCB     94
FCB     97
FCB     100
FCB     103
FCB     106
FCB     109
FCB     112
FCB     116
FCB     119
FCB     122
FCB     125
```

S10F1FF401600160044B04C9016001603D
S12301609BA6C0C71FDFA610B7041600A6FFB7053F01A601B7063F473F483F519A160416C2
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