

In keeping with the tradition of Intersil's microcontroller solutions handbook, we present the following routines for the control of an X9241 quad digitally controllable potentiometer. The X9241 has a variety of different instructions that provide flexibility to the designer. Additionally, the nonvolatile nature of the device allows for stored wiper positions that can be retrieved after power cycles. The following code implements all of the available X9241 instructions using a standard bi-directional bus protocol. Although the routines occupy less than 300 bytes of program memory, designers who won't need to implement all of the X9241 instructions can shorten the code by removing any unnecessary routines. However, this will necessitate the reassembly of the code.

For those instructions which program the nonvolatile data registers (XFR\_WCR, GXFR\_WCR, & WRITE\_DR), acknowledge polling has been implemented to determine an early completion of the internal write cycle. Although this is automatically handled by the routines, a word or two regarding the procedure should be informative. After issuing a start condition, the master sends a slave address and receives an acknowledge. It then issues an instruction byte to the X9241 and again receives an acknowledge. If necessary, it now transmits the data byte and receives a final acknowledge. The master must then initiate a stop condition which will cause the X9241 to begin an internal write cycle. The X9241 pins go high impedance until this internal cycle is complete. The master can now begin acknowledge polling by successively sending start conditions followed by "dummy" instructions. When the X9241 finally answers with an acknowledge, the internal write cycle

has been completed and the master must initiate a stop condition. After the next start condition, the X9241 is ready to receive further instructions.

In the code listing, an assumption was made that the code would execute upon a reset of the microcontroller. The code was also loaded into low memory, however this can be changed with an ORG assembler directive. A simple MAIN program to exercise these routines is included on the next page. In this listing, the commands cause an X9241 (at A3A2A1A0 = 0000) to be accessed and the WCR of E<sup>2</sup>POT #2 to be rewritten with the value 43 (for wiper tap position #43). Then a 15 pulse decrement of the wiper tap is initiated, causing the selected WCR to be reduced to the value 28 (for wiper tap position #28). The issuing of other commands follows the same general procedure.

In Fig. 1, a representative hardware connection between the X9241 and an 8051 family microcontroller is shown. The pull-up resistors on the SDA and SCL lines are determined by the total capacitance of all of the devices connected to the bus, which is about 18pF in this case, however these may not be necessary since I/O port pins on 8051 family devices have internal pull-ups. This code is available on Intersil's Bulletin Board Service. The Intersil BBS can be reached in the continental U.S. by dialing 1-800-258-8864, or from the (408) calling area and internationally by dialing 1-408-943-0655. The BBS will support up to a 19.2K baud rate modem (no parity, 8 bit words, 1 stop bit, and no local echo). Code for the X9241 quad E<sup>2</sup>POT can be accessed from the EEPOT SIG (Special Interest Group).

## Application Note 1151

```
MAIN:  mov  ADDR_BYTE,#01010000b      ;* LOAD SLAVE ADDRESS BYTE
       mov  ID,#00001000b             ;* LOAD ID BYTE (EEPOT #2)
       mov  COMMAND,#4                ;* WRITE TO WCR
       mov  DATA_BYTE,#00101011b    ;* SET D5D4D3D2D1D0 = 101011
       call INTERPRET
       mov  ID,#00001000b             ;* RELOAD ID BYTE (EEPOT #2)
       mov  PULSES,#00001111b        ;* DEC FOR 15 PULSES
       mov  COMMAND,#32               ;* INCREMENT/DECREMENT WIPER
       call INTERPRET

etc...
```

Sample MAIN Code Listing for Using the Following Interface Routines

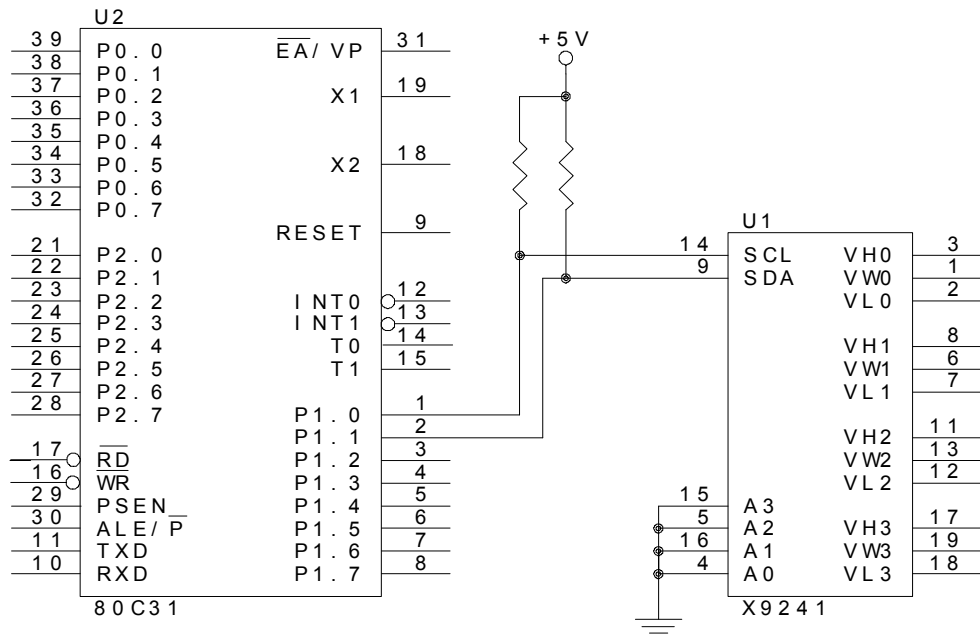


Figure 1 - Typical connection between an 80C31 and an X9241 (with A3A2A1A0 = 0000)

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```
1 ;*****
2 ;*
3 ;* 80C31 MICROCONTROLLER ROUTINES FOR MANIPULATING AN X9241
4 ;* QUAD EEPROM
5 ;*
6 ;* (C) XICOR INC. 1993
7 ;*
8 ;* *****
9 SCL bit p1.0 ;* 80C31 PIN USED AS SCL
0090 10 SDA bit p1.1 ;* 80C31 PIN USED AS SDA
REG 11 TEMP equ r1 ;* SCRATCH REGISTER
REG 12 COUNT equ r2 ;* LOOP COUNTING REGISTER
REG 13 PULSES equ r3 ;* BITS -> DIR X##### (# = 1 or 0)
REG 14 COMMAND equ r4 ;* INSTRUCTION (I.E. 0,4,8,12,16,...)
REG 15 ID equ r5 ;* BITS -> 0 0 0 0 P1 P0 R1 R0
REG 16 ADDR_BYTE equ r6 ;* BITS -> 0 1 0 1 A3 A2 A1 A0
REG 17 DATA_BYTE equ r7 ;* BITS -> CM DW D5 D4 D3 D2 D1 D0
18 ;*****
19 ;*
20 ;* INSERT A "JUMP TO MAIN" INSTRUCTION INTO 80C31 RESET
21 ;* VECTOR POSITION
22 ;*
23 ;* *****
0000 24 org 0000h ;* RESET VECTOR HANDLER
25 ;* AT THIS ADDRESS
0000 02 01 2C 26 jmp MAIN
27 ;*****
28 ;*
29 ;* NAME: INTERPRET
30 ;* FUNCTION: DETERMINES WHICH X9241 INSTRUCTION IS ISSUED,
31 ;* THEN EXECUTES
32 ;* INPUTS: COMMAND
33 ;* OUTPUTS: NONE
34 ;* CALLS: READ_WCR, READ_DR, WRITE_WCR, WRITE_DR, XFR_DR,
35 ;* XFR_WCR, GXFR_DR, GXFR_WCR, INC_WIPER
36 ;* AFFECTED: DPTR,A
37 ;*
38 ;* *****
0003 90 00 08 39 INTERPRET: mov dptr,#FIRST ;* JMP BASE ADDRESS
0006 EC 40 mov a,COMMAND ;* JMP OFFSET
0007 73 41 jmp @a+dptr ;* JUMP TO INSTRUCTION
42 ;* HANDLER
0008 12 00 2C 43 FIRST: call READ_WCR ;* COMMAND #0
000B 22 44 ret
000C 12 00 37 45 call WRITE_WCR ;* COMMAND #4
000F 22 46 ret
0010 12 00 42 47 call READ_DR ;* COMMAND #8
0013 22 48 ret
```

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0014 12 00 4D      49          call  WRITE_DR      ;* COMMAND #12
0017 22           50          ret
0018 12 00 58      51          call  XFR_DR        ;* COMMAND #16
001B 22           52          ret
001C 12 00 63      53          call  XFR_WCR       ;* COMMAND #20
001F 22           54          ret
0020 12 00 6E      55          call  GXFR_DR       ;* COMMAND #24
0023 22           56          ret
0024 12 00 79      57          call  GXFR_WCR      ;* COMMAND #28
0027 22           58          ret
0028 12 00 84      59          call  INC_WIPER     ;* COMMAND #32
002B 22           60          ret

61 ;*****
62 ;*
63 ;* THE FOLLOWING ROUTINES HANDLE EACH X9241 INSTRUCTIONS.
64 ;* THESE ARE CALLED BY THE INTERPRET ROUTINE AND ARE
65 ;* STRAIGHT FORWARD
66 ;*
67 ;* READ_WCR - READS A WCR AND RETURNS ITS' VALUE IN
68 ;* DATA_BYTE
69 ;* WRITE_WCR - WRITES THE VALUE IN DATA_BYTE TO A WCR
70 ;* READ_DR - READS A DATA REGISTER AND RETURNS ITS' VALUE
71 ;* IN DATA_BYTE
72 ;* WRITE_DR - WRITES THE VALUE IN DATA_BYTE TO A DATA
73 ;* REGISTER
74 ;* XFR_DR - TRANSFERS THE VALUE IN A DATA REGISTER TO ITS'
75 ;* WCR
76 ;* XFR_WCR - TRANSFERS THE VALUE IN A WCR TO ONE OF ITS'
77 ;* DATA REGISTERS
78 ;* GXFR_DR - GLOBAL TRANSFER OF LIKE DATA REGISTERS TO
79 ;* THEIR WCRS
80 ;* GXFR_WCR - GLOBAL TRANSFER OF WCRS TO THEIR LIKE DATA
81 ;* REGISTERS
82 ;* INC_WIPER - SINGLE STEP INCREMENT/DECREMENT OF WIPER
83 ;* POSITION FOR WCR
84 ;*
85 ;* FUNCTION: APPENDS BITS P1,P0,R1,R0 TO THE APPROPRIATE
86 ;* INSTRUCTION CODE & PASSES THE INSTRUCTION BYTE TO THE
87 ;* INSTRUCTION GENERATOR
88 ;* INPUTS: ID
89 ;* OUTPUTS: NONE
90 ;* CALLS: INSTR_GEN
91 ;* AFFECTED: ID,A,DPTR
92 ;*
93 ;*****

002C ED           94  READ_WCR:  mov  a,ID          ;* GET BITS P1 P0 X X
002D 44 90        95          orl  a,#090h       ;* APPEND TO READ_WCR
96                96                ;* INSTRUCTION CODE
002F FD           97          mov  ID,a          ;* SAVE THE RESULT
0030 90 00 B2     98          mov  dptr,#CASE1    ;* JMP BASE ADDRESS FOR THIS
99                99                ;* INSTRUCTION
100               100               ;* INSTRUCTION

```

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```
0033 12 00 8F 101      call  INSTR_GEN
0036 22          102      ret
0037 ED          103  WRITE_WCR:  mov   a, ID           ;* GET BITS P1 P0 X X
0038 44 A0       104      orl   a, #0A0h       ;* APPEND TO WRITE_WCR
                                105      ;* INSTRUCTION CODE
003A FD          106      mov   ID, a           ;* SAVE THE RESULT
003B 90 00 AB    107      mov   dptr, #CASE2   ;* JMP BASE ADDRESS FOR THIS
                                108      ;* INSTRUCTION
003E 12 00 8F 109      call  INSTR_GEN
0041 22          110      ret
0042 ED          111  READ_DR:   mov   a, ID           ;* GET BITS P1 P0 R1 R0
0043 44 B0       112      orl   a, #0B0h       ;* APPEND TO READ_DR
                                113      ;* INSTRUCTION CODE
0045 FD          114      mov   ID, a           ;* SAVE THE RESULT
0046 90 00 B2    115      mov   dptr, #CASE1   ;* JMP BASE ADDRESS FOR THIS
                                116      ;* INSTRUCTION
0049 12 00 8F 117      call  INSTR_GEN
004C 22          118      ret
004D ED          119  WRITE_DR:  mov   a, ID           ;* GET BITS P1 P0 R1 R0
004E 44 C0       120      orl   a, #0C0h       ;* APPEND TO WRITE_DR
                                121      ;* INSTRUCTION CODE
0050 FD          122      mov   ID, a           ;* SAVE THE RESULT
0051 90 00 B8    123      mov   dptr, #CASE3   ;* JMP BASE ADDRESS FOR THIS
                                124      ;* INSTRUCTION
0054 12 00 8F 125      call  INSTR_GEN
0057 22          126      ret
                                127
0058 ED          128  XFR_DR:   mov   a, ID           ;* GET BITS P1 P0 R1 R0
0059 44 D0       127      orl   a, #0D0h       ;* APPEND TO XFR_DR
                                128      ;* INSTRUCTION CODE
005B FD          129      mov   ID, a           ;* SAVE THE RESULT
005C 90 00 A8    129      mov   dptr, #CASE4   ;* JMP BASE ADDRESS FOR THIS
                                130      ;* INSTRUCTION
005F 12 00 8F 131      call  INSTR_GEN
0062 22          132      ret
0063 ED          133  XFR_WCR:  mov   a, ID           ;* GET BITS P1 P0 R1 R0
0064 44 E0       134      orl   a, #0E0h       ;* APPEND TO XFR_WCR
                                135      ;* INSTRUCTION CODE
0066 FD          136      mov   ID, a           ;* SAVE THE RESULT
0067 90 00 C5    137      mov   dptr, #CASE5   ;* JMP BASE ADDRESS FOR THIS
                                138      ;* INSTRUCTION
006A 12 00 8F 139      call  INSTR_GEN
006D 22          140      ret
006E ED          141  GXFR_DR:  mov   a, ID           ;* GET BITS X X R1 R0
006F 44 10       142      orl   a, #010h       ;* APPEND TO GXFR_DR
                                143      ;* INSTRUCTION CODE
0071 FD          144      mov   ID, a           ;* SAVE THE RESULT
0072 90 00 A8    145      mov   dptr, #CASE4   ;* JMP BASE ADDRESS FOR THIS
                                146      ;* INSTRUCTION
0075 12 00 8F 147      call  INSTR_GEN
0078 22          148      ret
0079 ED          149  GXFR_WCR:  mov   a, ID           ;* GET BITS X X R1 R0
007A 44 80       150      orl   a, #080h       ;* APPEND TO GXFR_WCR
```

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```
151                                     ;* INSTRUCTION CODE
007C FD                               152         mov  ID, a           ;* SAVE THE RESULT
007D 90 00 C5                          153         mov  dptr,#CASE5     ;* JMP BASE ADDRESS FOR
154                                     ;* THIS INSTRUCTION
0080 12 00 8F                          155         call INSTR_GEN
0083 22                                156         ret
0084 ED                               157 INC_WIPER:  mov  a,ID           ;* GET BITS P1 P0 X X
0085 44 20                              158         orl  a,#020h       ;* APPEND TO INC_WIPER
159                                     ;* INSTRUCTION CODE
0087 FD                               160         mov  ID,a           ;* SAVE THE RESULT
0088 90 00 9C                          161         mov  dptr,#CASE6     ;* JMP BASE ADDRESS FOR
162                                     ;* THIS INSTRUCTION
008B 12 00 8F                          163         call INSTR_GEN
008E 22                                164         ret

165 ;*****
166 ;*
167 ;* NAME: INSTR_GEN (INSTRUCTION GENERATOR)
168 ;* FUNCTION: ISSUES APPROPRIATE I2C PROTOCOL FOR EACH X9241
169 ;* INSTRUCTION
170 ;* INPUTS: ADDR_BYTE, ID, PULSES, DPTR, DATA_BYTE
171 ;* OUTPUTS: DATA_BYTE
172 ;* CALLS: START_COND, STOP_COND, SEND_BYTE, SEND_BIT,
173 ;* GET_BYTE, POLLING
174 ;* AFFECTED: DATA_BYTE, A, COUNT
175 ;*
176 ;*****

008F 12 01 04                          177 INSTR_GEN:  call START_COND ;* ISSUE AN I2C START
178                                     ;* CONDITION
0092 EE                               179         mov  a,ADDR_BYTE ;* SEND X9241 ADDRESS BYTE
0093 12 00 CF                          180         call SEND_BYTE
0096 ED                               181         mov  a,ID           ;* SEND X9241 INSTRUCTION
182                                     ;* BYTE
0097 12 00 CF                          183         call SEND_BYTE
009A E4                               184         clr  a           ;* JMP OFFSET (DON'T NEED
185                                     ;* AN OFFSET)
009B 73                               186         jmp  @ a +dptr      ;* JUMP TO VARIOUS
187                                     ;* INSTRUCTION CASES
009C EB                               188 CASE6:     mov  a,PULSES       ;* A <- BITS DIR X D5 D4 D3
189                                     ;* D2 D1 D0
009D 54 3F                              190         anl  a,#00111111b ;* A <- BITS 0 0 D5 D4 D3
191                                     ;* D2 D1 D0
009F F9                               192         mov  COUNT, a   ;* SAVE AS THE NUMBER OF
193                                     ;* PULSES
00A0 EB                               194         mov  a,PULSES
00A1 54 80                              195         anl  a,#10000000b ;* A <- BITS DIR 0 0 0 0 0
196                                     ;* 0 0
00A3 12 00 E1                          197 WIPER_LOOP: call SEND_BIT ;* SEND THE BIT (A SINGLE
198                                     ;* PULSE)
00A6 D9 FB [00A3]                      199         djnz COUNT,WIPER_LOOP ;* CONTINUE UNTIL ALL
200                                     ;* PULSES ARE SENT
00A8 02 00 CB                          201 CASE4:     jmp  STOP_GEN      ;* IF PROGRAM GETS HERE,
```

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                                202                                ;* THEN IT'S DONE
00AB EF                        203 CASE2:    mov  a,DATA_BYTE ;* SEND X9241 DATA BYTE
00AC 12 00 CF                  204                                call SEND_BYTE
00AF 02 00 CB                  205                                jmp  STOP_GEN
00B2 12 00 F6                  206 CASE1:    call GET_BYTE ;* RECEIVE X9241 DATA BYTE
00B5 02 00 CB                  207                                jmp  STOP_GEN
00B8 EF                        208 CASE3:    mov  a,DATA_BYTE ;* SEND X9241 DATA BYTE
00B9 12 00 CF                  209                                call SEND_BYTE
00BC 12 01 15                  210                                call STOP_COND ;* ISSUE A STOP CONDITION
00BF 12 01 24                  211                                call POLLING ;* BEGIN ACKNOWLEDGE POLLING
00C2 02 00 CB                  212                                jmp  STOP_GEN
00C5 12 01 15                  213 CASE5:    call STOP_COND ;* ISSUE A STOP CONDITION
00C8 12 01 24                  214                                call POLLING ;* BEGIN ACKNOWLEDGE POLLING
00CB 12 01 15                  215 STOP_GEN: call STOP_COND ;* I2C TRANSMISSION OVER!
00CE 22                        216                                ret

                                217 ;*****
                                218 ;*
                                219 ;* NAME: SEND_BYTE
                                220 ;* FUNCTION: SENDS 8 BITS (FROM MSB TO LSB) TO SDA AND
                                221 ;* READS 1 BIT FROM SDA
                                222 ;* INPUTS: A
                                223 ;* OUTPUTS: NONE
                                224 ;* CALLS: SEND_BIT,GET_BIT
                                225 ;* AFFECTED: COUNT,TEMP,A
                                226 ;*
                                227 ;*****

00CF 79 08                      228 SEND_BYTE: mov  COUNT,#8 ;* SET LOOP FOR 8
                                229                                ;* REPETITIONS
00D1 F8                        230                                mov  TEMP,a ;* STORE AS SHIFTED BYTE (NO
                                231                                ;* SHIFT)
00D2 E8                        232 BIT_LOOP:  mov  a,TEMP ;* RETRIEVE LAST SAVED
                                233                                ;* SHIFTED BYTE
00D3 54 80                      234                                anl  a,#10000000b ;* MASK FOR MSB (MOST
                                235                                ;* SIGNIFICANT BIT)
00D5 12 00 E1                  236                                call SEND_BIT ;* PLACE THIS BIT ON SDA
00D8 E8                        237 NEXT_BIT:  mov  a,TEMP ;* RETRIEVE LAST SAVED
                                238                                ;* SHIFTED BYTE
00D9 23                        239                                rl   a ;* ROTATE ALL BITS 1
                                240                                ;* POSITION LEFT
00DA F8                        241                                mov  TEMP,a ;* STORE THIS UPDATED
                                242                                ;* SHIFTED BYTE
00DB D9 F5 [00D2]              243                                djnz COUNT,BIT_LOOP
00DD 12 00 EB                  244                                call CLOCK ;* WHEN DONE ALL 8 BITS,
                                245                                ;* READ SDA LINE
00E0 22                        246                                ret
```

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```
247 ;*****
248 ;*
249 ;* NAME: SEND_BIT
250 ;* FUNCTION: PLACES A BIT ON SDA AND INITIATES A CLOCK
251 ;* PULSE ON SCL
252 ;* INPUTS: A
253 ;* OUTPUTS: NONE
254 ;* CALLS: CLOCK
255 ;* AFFECTED: SDA
256 ;*
257 ;*****

00E1 C2 91      258 SEND_BIT:  clr  SDA          ;* PULL SDA LOW
00E3 60 02 [00E7] 259          jz   SENT_ZERO      ;* SHOULD SDA REALLY BE LOW?
00E5 D2 91      260          setb SDA          ;* IF NOT, PULL SDA HIGH
00E7 12 00 EB    261 SENT_ZERO: call  CLOCK      ;* INITIATE A CLOCK PULSE
00EA 22         262          ret

263 ;*****
264 ;*
265 ;* NAME: CLOCK
266 ;* FUNCTION: ISSUES A LOW-HIGH-LOW CLOCK PULSE OF
267 ;* SUFFICIENT DURATION & READS SDA DURING THE HIGH PHASE,
268 ;* JUST IN CASE IT'S NEEDED
269 ;* INPUTS: NONE
270 ;* OUTPUTS: C
271 ;* CALLS: NONE
272 ;* AFFECTED: SCL,C
273 ;*
274 ;*****

00EB 00         275 CLOCK:    nop             ;* LET SDA SET-UP
00EC D2 90      276          setb SCL        ;* PULL SCL HIGH AND HOLD
00EE 00         277          nop
00EF 00         278          nop
00F0 00         279          nop
00F1 A2 91      280          mov  c,SDA      ;* MOVE SDA BIT INTO CARRY FLAG
00F3 C2 90      281          clr  SCL        ;* PULL SCL LOW
00F5 22         282          ret

283 ;*****
284 ;*
285 ;* NAME: GET_BYTE
286 ;* FUNCTION: RECEIVES 8 BITS FROM SDA (MSB TO LSB) AND
287 ;* SENDS 1 BIT TO SDA
288 ;* INPUTS: NONE
289 ;* OUTPUTS: DATA_BYTE
290 ;* CALLS: CLOCK,SEND_BIT
291 ;* AFFECTED: COUNT,SDA,A,DATA_BYTE
292 ;*
293 ;*****
```



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```
00F6 D2 91          294 GET_BYTE:  setb SDA      ;* RECEIVER SHOULDN'T DRIVE SDA
                   295                      ;* LOW
00F8 79 08          296          mov  COUNT,#8    ;* SET LOOP COUNTER TO 8
                   297                      ;* REPETITIONS
00FA 11 EB [00EB]   298 GET_LOOP:  call  CLOCK    ;* CLOCK IN THE CURRENT BIT
00FC 33             299          rlc  a        ;* RECONSTRUCT BYTE USING LEFT
                   300                      ;* SHIFTS
00FD D9 FB [00FA]   301          djnz COUNT,GET_LOOP
00FF FF             302          mov  DATA_BYTE,a    ;* STORE RETRIEVED BYTE
                   303                      ;* FOR USER
0100 E4             304          clr  a        ;* A <- LOW (SENDING A 0)
0101 11 E1 [00E1]   305          call END_BIT    ;* SEND AN ACKNOWLEDGE
0103 22             306          ret

                   307 ;*****
                   308 ;*
                   309 ;* NAME: START_COND (START CONDITION)
                   310 ;* FUNCTION: ISSUES AN I2C BUS START CONDITION
                   311 ;* INPUTS: NONE
                   312 ;* OUTPUTS: NONE
                   313 ;* CALLS: NONE
                   314 ;* AFFECTED: SDA,SCL
                   315 ;*
                   316 ;*****

0104 D2 91          317 START_COND: setb SDA    ;* PULL SDA HIGH AND ALLOW SET-UP
0106 D2 90          318          setb SCL    ;* PULL SCL HIGH AND HOLD
0108 00             319          nop
0109 00             320          nop
010A 00             321          nop
010B 00             322          nop
010C C2 91          323          clr  SDA    ;* PULL SDA LOW (SCL=HIGH) AND HOLD
010E 00             324          nop
010F 00             325          nop
0110 00             326          nop
0111 00             327          nop
0112 C2 90          328          clr  SCL    ;* COMPLETE CLOCK PULSE
0114 22             329          ret

                   330 ;*****
                   331 ;*
                   332 ;* NAME: STOP_COND (STOP CONDITION)
                   333 ;* FUNCTION: ISSUES AN I2C BUS STOP CONDITION
                   334 ;* INPUTS: NONE
                   335 ;* OUTPUTS: NONE
                   336 ;* CALLS: NONE
                   337 ;* AFFECTED: SDA,SCL
                   338 ;*
                   339 ;*****

0115 C2 91          340 STOP_COND:  clr  SDA    ;* PULL SDA LOW AND HOLD
0117 D2 90          341          setb SCL    ;* PULL SCL HIGH AND HOLD
0119 00             342          nop
```

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```
011A 00          343          nop
011B 00          344          nop
011C 00          345          nop
011D D2 91      346          setb SDA      ;* PULL SDA HIGH (SCL=HIGH)
011F 22          347          ret

348 ;*****
349 ;*
350 ;* NAME: ACK_SEND (SEND ACKNOWLEDGE)
351 ;* FUNCTION: SENDS AN ACKNOWLEDGE BIT TO COMPLETE SDA LINE
352 ;* DATA READS
353 ;* INPUTS: NONE
354 ;* OUTPUTS: NONE
355 ;* CALLS: SEND_BIT
356 ;* AFFECTED: A
357 ;*
358 ;*****

0120 E4          359 ACK_SEND:   clr  a          ;* A <- LOW (SENDING A 0)
0121 11 E1 [00E1] 360          call SEND_BIT ;* SEND THE BIT!
0123 22          361          ret

362 ;*****
363 ;*
364 ;* NAME: POLLING (ACKNOWLEDGE POLLING FOR XFR_WCR,
365 ;* WRITE_DR, GXFR_WCR)
366 ;* FUNCTION: SENDS DUMMY COMMANDS TO X9241 DURING AN
367 ;* INTERNAL WRITE CYCLE SO THAT THE END OF THE CYCLE IS
368 ;* MARKED BY AN ACKNOWLEDGE
369 ;* INPUTS: ADDR_BYTE
370 ;* OUTPUTS: NONE
371 ;* CALLS: START_COND, SEND_BYTE
372 ;* AFFECTED: C
373 ;*
374 ;*****

0124 31 04 [0104] 375 POLLING:   call START_COND ;* REESTABLISH I2C PROTOCOL
0126 EE          376          mov  a, ADDR_BYTE ;* ATTEMPT TO SEND A DUMMY
377 ;* COMMAND
0127 11 CF [00CF] 378 AGAIN:    call SEND_BYTE
0129 40 F9 [0124] 379          jc   POLLING ;* IF C=1, THEN THERE WAS NO
380 ;* ACKNOWLEDGE
012B 22          381          ret

382 ;*****
383 ;*
384 ;* PUT MAIN PROGRAM HERE...
385 ;*
386 ;*****

012C          387 MAIN:
```

ASSEMBLY END, ERRORS:0, LAST CODE ADDRESS:012BH, TOTAL BYTES:299

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