Send a Byte

```
    Jsr LISTEN

    Jsr SECLISTEN

    Jsr IECOUT

    Jsr UNLISTEN
```

Receive a Byte

```
    Jsr TALK

    Jsr SECTALK

    Jsr IECIN

    Jsr UNTALK
```

TALK

```
TALK:
F0D2  1F0D2   LDA #$40
F0D4          .byt $2c        ; skip next opcode
```

LISTEN

```
LISTEN:
; listn Send LISTEN Command on IEEE Bus
 F0D5  1F0D5  LDA #$20
```

UNTALK

```
: untlk   Send UNTALK

: ATN LO
 F1AE  1F1AE     LDA $E840 ; VIA
 F1B1            AND #$FB
 F1B3            STA $E840 ; VIA

: UNTALK byte
 F1B6            LDA #$5F
 F1B8            BIT $3FA9
```

UNLISTEN

```
: untlk   Send UNLISTEN

: UNLISTEN byte
 F1B9  1F1B9     LDA #$3F
 F1BB            JSR $F0D7       ; send with ATN
 F1BE            BNE $F148       ; always
```

SECLISTEN

```
 F143  1F143     STA $A5         ; Buffered Character for IEEE Bus
 F145            JSR $F109 ; -   Send Data On IEEE Bus
```

SECTALK

```
 F193  1F193     STA $A5         ; Buffered Character for IEEE Bus
 F195            JSR $F109 ; -   Send Data On IEEE Bus
 F198  1F198     JSR $F175
 F19B            JMP $F148
```

IECOUT

```
 F19E  1F19E     BIT $A0
 F1A0            BMI $F1A6
 F1A2            DEC $A0         ; Flag: IEEE Bus-Output Char. Buffered
 F1A4            BNE $F1AB
 F1A6  1F1A6     PHA
 F1A7            JSR $F109 ; -   Send Data On IEEE Bus
 F1AA            PLA
 F1AB  1F1AB     STA $A5         ; Buffered Character for IEEE Bus
 F1AD            RTS
```

IECIN

```
:NDAC LO
 F1C0  1F1C0     LDA #$34
 F1C2            STA $E821

:NRFD HI
 F1C5            LDA $E840 ; VIA
 F1C8            ORA #$02
 F1CA            STA $E840 ; VIA

: Wait DAV lo with timeout
 F1CD  1F1CD     LDA #$FF
 F1CF            STA $E845       ; timer
 F1D2  1F1D2     BIT $E840
 F1D5            BVS $F15B       ; timeout
 F1D7            BIT $E840       ; check DAV
 F1DA            BMI $F1D2

: NRFD LO
 F1DC            LDA $E840 ; VIA
 F1DF            AND #$FD
 F1E1            STA $E840 ; VIA

: Check EOI
 F1E4            BIT $E810
 F1E7            BVS $F1EE
 F1E9            LDA #$40
 F1EB            JSR $FBC4 ; -   Set Status Bit EOI

: Get data from bus
 F1EE  1F1EE     LDA $E820 ; PIA 2
 F1F1            EOR #$FF
 F1F3            PHA

: NDAC HI
 F1F4            LDA #$3C
 F1F6            STA $E821

: Wait DAV HI
 F1F9  1F1F9     BIT $E840
 F1FC            BPL $F1F9

: NDAC LO
 F1FE            LDA #$34
 F200            STA $E821

 F203            PLA
 F204            RTS
```

ATNOUT

```
: save byte
 F0D7  1F0D7     PHA
: NRFD HI
 F0D8            LDA $E840
 F0DB            ORA #$02  ; NRFD clear
 F0DD            STA $E840
: NDAC HI
 F0E0            LDA #$3C
 F0E2            STA $E821 ; NDAC clear

 F0E5            BIT $A0           ; do we have a byte in the buffer?
 F0E7            BEQ $F0FA ; no then skip

; Send out byte in buffer with EOI
 F0E9            LDA #$34  ; EOI out
 F0EB            STA $E811
 F0EE            JSR $F109 ; Send Data On IEEE Bus (RAWOUT)
 F0F1            LDA #$00  ; clear buffer flag
 F0F3            STA $A0           ;
 F0F5            LDA #$3C  ; EOI clear
 F0F7            STA $E811

; restore ATN byte
 F0FA  1F0FA     PLA
 F0FB            ORA $D4           ; Current Device Number
 F0FD            STA $A5           ; Buffered Character for IEEE Bus

; wait for DAV HI, then activate ATN
 F0FF  1F0FF     LDA $E840
 F102            BPL $F0FF ; wait for DAV clear
 F104            AND #$F8
 F106            STA $E840 ; ATN out

… F109 RAWOUT
```

ATN HI

```
; ATN HI
 F148  1F148     LDA $E840 ; VIA
 F14B            ORA #$04
 F14D            STA $E840 ; VIA
 F150            RTS
```

RAWOUT

```
; -       Send Data On IEEE Bus
;         -       Flag Errors

: DAV HI
 F109  1F109     LDA #$3C
 F10B            STA $E823 ; DAV clear

; Check NDAC/NRFD for Device not present
 F10E            LDA $E840
 F111            AND #$41  ; check NDAC & NRFD in
 F113            CMP #$41  ; both still clear?
 F115            BEQ $F16C ; yes, then Status #80 - device not present

; Put Data on bus
 F117            LDA $A5           ; Buffered Character for IEEE Bus
 F119            EOR #$FF
 F11B            STA $E822 ; data output to bus

; Wait for NRFD HI
 F11E  1F11E     BIT $E840
 F121            BVC $F11E ; wait for NRFD clear

; DAV LO
 F123            LDA #$34
 F125            STA $E823 ; DAV out

; Wait NDAC HI with timeout
 F128  1F128     LDA #$FF
 F12A            STA $E845 ; Timer 1 HI
 F12D  1F12D     LDA $E840 ; read NDAC,NRFD,DAV in
 F130            BIT $E84D ; check timer
 F133            BVS $F151 ; timer underflow - error
 F135            LSR               ; NDAC into carry
 F136            BCC $F12D ; wait for NDAC clear
```

Status 80 - Device not present

```
; -       Status #80 - device not present

 F16C  1F16C     LDA #$80
 F16E            BMI $F167
```

Timer underflow, Check Stop, Status 01

```
 F151  1F151     LDA $03FC ; 4: Flag: Kernal Variable for IEEE Timeout
 F154            BPL $F165 ; -       Status #01 - ??
 F156            JSR $F343 ; stop    Check STOP Key
 F159            BNE $F128

; -       Status #01 - ??

 F165  1F165     LDA #$01
```

Set Status

```
 F167  1F167     JSR $FBC4 ; -       Set Status Bit
 F16A            BNE $F138
```

END OUT

```
; DAV HI
 F138  1F138     LDA #$3C
 F13A            STA $E823 ; DAV clear

; Clear bus
 F13D            LDA #$FF  ; clear bus data
 F13F            STA $E822
 F142            RTS
```

Check read timeout

```
 F15B  1F15B     LDA $03FC ; 4: Flag: Kernal Variable for IEEE Timeout
 F15E            BPL $F170 ; -       Status #02 - read timeout
 F160            JSR $F343 ; stop    Check STOP Key
 F163            BNE $F1CD
```

Status 02 - read timeout

```
 F170  1F170     LDA #$02
 F172            JSR $FBC4 ; -       Set Status Bit
```

NRFD, NDAC LO

```
; NRFD LO
 F175  1F175     LDA $E840 ; VIA
 F178            AND #$FD
 F17A            STA $E840 ; VIA

; NDAC LO
 F17D            LDA #$34
 F17F            STA $E821

; fake return value
 F182            LDA #$0D
 F184            RTS
```