PULAFORD
RESEARCH

COCO & MIDI =

MUSIC
THE COCO MIDI INTERFACE

Technical Information on using the CoCo Midi Interface with your own programs.

By Allen C. Huffman

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Introduction:

This document was created for those of you who want to use the CoCo Midi Interface with your own programs. We will attempt to describe methods of using the pack through Basic and Assembly Language.

Background:

The CoCo Midi Interface uses a Motorola 6850 ACIA to control I/O between the computer and a Midi device. It is programmed in the same manner as the Tandy RS232 Program Pak or Speech/Sound Pak. When the pack is plugged in, two memory locations control everything:

$FF6E (65390) - Status Register. This location is used for initializing the pack for MIDI transmissions, and for checking to see if the pack is ready to send to receive a byte of data.

$FF6F (65391) - Data Register. This location is where all incoming and outgoing data bytes go.

Using the Pack:

Before the pack is able to send or receive Midi data, it must be initialized. This is done by sending a $3 then a $15 to the Status Register. In Basic it looks like this:

10 POKE &HFF6E,&H3 : POKE &HFF6E,&H15

...or for all you decimal-only programmers...

10 POKE 65390,3 : POKE 65390,21

The Assembly Language version looks like this:

SETUP LDA #$3
STA $FF6E
LDA #$15
STA $FF6E
RTS

After this, the pack is ready for Midi transmissions. To send a byte, simply store it at $FF6F. To receive a byte, simply get it from the same location. In order to tell if $FF6F is empty so you can send, you must check bit 2 of the status register. In Basic, it looks like this:
1500 REM Send A to pack
1505 IF (PEEK(&HFF6E) AND 2)=0 THEN 1505
1510 POKE &HFF6F,A
1515 RETURN

The Assembly Language version looks like this:

SENDAT LDB $FF6E Load accumulator B with Status.
BITB #2 Check bit #2.
BBQ SENDAT If Ø, buffer full. Go back.
STA $FF6F Otherwise, send A.
RTS Return from subroutine.

Receiving data from the pack is just as simple, except you check bit 1. Here it
is in Basic:

1000 REM Get byte from pack
1005 IF (PEEK(&HFF6E) AND 1)=0 THEN 1005
1010 A-PEEK(&HFF6F)
1015 RETURN

The Assembly Language version looks like this:

GETDAT LDA $FF6E Load accumulator A with Status.
BITA #1 Check bit #1.
BBQ GETDAT If Ø, nothing received. Go back.
LDA $FF6F Otherwise, load A with byte received.
RTS Return from subroutine.

NOTE: Receiving Midi data in Basic doesn’t work too well. By the time
you get one byte of data, many other bytes could have already been sent and
lost. Basic is just too slow to handle Midi input. Assembly, on the other
hand, works great.

A Routine:

The following page contains a short machine language routine that can be
used to write custom Midi programs such as librarians. It contains two main
routines.

The first will receive bytes from the pack and store them, starting at
$7100, until it receives a byte $F0 or greater, such as the XOX byte ($F7).

The other routine does the opposite. It starts sending all data at $7100
until it encounters $F0 or greater.

The rest is up to you. Please note that while receiving data, if no end
byte ($F0 or greater) is encountered, the routine will continue to store
incoming bytes in memory until it writes over the I/O portion of memory which
will probably cause a system crash.
Assembly Language Listing of Midi Get/Send Routine:

00100 * MIDI ROUTINE for CoCo Midi Interface
00120 * Version 1.0

00140 MSTAT EQU $FF6E
00150 MDATA EQU $FF6F
00160
00170 ORG $7000
00180
00190 START1 BRA GET
00200 START2 BRA SEND

00210 GET BSR INIT
00220 LDX #$7100
00230 BSR GETDAT
00240 GLOOP STA ,X+
00250 CMPA #$F0
00260 BLS GLOOP
00270
00280 RTS

00290
00300 SEND BSR INIT
00310 LDX #$7100
00320 SLOOP LDA ,X+
00330 BSR SENDAT
00340 CMPA #$F0
00350 BLS SLOOP
00360 RTS

00370
00380 INIT LDA #$3
00390 STA MSTAT
00400 LDA #$15
00410 STA MSTAT
00420 RTS

00430
00440 GETDAT LDA MSTAT
00450 BITA #1
00460 BEQ GETDAT
00470 LDA MDATA
00480 RTS

00490
00500 SENDAT LDB MSTAT
00510 BITB #2
00520 BEQ SENDAT
00530 STA MDATA
00540 THEEND RTS

00550 END

From here on, MSTAT refers to $FF6E and MDATA refers to $FF6F

Program starts at $7000

GET routine at $7000
SEND routine at $7002

Jump to INIT routine
Make X point to start of "buffer"
Loop. Jump and get byte from pack
Store byte at X, increment X
Compare A to $F0
If A < $F0, return to GLOOP
Return from subroutine

Jump to INIT routine
Make X point to start of "buffer"
Loop. Load A from X, increment X
Jump and send A to pack
Compare A to $F0
If A < $F0, return to SLOOP
Return from subroutine

Load A with $3
Store it at MSTAT
Load A with $21
Store it at MSTAT
Return from subroutine

Load A with Status
Test bit 1
If it's 0, go back to GETDAT
Byte received, load it in A
Return from subroutine

Load B with Status
Test bit 2
If it's 0, go back to SENDAT
Pack clear, send A
Return from subroutine

That's it!
Here is a Basic loader for the above listing:

10 CLEAR 200,&H7000
15 X=0:FORA=&H7000 TO&H7040:READA$:B=VAL("&H"+A$):POKE A,B:X=X+B:NEXT:PRINTX
20 DATA 20,2,20,E,6D,1A,8E,71,0,6D,20,A7,E0,81,F0,23,F8,39,8D,C,8E,71,0,A6,80,
     8D,1B,81,F0,23,F8,39,86,3,B7,FF,6E,86,15,B7,FF,6E,39,B6,FF,6E,85,1,27,
     F9,B6,FF,6F,39,F6,FF,6E,C5,2,27,F9,B7,FF,6F,39

EXEC &H7000 – Execute GET routine
EXEC &H7002 – Execute SEND routine

When you run the Basic version of the program, it should print 8077. That is the checksum of the data statements. If you get anything else, recheck your typing.

Acknowledgements:

I would like to thank Lester Hands for sending me the initial information on using the interface, and Mark Thomas for digging up the technical specs on the MC6850. Thanks also to Cecil Houk for allowing me to present this information, and finally, thanks to you for supporting the future of music on the Color Computer!

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<td>A 10 track midi sequencer/editor that's very easy to use. Includes COCO MIDI INTERFACE.</td>
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<td>COCO MIDI 3**</td>
<td>$60.00</td>
<td>Software only.</td>
</tr>
<tr>
<td>COCO MIDI INTERFACE</td>
<td>$100.00</td>
<td>Hardware interface required by COCO MIDI 2/3 and some editors and librarians.</td>
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<td>opt 1</td>
<td>$10.00</td>
<td>Adds midi &quot;thru&quot;</td>
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<td>opt 2</td>
<td>$10.00</td>
<td>Adds 2nd, switched, midi &quot;in&quot;</td>
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<td>opt 3</td>
<td>$20.00</td>
<td>Opt 1 &amp; 2 (opt 1 becomes switched out - thru add $5.00 to have each option installed in your existing interface.</td>
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<td>&quot;Y&quot; CABLE</td>
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Except for FBEDIT, ALL programs run on COCO's 1, 2 or 3 - 64K and up.

* REQUIRES MULTIPAK OR "Y" CABLE
** REQUIRES COCO MIDI INTERFACE (which requires Y cable or Multipak)