

```

/*****
*
*                               H M A C . C
*
**-----**
*   Description      : Demonstration of direct access to the HMA without
*                     the assistance of any special drivers.
*
**-----**
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*   Developed on    : 07/27/1990
*   Last update on  : 04/07/1995
*
**-----**
*   (MICROSOFT C)
*   Creation        : CL /AS /Zp hmac.c hmaca
*   Call            : hmac
*
**-----**
*   (BORLAND TURBO C)
*   Creation        : create a project file with the following contents
*                     hmac.c
*                     hmaca.obj
*****/

/*-- Include files -----*/

#include <dos.h>                                /* for interrupt call */

#ifdef __TURBOC__
    #include <alloc.h>
#else
    #include <malloc.h>
#endif

/*-- Constants -----*/

#define TRUE  ( 0 == 0 )
#define FALSE ( 0 == 1 )

/*-- Macros -----*/

#ifndef MK_FP
    #define MK_FP(seg,ofs) \
        ((void far *) (((unsigned long)(seg) << 16) | (unsigned)(ofs)))
#endif

#define Hi(x) (*( (BYTE *) &x+1))              /* Hi-Byte one ints */
#define Lo(x) (*( (BYTE *) &x))                /* Lo-Byte one ints */

/*-- Type declarations -----*/

typedef unsigned char BYTE;
typedef BYTE BOOL;
typedef unsigned WORD;

/*-- extern declarations -----*/

extern BOOL HMAAvail( void );                    /* HMA available? */
extern BOOL GateA20( BOOL free );              /* A20 locked/free */
extern BOOL IsA20On( void );                   /* A20 available? */

/*****
*   HMA Test : Demonstration of accessing the HMA
*
**-----**
*   Input    : none
*****/

void HMA Test( void )

{
    BYTE far * hmap;                            /* Pointer to the HMA */
    WORD i,                                     /* loop counter */
        err;                                    /* Number of the error for HMA access */

    if ( IsA20On() )
        printf( "The address line A20 is already switched on!\n" );
    else
        if ( GateA20( TRUE ) == FALSE || IsA20On() == FALSE )

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    {
        printf( "Note! The address line A20 can not be "
               "be made available." );
        return;
    }
    else
        printf( "The access to the HMA is switched on.\n" );

hmap = MK_FP( 0xFFFF, 0x0010 );           /* Pointer to HMA */
err = 0;                                  /* start will no errors */
for ( i = 1; i < 65520; ++i, ++hmap )
{
    printf( "\rMemory location: %u", i ); /* test the memory locations */
    *hmap = i % 256;                      /* memory location description */
    if ( *hmap != i % 256 )               /* and return selection */
    {
        printf( " ERROR!\n" );           /* ERROR! */
        ++err;
    }
}

printf( "\n" );
if ( err == 0 )                          /* Output test results */
    printf( "HMA ok, no defective memory locations.\n" );
else
    printf( "ATTENTION: %d defective memory locations in the HMA "
           "discovered!\n", err );
GateA20( FALSE );                       /* Address line switched off */
}

/*****
*                               M A I N   P R O G R A M                               *
*****/

void main( void )
{
    int i;                               /* loop counter */

    for ( i = 1; i < 25; ++i )           /* clear screen */
        printf ( "\n" );

    printf("HMAC - HMA Demo program by MICHAEL TISCHER\n\n" );
    if ( HMAAvail() )
    {
        HMAtest();                       /* HMA test */
        printf( "\n" );
    }
    else
        printf( "No access to HMA possible.\n" );
}

```