TVP5150AM1 Patch Code Download Guidelines

The TI family of video decoder products offers the optional flexibility to update device firmware by downloading patch code into the device RAM. This application note outlines how to correctly download patch code updates into the TVP5150AM1. A summary of all required I^2C register writes, and sample C code are included.

1 Download Options

There are two options for downloading the patch code onto the TVP5150AM1: (1) using the TI EVM, and (2) using the Customer System.

1.1 TI EVM

1. Power-on the board with TVP5150AM1 device on it. Connect source to Input and Output to monitor.
2. From the included WinVCC6 software, open Patch_04XX.CMD file, where XX refers to the patch code revision number.
3. Load line 1

   "Set up after Power On, For ROM 4.0 only All Switch (Init: NTSC)"

   Now you should get good picture on monitor. There is no code loading here, just setups for TVP5150AM1 and THS8200.

   Check the version number from property sheets on WinVCC6. You will see 04.00.
4. Load line 2

   "Patch Code P5150_04XX.hra, …" Now the patch code is downloaded, and microprocessor is restarted. The decoder is running ROM + Patch RAM code.

   Check the version number from the property sheets, you will see 04.XX. The XX refers to the patch code revision number.

1.2 Customer System

1. Power on the board with TVP5150AM1 ROM v4.00 device on it. After the power supplies are active and stable (at least 100ms), perform a hardware reset. This is done by pulling RESETB (pin 8) active low for at least 500ns. Then wait at least 10ms before initiating I^2C communication.
2. Configure I^2C Master Controller speed to 400kbps.
3. Start the TVP5150AM1 without the patch code.

   There are only 2 register writes to get the TVP5150AM1 up and running. The user should start the internal microprocessor (write 0x00 into register 0x7F) and has the option (not required) to enable the outputs (write 0x69 into register 0x03). There is no code loading here, this just set up the TVP5150AM1 for normal operation.

   Check the version number in registers 0x82 and 0x83. The values you will see are 0x04 and 0x00, respectively.

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4. Load the code
   There is a password for patch RAM code download. After the password is set, it is a good idea to lock the device again, by writing 00 into that address. The password prevents undesirable writes into the device at startup due to power surges etc. The following code demonstrates the method for unlocking and then locking the device again.
   **** Code starts here ***

   (a) Unlock the device

I2C Subaddress	Data	Description
0x21	0x51	// Password MSB data
0x22	0x50	// Password MSB data
0x23	0xFF	// Data address
0x24	0x04	// Write command

   (b) Download real patch code P5150A_04XX.hra through subaddress 0x7E. XX refers to the patch code revision number. Write all data to address 0x7E continuously.

Start	0xB8/0xBA	0x7E	Data0	Data1	Data2	…	DataN-1	Stop

   Slave Address and data address are only needed for first byte of data, and user can download all patch code data continuously.

   (c) Restart microprocessor

   Write into register 0x7F, data 0x00 // Restart TVP5150AM1 microprocessor

   (d) Lock the device

I2C Subaddress	Data	Description
0x21	0x00	// Password MSB data
0x22	0x00	// Password MSB data
0x23	0xFF	// Data address
0x24	0x04	// Write command

   **** Code ends here ****

   Now decoder should run ROM + Patch RAM code.

   Check the version number in registers 0x82 and 0x83. The values you will see are 0x04 and 0xXX, respectively. XX refers to the patch code revision number.

5. After downloading the patch code, if there is an hardware reset to the TVP5150AM1 (active low pulse to pin-8), the original ROM code is restarted to run (patch code is disabled). To let patch code run without downloading the whole patch code again, please use the following procedure.

   Set the correct password by doing the four writes as mentioned above (step 4.a) to unlock the device. Then write 0x05 to I2C address 0x10. Now the patch code is running. (Verify the version number in registers 0x82 and 0x83. The values you will see are 0x04 and 0xXX respectively.) Finally, lock the device as in the previous section (step 4.d).

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1.3 Summary of I²C Register Writes

I2C subaddr	Data	Description
0x7F	0x00	// Restart microprocessor
0x03	0x69	// Enable outputs
0x21	0x51	// Password MSB data
0x22	0x50	// Password LSB data
0x23	0xFF	//Data address
0x24	0x04	//Write command
0x7E	Patch code	//Load patch code with multi-byte/burst writes

ST B8/BA 7E D0 D1 D2 … Dn-1 SP

Where,

- ST: Start Condition
- B8/BA: I²C Slave Address
- 7E: I²C Subaddress
- D0: First Byte of patch code data
- n: number of Bytes in patch code
- SP: Stop Condition

0x7F	0x00	// Restart microprocessor
0x21	0x00	// Password MSB data
0x22	0x00	// Password LSB data
0x23	0xFF	//Data address
0x24	0x04	//Write command

1.4 Sample C Code for Patch Download

```
#define TVP5150AM1_ADDR 0xB8     //Device Address could also be 0xBA

////////////////////////////////////////////////////////////
// Firmware data array (.C file example)
////////////////////////////////////////////////////////////

/* COPYRIGHT (C) 2003 TEXAS INSTRUMENTS   HexConv v3.00    */
/* DEVICE        : TVP5150AM1                              */
/* VIDEO STANDARD: (M)NTSC(AUTO)                           */
/* SAMPLING RATE : ITU-R BT.656                            */
/* FILENAME      : P5150A_0480.HRA                         */
/* ASSEMBLED     : Wednesday, November 05, 2003 14:31:02   */
/* VERSION       : 4.80                                    */
/* SIZE (BYTES)  : 3990                                    */

const unsigned char g_pData[3990] =
{
    0x01, 0x00, 0x00,
    0x00, 0x00, 0x04,
    0x03, 0x05, 0x00,
    0x00, 0x00, 0x80,
   .
   .
```


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```
    .
     0x0F, 0x56, 0xC7
};

//////////////////////////////////////////////////////////
// Buffer Size
//////////////////////////////////////////////////////////
int g_nNumBytes = 3990; //Add this line

//////////////////////////////////////////////////////////
// Function prototypes
//////////////////////////////////////////////////////////

//This will write to slave address 'nSlaveAddr',
//sub-address 'nSubAddr' the data 'nData'
//Definition based on system and I2C controller requirements.

void I2CWriteByte(unsigned char nSlaveAddr,
                  unsigned char nSubAddr,
                  unsigned char nData );

//This will write to slave address 'nSlaveAddr', sub-address 'nSubAddr'
//'nNumBytes' bytes from buffer 'pData' in one continuous I2C transfer.
//Definition based on system and I2C controller requirements.

void I2CWriteBuffer(unsigned char nSlaveAddr,
                    unsigned char nSubAddr,
                    int nNumBytes,
                    unsigned char* pData );

//This will load the TVP5150AM1 program RAM from buffer 'pData'
//'nNumBytes' bytes

void TVP5150ALoadProgramRAM(unsigned char* pData,
                            int nNumBytes );

//////////////////////////////////////////////////////////
// Main Program
//////////////////////////////////////////////////////////

int main (int argc, char *argv[])
{
TVP5150ALoadProgramRAM( g_pData, g_nNumBytes );
}

//////////////////////////////////////////////////////////
// Function: TVP5150ALoadProgramRAM()
//////////////////////////////////////////////////////////

void TVP5150ALoadProgramRAM ( unsigned char* pData, int nNumBytes )
{
   I2CWriteByte( TVP5150A_ADDR, 0x7F,0x00 );  // Restart TVP5150AM1 uP
   I2CWriteByte( TVP5150A_ADDR, 0x03,0x69 );  // Enable Outputs

   // unlock password for patch code download & register write
   I2CWriteByte( TVP5150A_ADDR, 0x21,0x51 );
   I2CWriteByte( TVP5150A_ADDR, 0x22,0x50 );
   I2CWriteByte( TVP5150A_ADDR, 0x23,0xFF );
   I2CWriteByte( TVP5150A_ADDR, 0x24,0x04 );
```


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```
        //This will write to slave address TVP5150AM1_ADDR, sub-address 0x7E
        //(auto-incrementing data register) 'nNumBytes' bytes
        //from buffer 'pData' in one continuous I2Ctransfer.

        I2CWriteBuffer( TVP5150A_ADDR, 0x7E, nNumBytes, pData );

        I2CWriteByte( TVP5150A_ADDR, 0x7F,0x00 );  // Restart TVP5150AM1 uP

        //lock password for patch code download & register write
        I2CWriteByte( TVP5150A_ADDR, 0x21,0x00 );
        I2CWriteByte( TVP5150A_ADDR, 0x22,0x00 );
        I2CWriteByte( TVP5150A_ADDR, 0x23,0xFF );
        I2CWriteByte( TVP5150A_ADDR, 0x24,0x04 );
    }
```


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