MP3 my BMW

I recently finished installation of a DVD changer that is playing the MP3 files along with the regular CDs and the video DVDs from all the DVD coding regions.
Please forgive me for the lengthy write-up – in my previous work assignment I was testing and evaluating different electronic equipment and was writing evaluation reports and application guides… ☺
With the usual disclaimer that this write-up is for information and entertainment only, and you are undertaking any steps at your own risk, below is the write-up itself. All trademarks mentioned in this document, are the property of their rightful owners and used here for descriptive purposes only.

Starting point:
A BMW I-bus car with a CD changer, Navigation and rear screens. See Appendix, Figure 1.

The super primary goal:
Keep the cost down as much as possible
The primary goal:
Have the DVD player ability to keep the little fellows happy during long (and short) trips.
The secondary goal:
Have the MP3 ability on the stock system

Pre-requisites:
Pre-wiring for an OEM BMW CD-changer with 3-pin and 6-pin connectors;
If DSP present, it needs to be non-digital (consult EAS for more info on this).
16:9 screen (regardless if you have a navigation or not), the 4:3 screen might not be as good but will work as well;
OEM TV tuner; with factory harness. Installed separately, please see Figure 2.
TV-in-motion harness with ability to select alternate audio source. This search string on eBay has the factory harness for the TV module and the TV-in-motion harnesses. Read on about the TV-in-motion harness purchase options.
If your DSP is of a digital variety, then you might need this converter from here and possibly 12VDC to 9VDC converter. I have not dealt with this setup.

Needed item:
DVD changer that plays video DVDs, MP3 DVD, MP3 CDs,Video CDs, and regular CDs
Converter to convert the I-bus commands to the DVD changer commands
Belden 8723, two-pair 22 AWG shielded Audio, Control and Instrumentation Cable with 24 AWG stranded drain wire (or any other cable that you deem fit)
Tap-in squeeze connectors (Radio Shack part #64-3053)
Bullet connectors (Radio Shack part #64-3047)
RCA plugs and jacks (Radio Shack part #'s 274-337, 274-915, 42-2535)
Electrical tape (Radio Shack part # 64-2374)
Male connectors from Digi-Key (part # WM2515-ND), must-haves for many projects

Female connectors from Digi-Key (part # A28327-ND), must-haves for many projects
Shrink tubing (Radio Shack part # 278-1627B)
Metal coat hanger
Soldering iron and the rosin core solder (Radio shack part # 64-2802)
Some basic tools, like screwdrivers, pliers, wire cutters, crimpers, etc…
TV-in-motion harness if you don't have one already installed
Some items are optional, please read the entire document before investing into any hardware.

Difficulty level:
Intermediate – knowledge of wiring termination, soldering, wiring routing is needed

Here is what the subject car is and what it has:
E53 X5 4.6is, built 11/01.
OEM Navigation MK-III (MK-3);
OEM 16:9 color screen;
OEM Cassette deck behind the screen;
OEM CD changer;
OEM DSP (analog version of the DSP, no RG-174 coax cable between CD changer and the DSP unit, just 3-pin and 6-pin connectors);
OEM radio module (no AUX input supported);
Aftermarket two 6-inch screens in the headrests, with Audiovox IR transmitter for the headphones, two AV inputs for the screens;
OEM TV tuner;
OEM AV IN/OUT plug and TV SEARCH button in the rear of the center console;
MISUMI reverse camera in OEM location, triggered by the PDC system;
CCFL Angel Eyes that shut off when the car is in reverse (to avoid interference with PDC);
OEM 12th generation Bluetooth; the BT is a separate installation; consult Martin at bimmernav.com for application.

Discussion

I am not going to discuss the installation of the rear screens; it is well documented elsewhere, besides I did not install them myself anyway…

The main component of this installation is the DVD changer. I've searched high and low and have come to a conclusion that there is one DVD changer on the market that is doing what I need it to do at the price I can afford. It is offered by several companies, it is made in China (like everything else around us). That particular player is capable of playing DVDs from all regions (I tested with region 1, 4 and 5, both NTSC and PAL), so you are not limited to the expensive DVDs from the US or UK. This player is also playing MP3 files burnt onto CDs and DVDs – I burnt about 3.8G worth of music on one DVD and that thing was playing one disk non-stop for several hours (and still did not get all the files!!!).

I've got my DVD changer from eBay (click here for the search string), there are couple of sellers selling it, take a pick. The DVD changer runs about $320 delivered to the US.

The big idea is to connect the RCA outputs from the DVD changer to the AV inputs of the TV tuner – this way you will get the picture and sound every time you choose the AV option from the channel list of the TV function. Your DSP (if so equipped) functionality remains unaffected. See Figure 5
This works just fine but the OEM BMW TV module is a mono, so you will loose the stereo ability. This is not acceptable, as we are trying to gain features and not to lose any.

To accomplish the task of enabling the stereo we need to pipe the stereo outputs from the DVD player to the car's audio system – it can be done by routing the audio into the AUX input of the radio. This would require that the radio is of the latest variety that supports the AUX input. Mine did not support it and I had to buy a new radio unit.
Too much money, so I've chosen a different approach altogether.

Since I have a DVD player that plays the CDs, I do not need the OEM CD changer any longer. The 6-pin connector of the CD-changer has the audio inputs that I need. All I have to do is route the DVD audio outputs to the car audio inputs, and voila! I have the stereo sound coming from the DVD player.
However, this only complicates the seemingly simple situation:

If I choose the AV input on the TV, I get the picture and the sound from the TV module. If I choose the CD changer, I get the audio from the CD changer and no picture on the screen. Besides, to choose the CD changer, I need to have the actual OEM changer plugged into the 3-pin connector for the I-bus to recognize that CD changer is present; otherwise the car will bypass the CD input. The CD changer is removed and the DVD changer can't fool the I-bus into selecting the audio inputs from the 6-pin connector.

So, this brings us to two additional devices that we need: a motion harness and a converter.

A harness allows the TV to be played on the front monitor while the car is in motion. Although watching the video while driving is probably illegal in most jurisdictions around the world, our goal is to have the DVD changer controls visible on the screen while standing and in motion.
The secondary function of these harnesses allows a choice of an alternative audio source, like radio, CD-changer, tape and then you can bring the muted TV picture on the screen if you choose to do so. In our particular situation, it will allow us to pipe the stereo audio sound from the DVD's RCA stereo audio outputs to the CD audio inputs on the 6-pin connector and the video signal to the TV module's video input. So, you would select the "CD-changer" as the playback device and then will

activate the “muted” picture from the TV module by selecting the “Clock” button on dashboard and once the TV picture is on the screen, selecting the AV input. As a result, you will have a video along with stereo sound coming in from source to one destination by taking different electronic routes. In this situation, the secondary function of the harness becomes primary for our purposes but TV-in-motion is still vital for the rest of our application.
I’ve bought my harness from a guy in Germany; his harness is working fine in my set up. Harness runs about 60 Euros plus about 7 euros shipping outside of Germany. I have talked to the guy and he agreed that anyone who mentions “TerminatorX5” at the PayPal checkout can pay 50 Euros plus 6.50 euros for the shipping – just make appropriate adjustments in the “Seller’s discounts” upon check out. Of course, if you manage to win the harness for less, then you just pay less. I get no kick backs from this deal.
Here is the search string for his auctions on eBay.com.
Now, we still need to resolve the issue of the factory CD changer being absent and the car not recognizing the CD inputs as active source.
This is resolved by introducing a second device, a PIE adapter that is designed specifically for this task – the adapter takes the 3-pin connector and tells the car that a CD changer is connected, it also takes the 6-pin connector and pipes the stereo audio from the DVD changer to the car. The DVD changer is connected to the PIE adapter via an IP-Bus connector that is supplied with the adapter. This set up also allows the basic control of the DVD changer. I have found the best price on this adapter at cardomain.com.

So, for this particular setup, all you need is three major components:
DVD changer
TV in motion harness
Signal converter

Very interesting part of the signal converter from PIE, that it will allow you to connect an iPod adapter, XM radio module, XM radio module with traffic reports or SIRIUS radio module without introduction of any new hardware – those items are made by PIONEER and all are IP-bus driven.
I have not installed any additional IP-Bus devices but would like to hear from folks that might have tried them out.

The cost

DVD changer – about $320 including delivery from this search string on eBay.
OEM CD changer can be either sold off to offset the cost or retained for reinstallation

IP-bus to I-bus converter - $80 including delivery from cardomain.com
TV-in-motion harness – 50 Euros + 6.50 euros for US shipping from eBay.com. During PayPal checkout, mention TerminatorX5 and use these prices, unless the winning bid is less.

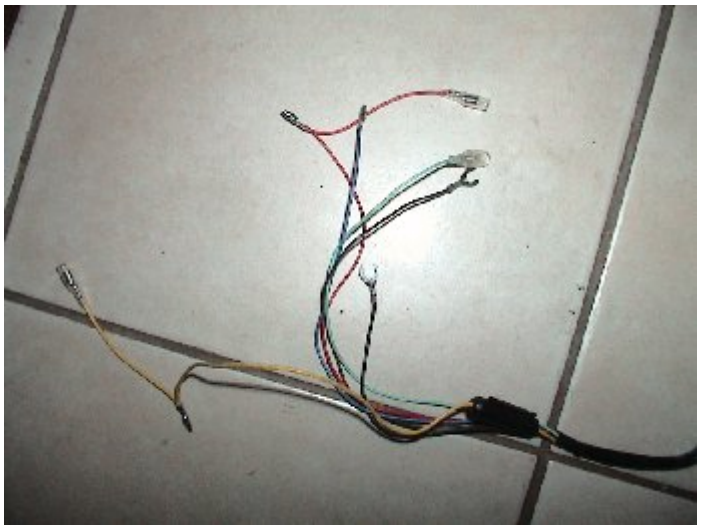
XM-tuner – about $95 including delivery from cardomain.com
XM-tuner with traffic reports – about $200 including delivery from cardomain.com
Sirius-tuner – about $90 including delivery from cardomain.com
iPod adapter – about $55 including delivery from cardomain.com
If you need an OEM TV tuner, check this search string on eBay
For OEM TV tuner harness, check this search string on eBay

Installation

The changer has power cord, remote control cord and the AV cord (sourced separately).

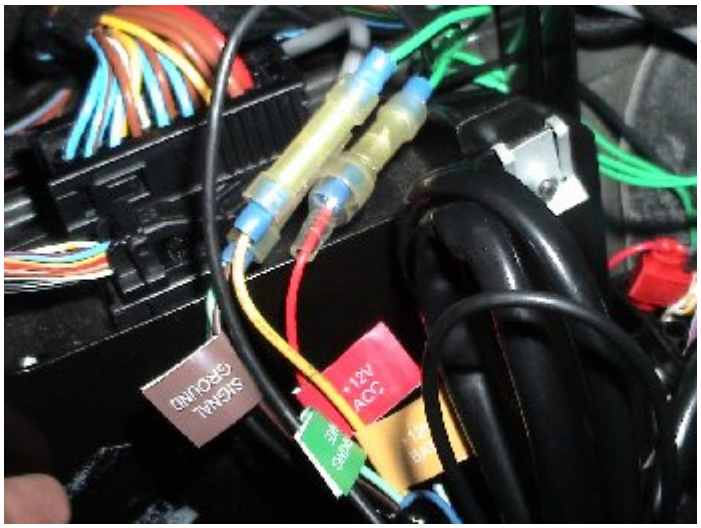
Installation of power cord

The DVD changer comes with a long power cord that is terminated on one end with a Molex 6-pin plug that plugs into the DVD changer, and the other end has 6 wires that are all color coded and also labeled with little stick-on labels.



The Power Ground (black), Signal Ground (brown) and the Parking Brake (teal) wires of the DVD player will all be connected to a single ground point. Yellow is a full time +12VDC. Red is switched +12 VDC, when the ignition key is on. There are plenty of spots in the rear left of the BMWs that have both switched and unswitched power supplies. For example, pin 2 of the CD-changer's 3-pin connector (X18180) is the source of unswitched constant +12VDC. Pin 1 of the same connector is system/vehicle ground. DO NOT tap into pin 3 as it is vehicle's I-Bus wire.

The supplied power cord is wa-a-ay too long, so I measured the needed length from the Molex connector (about 2-3 feet) and cut it. Then I used bullet connectors, (Radio Shack part #64-3047, comes with 6 connectors and 3 barrels) to put a bullet connector onto red and yellow wires each and then I got black, brown and teal wires together and crimped one bullet connector on those three wires – they will be connected to a same ground point. Then I spliced into one of the brown wires that are abundant in that area of the car for the ground point (use Ohm-meter to make sure you are splicing into ground point – the continuity tester should show connection between the wire and any bare metal of the car). I used tap-in squeeze connector, Radio Shack part #64-3053 to tap into a wire.

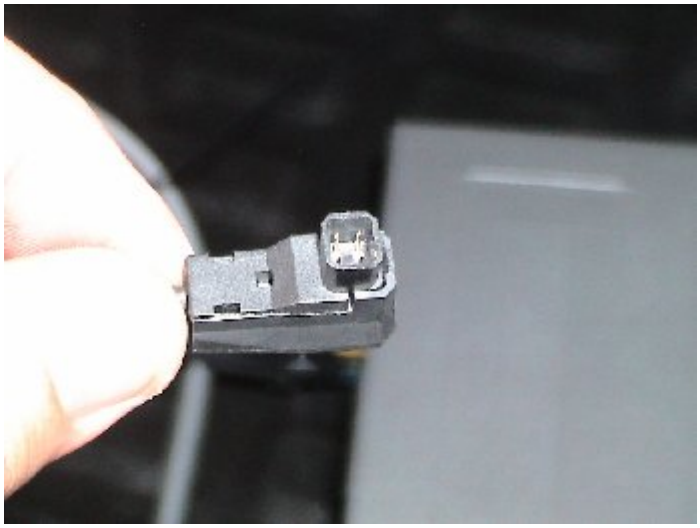


Then I used the pin 2 of the CD changer's 3-pin connector for the unswitched, constant +12VDC and tapped into it using the tap-in connector. Then I started digging around with a Volt-meter looking for

the dead wires that come alive when the ignition is in the ACCESSORY position. This wiring can be different in each car due to the level of the equipment and options installed into a particular vehicle. I terminated those three wires with a bullet connector each (so, I used up all 6 from the package) and used the barrel adapters from the same package to connect the bullet connectors from the car to the bullet connectors from the DVD's power cord.

One of the wires in the power cord is left disconnected, it is kind of amplifier wire not used in this setup.

This concludes the wiring of the power source to the DVD changer



Installation of the IR eye extension cable

The changer also comes with an 18-foot long IR eye cable that we have to wire from the front of the car to the DVD changer in the back.

It is obviously a personal choice and preference as where to mount the eye. I did not want to make an obvious "thingy" sticking out on the clean lines of the cockpit and also I wanted the ability to "hit" the eye using the remote from the front seats and from the back seats. After some considerations I chose to install the eye on the plastic cover that holds the rearview mirror. My mirror has some wires going into the headliner for the "clown nose", so there is an access hole into the headliner.

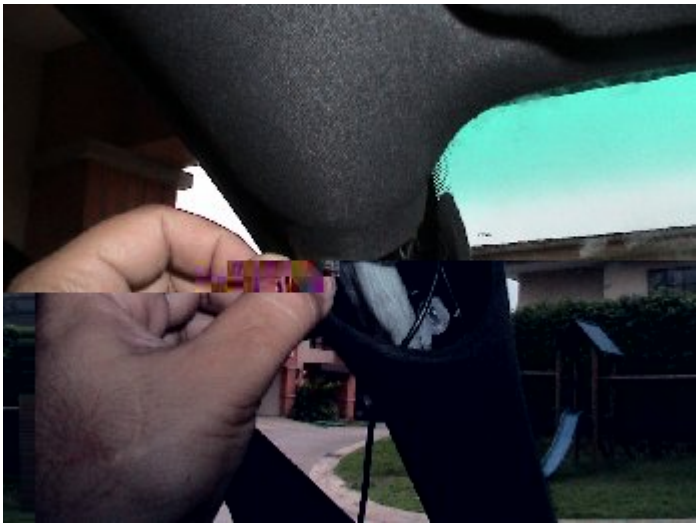
Important note: the IR cable is terminated on one end with the IR eye and the other end has a right-angle 4 prong proprietary connector that goes into the DVD changer. The eye and the connector are both too big to be able to fish through the little openings in the headliner and the carpeting, so we need to remove one of the ends – in this case, the connector needs to be taken apart.

Use a flat-head small screwdriver to pop the cover of the connector. This will expose the back side of the wires. The prongs in that connector are very, VERY fragile, so you would need to use needle-nose pliers to pull

them from the plastic portion of the connector. At this point it is your decision if you wish to tape those 4 connectors back or even cut the wire for future resoldering of those connectors – I pulled mine back and broke two of the pins during "fishing" of the wire. In hindsight, I would probably cut an inch of the wire along with the connector, fish the whole thing from the front of the car to the back and then resolder the same pins back onto the cable and reinsert them into the connector housing. This way I would not mess up original pins and will have the correct pinout of the cable as I would have been pulling the wires one at a time.

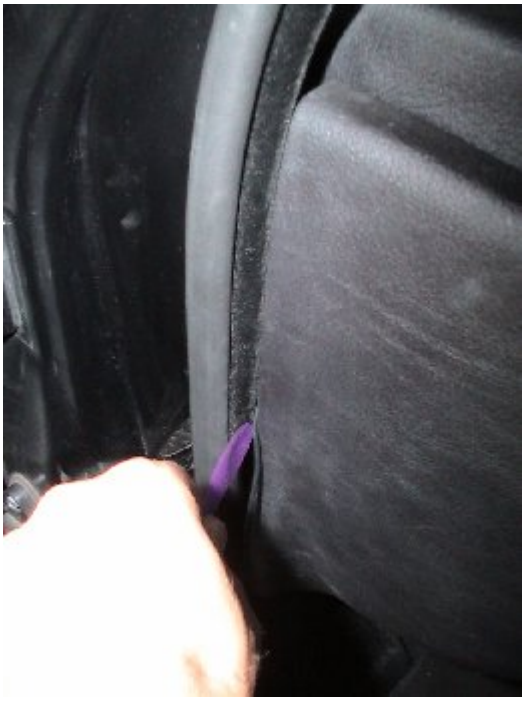
In my case, I have taken some digital pictures of the connector so I could reinstall the correct pins to the proper locations. Also, I had some pins from Digi-Key (part # WM2515-ND) around the house for various projects (must-have if you are doing projects on your bimmer), so I was able to replace the broken pins with my own.

First, I took the dome light in the front of the car out by prying it out with an old credit card. Once the light is out, it exposes the two star screws that need to be removed. Then open the glasses holder, it has two more of those screws – remove them too. That will drop the whole overhead console off the ceiling – it still will be held by a bunch of wires that you might have, like the garage opener, microphone, sunroof switch…



At this point I fished the IR cable into that opening from the mirror side. Then I fed cable back out from the headliner and tucked the cable along side to the left A-pillar. Technically you could just tuck the cable from the mirror side all the way to the left A-pillar without removing the overhead console but I wanted to make sure that that cable will not wiggle out from the headliner while driving. When you are in the overhead console space, you can zip tie the cable to other wiring and thus insure that the cable will not jump out during hard cornering.

Then I removed the “HPS” plastic cover on the A-pillar trim, exposing a star torx screw.
After removing that screw I pulled gently but firmly on the trim and it dislodged the pins from the holding holes. That allowed me to route the IR cable UNDER the head airbag (don’t worry, it will not go off). You have to make sure that the cable is NOT on the way of the potentially expanding airbag. Route the cable down the A-pillar and then tuck in between the door and the dash trim using the same old credit card. The cable should be completely invisible.
Line up the pins on the A-pillar trim and push in, the pins should snap back in. Make sure that they are all snapped in by pushing along the length of the trim (have a digital pictures of the trim before you start working to insure that the trim is back to its original position).



Continue routing the cable under the sound insulation trim along side the door edges. On this picture, the cable is being tucked in the area where the door hinges are, under the velvety tube insulation.

Pull on the door sill, it will dislodge the pins and will allow you to pull the door sill completely out. Route the cable under the door sill into the B-pillar.

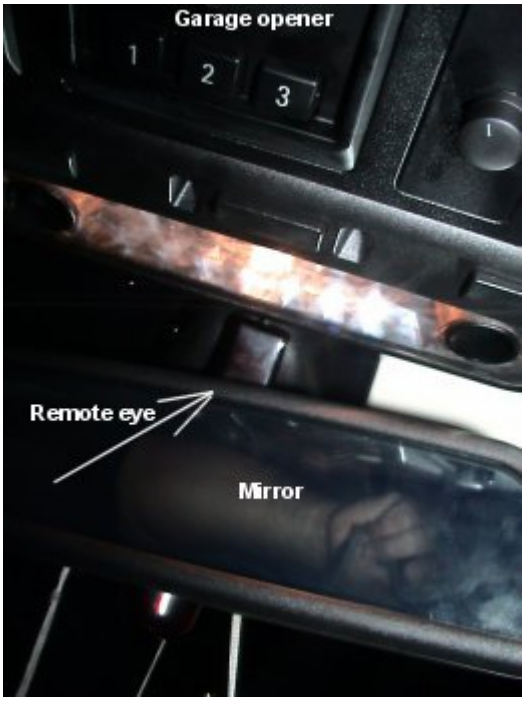
Go to the back door and pull on the rear door sill. To route the cable under the bottom of the B-pillar trim use the same old credit card; you may pull the B-pillar trim at the bottom just enough to tuck the cable under.

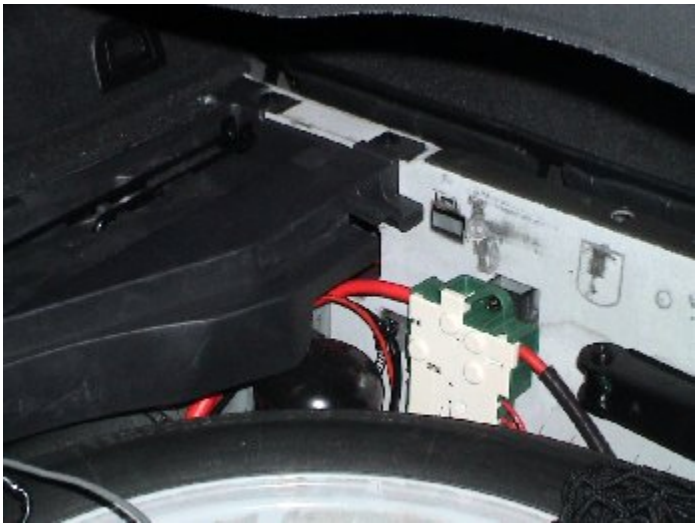
At this point you can reinstall the front door sill back – align the pins and push them in. Make sure that the grooves on the right side of the sill are in the grooves of the bottom of the B-pillar trim. Once you aligned the pins and the holes, just push in and the pins will snap into the holes.

Now you need to remove the back seat bottom, to continue the cable routing.

Pull up on the left side of the seat (if there were a person sitting in the left part of the seat, the location of pulling force would be between the persons legs), this will dislodge the blade holder on the left side. Do the same thing on the right. The seat will come lose and will be able to pull it out of the way – the seat will not come completely out as the seat belts are fed through the hole in the seat thus holding it attached to the car. Just put it to a side out of way.

Route the cable along the edge of the door and under the seat. Open the trunk lid and remove the trunk floor and the spare wheel cover. In the back, closer to the seats, you will some cables going into the car under the seat. Take the metal coat hanger, straighten it to your likening and gently poke for the hole where the red power cables are entering into the hole – the grommet is big and the coat hanger should just come out on the seat side. Tape or otherwise attach the IR cable to the coat hanger and gently pull the hanger back into the trunk. At this point you have the cable end in the trunk.





Then line up the pins and the grooves of the door sill and push the sill back into its place – make sure that everything snaps back together as it was before. Then take the seat and line it back, push it as far back into the back of the seat as it will go, fish out the middle passenger's seat belt buckle and feed it

through the opening in the seat and then press hard (sit on it) onto those two spots where the blade holders are on the seat. They should snap in place.
At this point you have the IR cable in the car and you don't have to do anything else in the front of the car (unless you are wiring something else). You would need to neatly route the IR cable to the area of the CD changer in the left side of the car and reconnect that angle connector back to the cable. Let it go for the time being.

This concludes the wiring of the IR cable

Installing the TV-in-motion harness

At this time I disconnected the blue connector from the Nav computer and connected it to the blue connector of the TV-in-motion harness and then connected the other end of the harness to the other blue connector – in other words, I inserted the TV-in-motion harness between the TV module's blue connector and the Nav computer. No tools needed, just plug-n-play.

This concludes installation of the harness

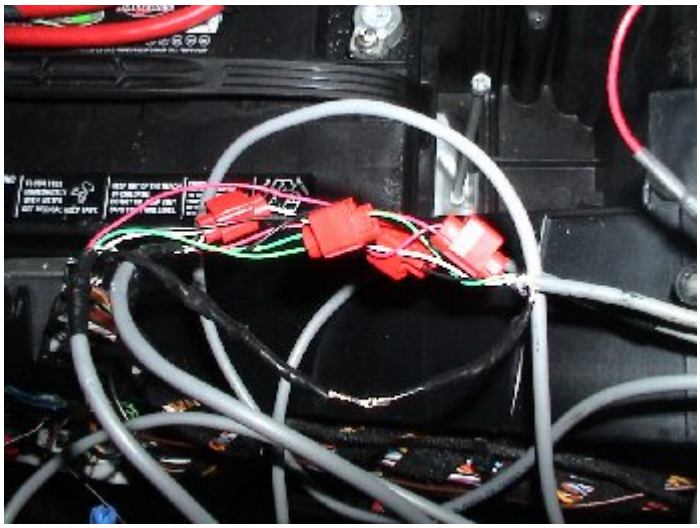
Installation of the AV cable

Now, if you have a long enough old RCA cable with one video and one audio plug, we are ready to make the connection to the TV module. On the TV module, there are two plugs, one is blue and the other one is white. The blue plug is mostly data and the white plug is mostly AV. We need to run 4 wires into the white plug for video (+) and (-) and audio (+) and (-). The DVD outputs are stereo and the TV module audio input is mono, so we need to combine the output audio signal into a mono signal by using the Y-adapter, Radio Shack part # 42-2535. I also used the right angle phono adapter to reduce the space usage on the back of the player for easier mounting.
The RCA cable needs to be neatly routed from the left area of the trunk to the battery compartment where the TV tuner is installed in a factory location. The cable routing needs to be done in a neat manner.

The other end of the AV RCA cable will need to have the Digi-Key pins (part # A28327-ND) terminated onto the Video (+) and (-) and Audio (+) and (-) leads of the RCA cable.
Those pins are going to white plug X18806 on the TV module:
Video (+) to pin 6
Video (-) to pin 15
Audio (+) to pin 4
Audio (-) to pin 5

All cabling needs to be routed in a neat manner, zip ties used to secure the cables to prevent them from rattling and moving and possibly getting damaged during driving. In my particular case I have used the Belden cable instead of an RCA cable and I have terminated the

RCA phone jacks on one end of the cable to go into the DVD changer. I actually spliced the other end into my other Belden cable that I had from the AV IN/OUT plug installation in the rear center console – I had the AV IN/OUT before I got the DVD player and had it all wired up already into the AV IN/OUT of the TV tuner.



UPDATE 7/7/2007

Also, in my case, since I spliced into another cable of mine, I decided to solder the splice site (I had tap-ins for several weeks). Soldering reduced the bulge that I had on the splice site, and now I can be reassured that I will not lose a contact over a hard bump on a road.

END UPDATE

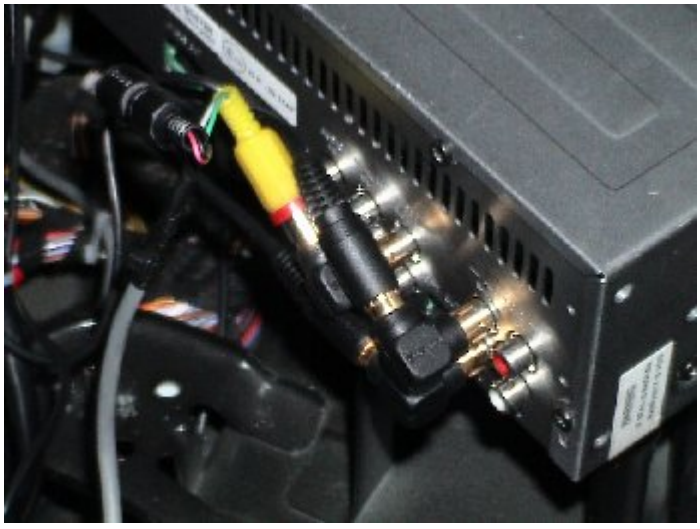
Initially, at the test run, the engine noise was heard in the speakers. Grounding of the drain wire of the Belden cable has resolved this issue.

UPDATE 7/7/2007

The whine has returned. To completely eliminate the whine, we need to either use Ground Loop Isolator (GLI), to isolate electrically the alternator which is a source of whine (I have GLI already) or use magnetic shielding that will prevent the induction of the AC currents in the signal and power cables. I used the non-adhesive magnetic sheets of paper from McMaster.com, part # 5756K31, cut in strips and wrapped around the cabling and secured with regular electrical tape. At the end of the tape wrap I used wire zip tie to prevent the tape from unwinding in the future, when the adhesive properties of the tape will give in due to age. This procedure seems to have eliminated the engine whine.

END UPDATE.

This concludes the installation of the AV cable



At this point we should have all the wiring routed from various parts of the car to the left part of the trunk where the DVD changer will be mounted.

Installing the PIE adapter

The PIE adapter has three connectors, one is for the IP-Bus that is connected via supplied IP-Bus cable to the DVD changer, and the other two connectors are connected to the 3-pin and 6-pin connectors from the car. The adapter is neatly tucked away and secured with a zip tie.

This concludes installation of the PIE adapter

Connections

Connect the 6-pin Molex connector of the power cord to the power port of the changer.
Connect the 4-pin IR extension cable to the IR port of the changer
Connect the IP-bus plug into the IP-bus port of the changer
Connect the right angle plugs into the FR and FL audio outlets and into the Video 1 outlet of the changer. Then connect the Y-adapter into the audio outlets and connect the RCA cable from the TV module to the single audio output of the Y-adapter and into the right angle phone adapter of the video outlet.

Mounting

My mounting solution sucks, so don't follow my lead.
I was not able to make a successful and clean modification to the bracket: the changer is secured on one side with the provided bracket and not on the other side. Also, the changer is sitting crooked, so the install, while electrically and electronically is a success, is not as clean mechanically. If anyone on this board is able to complete the task, I would love to see and to learn from that experience – please post your findings.

Operation

Once you turn the ignition key into the ACCESSORY position and beyond, the AV system in the car should come alive – the radio, the TV tuner, the DVD player, the screen. If you have a CD or a DVD in the DVD changer, and the head unit is in CD mode, the sound from the DVD changer will come on. If you have a video DVD, you will get the funky music from the movie menu, otherwise, you will get the normal music playback.
As TV module is an OEM hardware, the Nav screen would show an available option "TELEVISION". Once you choose that option, you will get the TV picture from the tuner with a local channel on the screen.

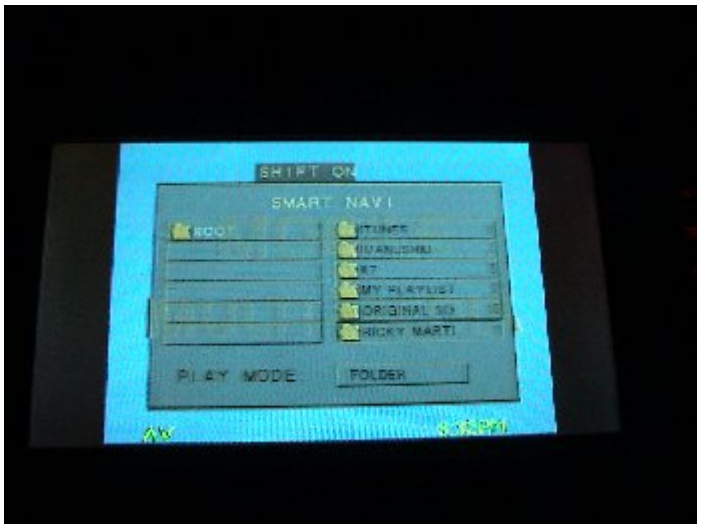
As you turn the right knob, it presents you with a list of available channels, if any, and also gives an option for “AV”. Once you choose AV, the feed from the DVD is showing up on the screen.

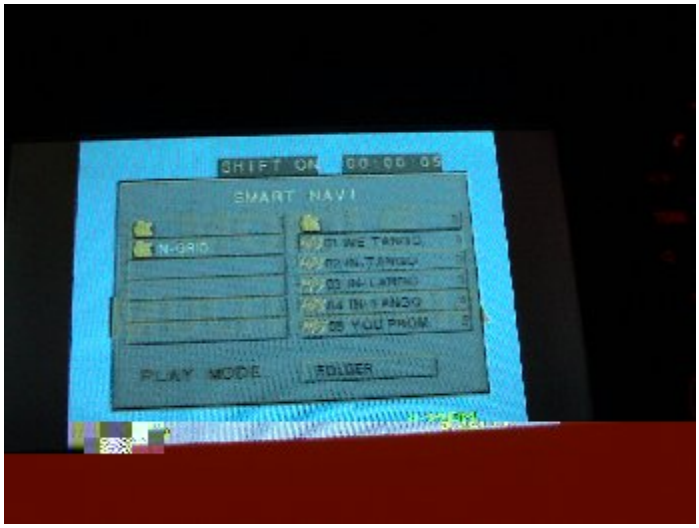
At this point you just use the remote control from the DVD player to choose your disk, your MP3 playlist, etc…

The AV option provides you with mono sound only.
To actually have the stereo sound, from the initial screen with various options, use the MODE button to select the playback from CD. The screen will show the CD number and the track that you can change as with a normal CD changer. Please bear in mind, that the car controls are designed to control the CD playback – the video DVDs normally have the movie menu screen that gives you options of its own. In this case, if you choose a DVD disk, the sound that you will hear will be of that movie menu screen (you’ll hear the sound but the screen shot isn’t visible yet as you have the main navigational screen menu for the DSP, Navigation, Television, etc..). Once you have the audio source playing, then you would need to press and hold the “clock” button on the right side of the screen and this will bring the “muted” video screen on. Please consult the TV-in-motion harness’ manual to activate this function.

Essentially, you have the video coming via the TV tuner and the audio coming from the CD changer inputs, giving you the full stereo effect with the video output. At this point you control the DVD in accordance with the changer manufacturer’s manual.
The DVD changer is capable of playing the CDs, no visible change in functionality or operation of the system from stock CD-player. No remote control is needed in this type of operation
When the DVD changer is playing CD or a DVD with MP3 files, the first 11 characters of the folder name and of the file itself are displayed in the computer-like manner: the root folder to the left, and the next folder or file to the right.

When the DVD video is played, the menu screen is up and the choices are made using the DVD menu.
The DSP is fully functional with this setup. During the MP3 playback you can choose the equalizer bars or, if you are in CD mode, even a picture of a local TV station by selecting the “clock” button and a TV channel.





Expansion

This changer has two video outputs, VIDEO 1 and VIDEO 2, and two sets of audio out – Front Left, Front Right, Rear Left and Rear Right. During our installation we used up VIDEO 1 and FL and FR outputs, this leaves the VIDEO 2 and RL and RR available. The IP-Bus port also has the Left and Right audio channels that are piped into the CD inputs. These second sets of Audio/Video outputs are available for possible wiring to the rear screens only (this way I will still have the movies played in the back with sound coming via the IR headphones and the Navigational system operational for the front and a radio tuner and a tape, since the CD/DVD channel is taken by Barney, The Pink Monster). The DVD changer can’t play two disks simultaneously☺. In this case the rear screens are connected to the changer in a stand-alone fashion. See Figure 6.
The DVD changer also has video and audio inputs for other AV sources, should you decide to have something else connected and this AV input is wired inside the car to the rear passenger area under the right front seat, in case if my passengers wish to play their source, please see Figure 7.
The IP-bus adapter also allows connection of other IP-bus devices, such as XM-radio tuner, with a pass-through port and an iPod adapter that also has a pass-through port. This set up allows daisy-chaining the IP-bus devices and control and operation of the devices from

the BMW factory head unit. The DVD changer is an end IP-bus device, as it does not have a pass-through port. See Figure 8
iPod adapter will require routing of the iPod dock connector to the area of your choice. I would suggest using Pro-Fit International's mounts that do not require drilling of the dash for the installs.
No splicing except for the supply of the power to the devices.
All of the active components will require supply of switched and unswitched power and ground.

Conclusion

The goals set above are met, the system allows future expansion, splicing kept to a minimum.
I did not need to install a new radio unit for the use of the AUX input as I recycled the CD changer input thus realizing some savings.
The DVD changer is capable of playing Double Layer MP3 DVDs, that is about 9G worth of music. And if you have double sided, double-layered DVDs for 18G of storage. Multiplied by six disks… Wow…
So, I have the ability to play the MP3 without investing into dedicated hardware that only plays MP3 (iPod), instead I can watch movies, play MP3 and still listen to CDs that my passengers might want to play while in my car.
The introduction of the PIE adapter allows for the connection of the additional AV equipment, including the video iPod – in this case, the video out would need to be routed to the AUX video input of the DVD changer. This way in theory, I have not locked myself out of using an iPod, either an audio or video model, see Figure 8.
This set-up would allow anyone with a screen in the front of the car and a TV tuner get the DVD capability and the MP3 capability without much of the fuss.
I can speculate that a car without an LCD screen still would be able to utilize the DVD changer for limited use – obviously, no video in the front on the OEM head unit, but a possibility of MP3 playback right through the OEM system. This is only a speculation, as I did not try it out and I have no means of trying it out.

This particular setup worked for me, if you embark onto this installation, you are doing it at your risk – I can not and will not be held responsible for any damage caused to your vehicle and/or equipment. You can get in touch with me at the bmw@midnightstar dot com if you have any questions – I will try my best to answer. I travel a great deal, so I might not be able to reply in timely manner but I sure will try to.

As I continue to tweak the system, I reserve the right to add new pictures and otherwise update this write-up. A most current copy of this PDF file is also available at www.midnightstar.com/bmw

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Below are the block diagrams for the install

APPENDIX A

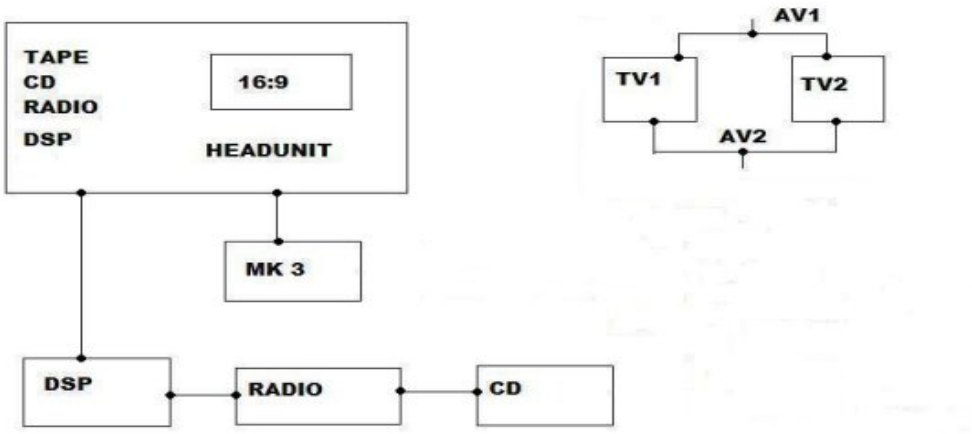

Figure 1 This is the initial block diagram for the car

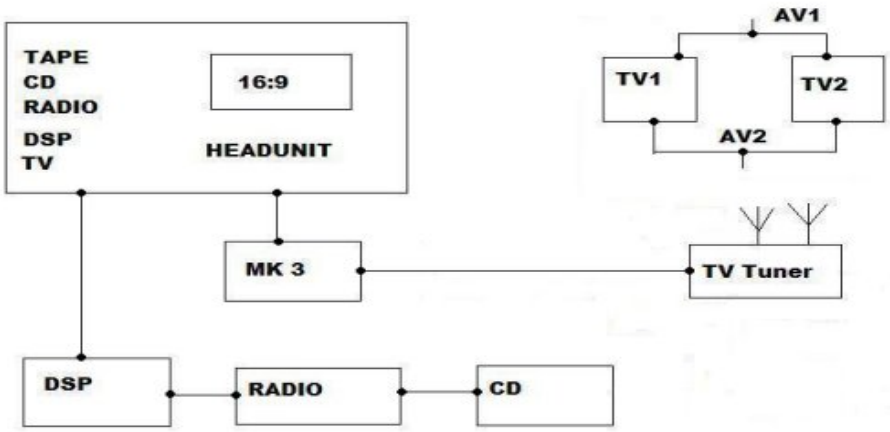

Figure 2 TV tuner is added

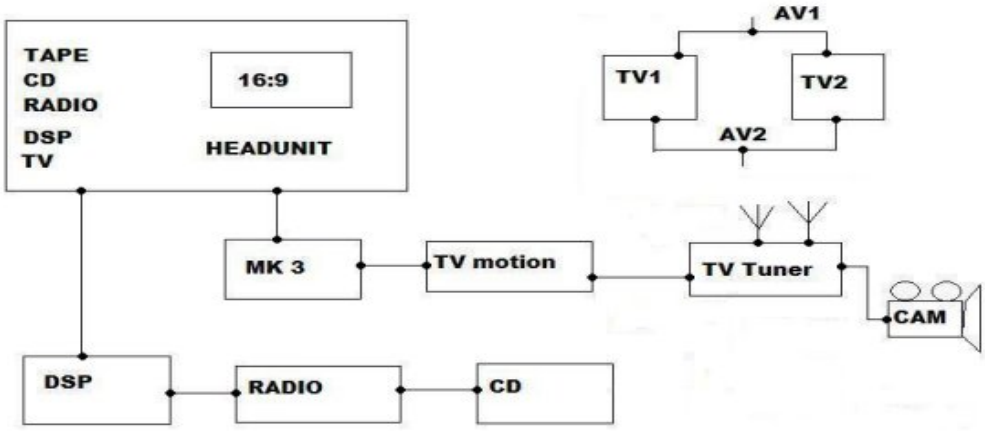

Figure 3 Reverse camera and a TV-in-motion harness are added

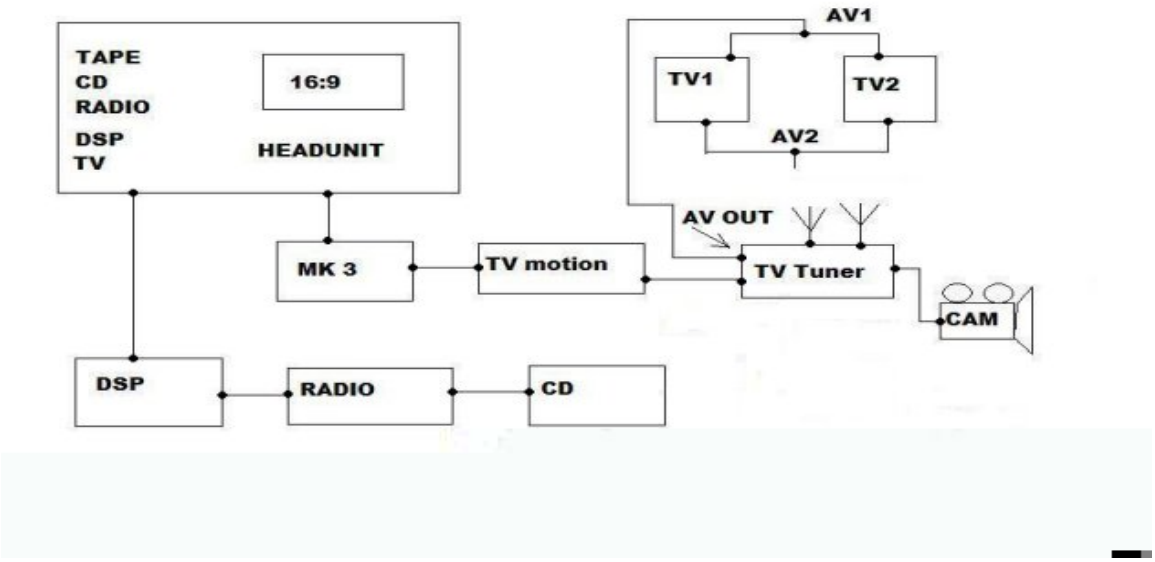

Figure 4 AV out is connected to the rear screens

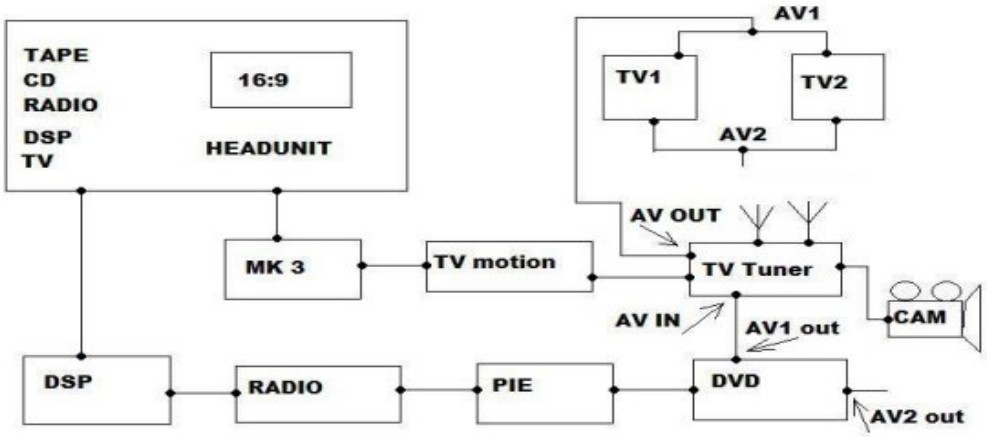

Figure 5 CD changer is removed, PIE adapter is added, DVD changer is installed and connected to AV in of the tuner

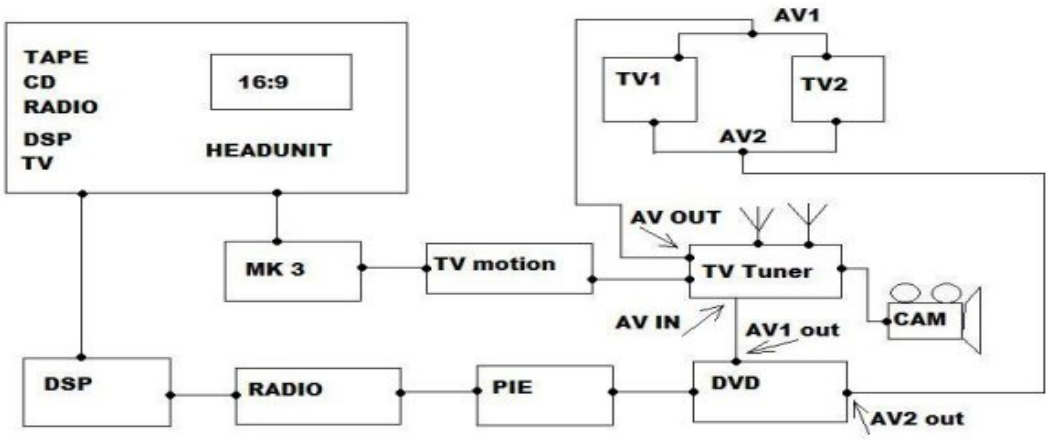

Figure 6 AV2 from the DVD changer is connected to the AV2 of the rear screens.

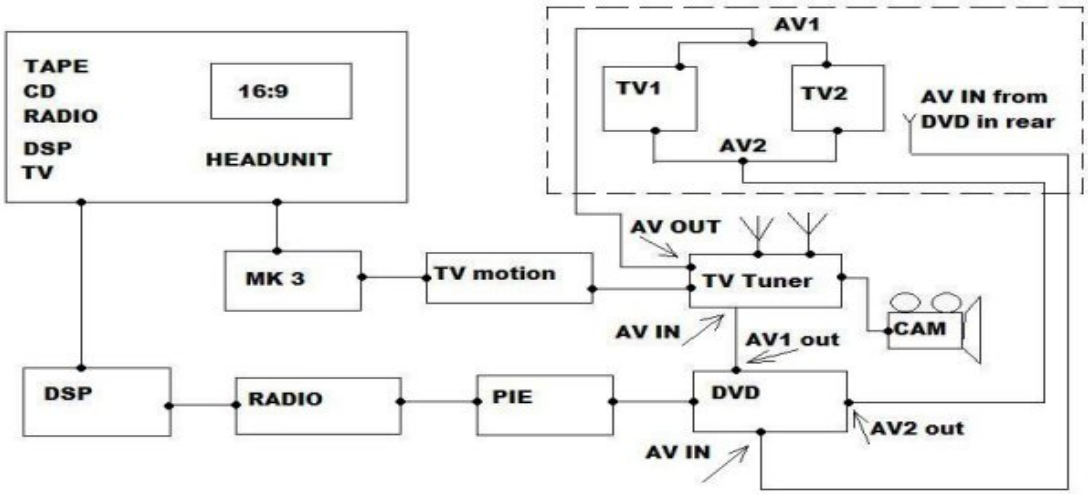

Figure 7 AV IN to the DVD changer is routed to the rear seat area

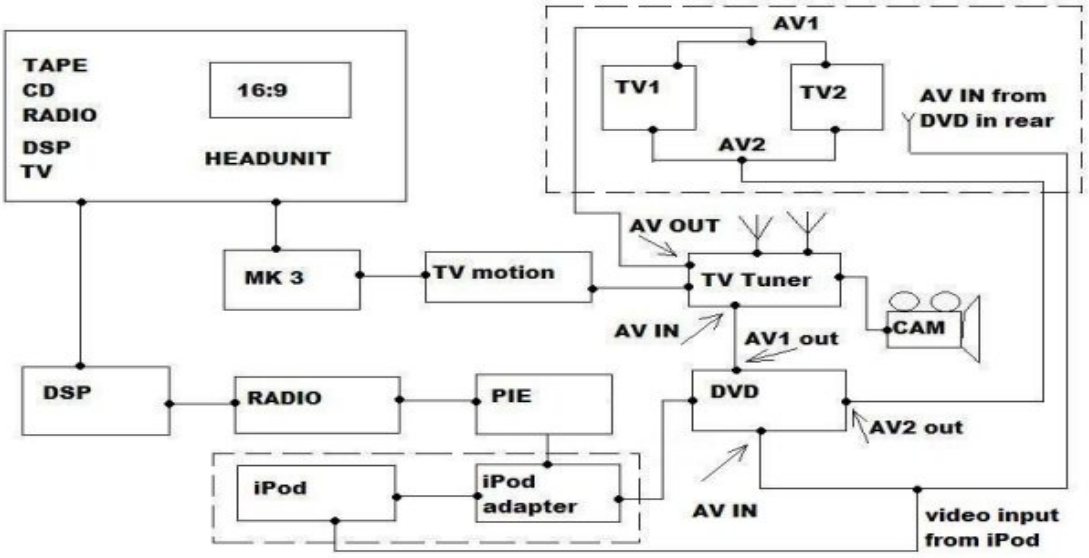

Figure 8 Possible connection of iPod adapter and an iPod to the system