



PORSCHE



PCM 3.X Overview

PCM 3.X Overview



The goal of this document is to provide a better understanding of PCM system operation.

This document has been created using multiple sources of information, many of which are available to the technician already.

In addition to using source material available to technicians, this document draws on the knowledge and experience of the Technical Support Group within PCNA.

Contents

1. System overview	6
1.1. Head unit	7
1.1.1. Hardware versions	7
1.1.2. Software versions	8
1.1.3. PCM connections	9
1.1.5. Enabling codes	10
1.2. Navigation	12
1.2.1. Navigation map data	12
1.2.2. Tequipment updates	15
1.3. Bluetooth® handsfree and telephone module	17
1.3.1. Bluetooth® handsfree	17
1.3.2. Telephone module	18
1.4. XM Radio	19
1.4.1. Traffic and data services	19
1.5. Multimedia interface, Bluetooth® audio, Aha Radio, and Jukebox	20
1.5.1. Auxiliary	20
1.5.2. USB and iPod®	20
1.5.3. Jukebox	20
1.5.4. Aha Radio	21
1.6. Instrument cluster	21
1.7. Antennas	21
1.7.1. Antenna amplifiers	21
1.7.2. AM / FM antennas	23
1.7.3. XM antenna	23
1.7.4. GPS antenna	23
1.7.5. Telephone antenna	24
1.8. Audio amplifiers	24
1.8.1. Burmester	24
1.8.2. Bose	24
1.8.3. ASK	24
2. Glossary	27

1. System overview

PCM 3.0 was introduced with the 2009 Sports-cars and Cayenne. PCM 3.0 includes a color touchscreen interface and the following (optional) functions built in to the head unit:

- Touchscreen interface
- CD changer
- Navigation
- Telephone module
- Bluetooth® mobile phone prep
- Logbook
- Voice control
- Universal Audio Interface (external)
- XM Radio (SDARS)
- Sport Chrono Plus
- BOSE Surround Sound System (external)

PCM 3.1 was introduced with the 2010 Panamera, 2011 Cayenne, 2012 Sports-cars, and 2015 Macan. PCM 3.1 is similar in operation to the PCM 3.0 with the following additional (optional) features:

- High resolution display
- 3D Navigation with Speed limit information
- Map functions in the Instrument Cluster
- Bluetooth® Audio (A2DP/AVRCP) streaming
- XM Data Services
- Burmester Surround Sound System (external)

PCM 3.1 was updated during the 2012 model year for all models with the following (optional) features:

- HD Radio®
- Start Screen

PCM 3.1 was updated during the 2013 model year for all models with the following (optional) features:

- Aha Radio (Online services)
- Jukebox
- Email and Text message support

1.1. Head unit

The main component of the PCM system is the head unit. Hardware for many of the various options is contained directly within the head unit. Some options can be retrofitted into a vehicle via Tequipment offerings if it was not originally equipped. Please reference the PIWIS Information System for a list of what is available as it varies by model and year. If a specific item is not listed in the Tequipment catalog; a retrofit is not supported.

The hardware and capabilities of the PCM system have evolved over time. While the head unit from a 2010 Panamera may look similar to a 2014 Panamera, the hardware, software, and capabilities are different.

1.1.1. Hardware versions

PCM 3.0 was launched in 2009 for Sports-cars and Cayenne.


During 2011 MY, version 2 was released for Sports-cars with improvements in mapping, navigation, and internal hardware.

PCM 3.1 was launched in 2010 for Panamera including new features such as a new display, 3D Navigation, mapping in the Instrument Cluster, Bluetooth® Audio streaming, and the Burmester Surround Sound system.

During 2010 MY, version 2 was released for Panamera including a revised iPod® / Multimedia interface.

During 2012 MY, version 3 was released for all variants including improved hardware, Start Screen support, and HD Radio®.

During 2013 MY, version 4 was released for all variants including new features such as Aha Radio (Online Services), Jukebox, and Email / Text.

 Later PCM hardware versions cannot be retrofitted into earlier vehicles. Incompatibilities in navigation software and enabling codes will lead to loss of functionality. When replacing a PCM, the correct hardware version must be ordered by VIN.

1.1.2. Software versions

There are multiple software levels for PCM 3.0 and PCM 3.1. When running a “standard” update for a PCM as specified in WM 911049, a PCM will only update to the highest version within its current level. In other words, a PCM 3.1 at software level 2.44 will update to 2.47, and not to 4.73 with update disc WKD 952 800 15.

You will find the latest software update discs listed in the PIWIS Information System WM 911049 and also published in Special Tool Bulletins. The Special Tool Bulletins are both posted to PPN and to the Document Repository.

PCM 3.0 has 2 major software levels that generally correspond to hardware changes:

	HW Version 1	HW Version 2
PCM 3.0 SW Level 1.X	2009-2011	
PCM 3.0 SW Level 2.X		2011-2013

PCM 3.1 has 4 major software levels that generally correspond to hardware changes:

	HW Version 1	HW Version 2	HW Version 3	HW Version 4
PCM 3.1 SW Level 1.X	2010			
PCM 3.1 SW Level 2.X		2010-2012		
PCM 3.1 SW Level 3.X			2012-2013	
PCM 3.1 SW Level 4.X				2013-

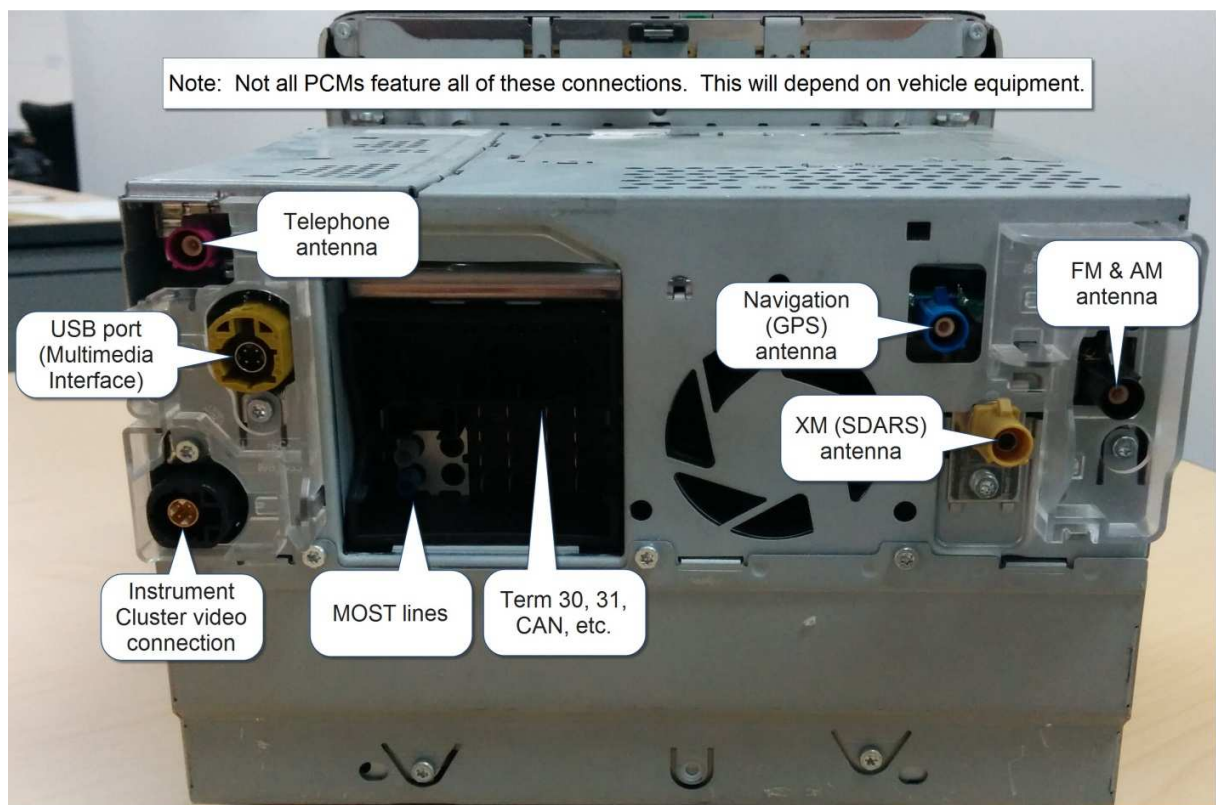


A PCM should not be updated from one software level to the next unless a Tequipment Navigation Update is being performed. Incompatibilities in the software levels will render Navigation non-functional if such an update is carried out without the appropriately purchased Tequipment update.

1.1.3. PCM connections

The head unit is built in a “modular” fashion, allowing the same package to house multiple different options and configurations. Shown below is the rear view of a PCM 3.1 with all connections annotated. A PCM may not have all of the pictured connections.

Please note that not all shielded connections to the PCM have dedicated connections. Microphones and AV inputs (reversing camera) are contained within the main wire harness connector.



1.1.5. Enabling codes

Several PCM features are enabled by enabling codes specific to each VIN. The enabling codes are provided for factory-installed equipment or Tequipment retrofitted equipment. The enabling codes can be found in *PPN >> PIWIS Information System >> Vehicle Code Information* for users with access rights (refer to the “PIWIS Vehicle Code Request Form” found in the Document Repository).

The VIN specific enabling codes must be entered with the PIWIS Tester:

- **9PA PCM 3.0** enabling codes are entered in Drive Links.
- **9X7 PCM 3.0** enabling codes are entered in Coding/Adaptations.
- **All PCM 3.1** enabling codes are entered in Maintenance/Repairs



If the message “**Negative response**” is displayed when entering a PCM enabling code then it is recommended to recode the complete VIN in the PCM under the menu *PCM >> Extended identification >> VIN*. Then try the enabling code(s) again. Performing a Read/Write on the PCM during control unit replacement will often times only enter a Short VIN in *Extended identification*. The full VIN must be entered before functions can be enabled.

Here is a short description of PCM 3.x enabling codes:

Bluetooth®: enables Bluetooth® functionality. This is entered in the PIWIS Tester enabling codes as “Bluetooth® mobile phone prep”.

Navigation: enables Navigation functionality. This is entered in the PIWIS Tester enabling codes as “Navigation software”.

Navigation maps, North America (as at vehicle delivery): allows North America navigation maps to be loaded onto the PCM. This is entered in the PIWIS Tester enabling codes as “Navigation map data, North America”.

SDARS: enables the Satellite Digital Audio Radio Service (i.e. XM Radio). This is entered in the PIWIS Tester enabling codes as “Digital radio tuner”.

UAS (Universal Audio Interface): enables the Aux/USB/iPod® input. This is entered in the PIWIS Tester enabling codes as “UMS USB connection, ipod®”.

Sportchrono MMI: enables the Sport Chrono interface. This is entered in the PIWIS Tester enabling codes as “Sport chrono”.

Individual Memory: enables the Individual Memory feature. This is entered in the PIWIS Tester enabling codes as “Individual Memory”.

Logbook: enables the optional Logbook feature. This is entered in the PIWIS Tester enabling codes as “Logbook”.

Voice control: enables the Voice Control feature. This is entered in the PIWIS Tester enabling codes as “Voice control”.

HD Radio: enables the HD Radio feature. This is entered in the PIWIS Tester enabling codes as “HD Tuner”.

Start Screen: enables the vehicle specific start up screen. This is entered in the PIWIS Tester enabling codes as “Feature Level”. **Note:** This enabling code may be listed in PPN even if the PCM is not capable of displaying the Start Screen. This is only functional if the PCM is version 3.xx or later.

Online Services: enables the Aha Radio Service. This is entered in the PIWIS Tester enabling codes as “Online Services”.

1.2. Navigation

Depending on the model type and year, navigation may be standard or optional equipment. The hardware (except antenna) is contained within the PCM. The navigation system uses the Global Positioning System (GPS) to calculate the current location. This system utilizes a network of satellites to triangulate the vehicle's location. A clear unobstructed view of at least 4 satellites is required to triangulate the vehicle's position. The stored map data then utilizes the location information for mapping and directions.

With the introduction of PCM 3.1, mapping functions are also available within the Instrument Cluster display. There is a direct connection to the Instrument Cluster for this purpose.

Over time, the navigation system and the corresponding map databases have been improved with new features. For this reason, newer software and map data may not be directly compatible with older head units. Please refer to the relevant Tequipment bulletins for pricing and requirements to update an older PCM 3.X to the latest map data.

1.2.1. Navigation map data

For all PCM 3.X units equipped with navigation, navigation data is preloaded in the PCM prior to delivery of the vehicle to the dealer. This map data can be updated at a cost to the customer via Tequipment updates as new map data is made available (typically on a yearly basis).

In the event a PCM requires replacement, the *"map data as at vehicle delivery"* must be loaded into the replacement PCM, unless the customer had previously purchased a Tequipment update.

The PCM can be updated after the vehicle is delivered with the latest maps available for purchase through Tequipment. If an update has been purchased for a vehicle, this updated map data must be loaded into a replacement PCM. This data can be loaded directly; it does not require the *"maps as at vehicle delivery"* to be loaded first.

The map data version information that was loaded into the PCM during production is stored in the PIWIS Information System. This information can be used to locate the correct map data to load into a replacement PCM. Select *Vehicle Information* in PIWIS:

WM TI SY TEQ WD OWM LO DC SIT >>

Information media — WM - Workshop Manual

Current vehicle:

Model range	Model year
92A	2012 - C

Main group: 9 Electrical system
Repair group: 91 - Radio, stereo, telephone, on-board computer

Document title

(TI) 9110 PCM3.1 Cannot be Activated During "Vehicle Handover to the Customer" (67/13)
911019 Removing and installing PCM 3.1 display and operator control unit
New (SY) 911049 Eliminating symptoms in body interior: PCM3.1 integrated system: Complaints
911055 Replacing PCM
911319 Removing and installing GPS antenna
911719 Removing and installing TV tuner
911755 Replacing TV tuner

When the new screen opens, scroll down to "PCM software version, maps (as at vehicle delivery)". In this example, the software is 7PP.919.193.AR. This number is the software version number of the maps. This is not a Porsche part number. This number can be used in PET to verify the Porsche part number of the map data loaded at vehicle production.

Electrical system/electronics specifications	
transfer box serial number	81296274
driver's belt pretensioner	4SUR73NRP
passenger's belt pretensioner	4SUR73NRP
SAT receiver serial number	87952023
airbag control unit hardware version	405
air conditioning regulator control unit hardware version	28
DME control unit hardware version number	402
Park Assist control unit hardware version	408
PCM control unit (head unit) part number	7P527000448
PCM control unit (head unit) serial number	800302132004726
PCM software version, maps (as at vehicle delivery)	7PP919193AR
PCM control unit (head unit) software version	91112750
PCM control unit (head unit) hardware version	91100020

Reviewing the listing in PET, we can see the software 7PP.919.193.AR corresponds to Porsche part number 997.642.273.54. For the vehicle in this example, the map database 997.642.273.54 should be loaded in the event of PCM replacement.

-	997 642 273 52	dvd navigation system for software 7PP.919.193.S	1	I7RS
-	997 642 273 53	dvd navigation system for software 7PP.919.193.AG	1	I7RS
-	997 642 273 54	dvd navigation system for software 7PP.919.193.AR	1	I7RS

1.2.1.1. Navigation software versions

The map data disc sets are sent automatically when they are published (typically yearly). These map data disc sets are shop tools and should not be provided to the customer. For reference purposes, a list of navigation software versions is provided in this table.

PCM 3.0 and PCM 3.1 Navigation Database Information				
Part number	Disc name	Software (as at delivery)		Software (in VAL)
997.642.273.50	Map Data PCM 3.0 – 06.2008	997.642.273.00	7L5.919.193.A	01D30807
997.642.273.51	Map Data PCM 3.0 – 08.2009	997.642.273.01	7L5.919.193.H	01D30922
970.642.273.50	Map Data PCM 3.1 – 08.2009	7PP.919.193.A		01D20908
997.642.273.52	Map Data PCM 3.X – 02.2010	7PP.919.193.S		01D20951
997.642.273.53	Map Data PCM 3.X – 09.2010	7PP.919.193.AG		03D21021
997.642.273.54	Map Data PCM 3.X – 05.2011	7PP.919.193.AR		04D21113
997.642.273.55	Map Data PCM 3.X – 05.2012	7PP.919.193.BK		05D21212
997.642.273.56	Map Data PCM 3.X – 06.2013	7PP.919.193.CC		06D21308
997.642.273.57	Map Data PCM 3.X – 05.2014	7PP.919.193.CM		07D21349

1.2.2. Equipment updates

The PCM can be updated after the vehicle is delivered with the latest maps available for purchase though Equipment. Equipment updates are typically released on a yearly basis. In addition to the latest map data, additional features may be made available depending on vehicle model and year. The Equipment bulletins published in the PIWIS Information System will have details on what is available, pricing, and update instructions.

Equipment updates contain a license key and PCM software update discs. The updates do not contain the map data. Below is an example of the contents of a Equipment update set.



If a vehicle that has previously had the maps updated through a Tequipment update requires a PCM replacement, the correct map update must be loaded. The correct maps can be located in PIWIS - *Vehicle Code Information*:

WM TI SY TEQ WD OWM LO DC SIT >>

Information media — WM - Workshop Manual

Current vehicle:

Model range	Model year
92A	2012 - C

Main group: 9 Electrical system
Repair group: 91 - Radio, stereo, telephone, on-board computer

Document title

- (TI) 9110 PCM3.1 Cannot be Activated During "Vehicle Handover to the Customer" (67/13)
- 911019 Removing and installing PCM 3.1 display and operator control unit
- New** (SY) 911049 Eliminating symptoms in body interior: PCM3.1 integrated system: Complaints
- 911055 Replacing PCM
- 911319 Removing and installing GPS antenna
- 911719 Removing and installing TV tuner
- 911755 Replacing TV tuner

Scroll down to PCM navigation update.

Note that this vehicle has been updated and requires the Porsche part number 997.642.273.56 to be loaded into a replacement PCM. The "maps as at vehicle delivery" does not have to be loaded before this disk is loaded.

Generate activation code

- - - -

Check Licence key

Activation codes stored for navigation updates for the vehicle

Description/part serial number/TEQ part number:	enabling code
<input type="checkbox"/> NA6.2013 / 99764227356 / 95804490251	

1.3. Bluetooth® handsfree and telephone module

The PCM supports both an optional internal telephone module and optional Bluetooth® connections to customer supplied mobile phones. These functions can be present together or separately; having one option does not require the other. These options are available for purchase within the Tequipment catalog.

The PCM can store phonebook contact information directly within the PCM. A maximum of 2,500 phone numbers may be stored. If there are multiple phone numbers for each contact, the total number of contacts that can be stored will be less.

1.3.1. Bluetooth® handsfree

The optional Bluetooth® mobile phone preparation is installed directly within the PCM and requires no additional hardware outside of the head unit beyond a microphone and wiring.

Bluetooth® connections rely on the mobile phone for placing the phone call directly through the phone itself. The PCM does not directly handle the mobile network connection. As such, call quality and reception are dependent on both the mobile phones connection to the network and the Bluetooth® connection to the PCM.

The PCM supports storage of up to 5 separate Bluetooth® device connections. Only 1 device may be paired for mobile phone operation at a time.

On some model types, it is possible to have a Bluetooth® connection available without a mobile phone preparation (for downloading of logbook data for example). Always check the vehicle equipment before diagnosing perceived phone issues.

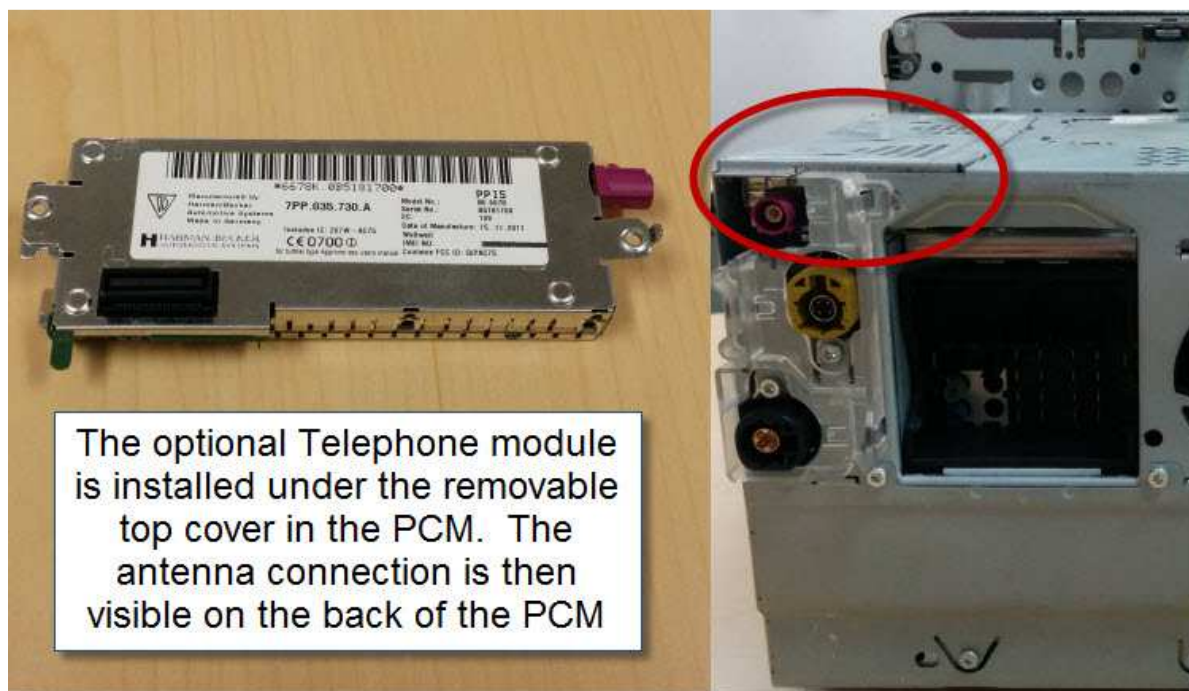
Additional features are available in later models including Aha Radio (Online services), email, and text message support. These features are not supported by all mobile phones; please refer to the PCM operator's instructions and documentation for the mobile phone for additional details.

Additional information regarding Bluetooth® audio streaming is covered in the *Multimedia Interface, Bluetooth® Audio, Aha Radio, and Jukebox* section of this document.

1.3.2. Telephone module

The optional telephone module is installed directly into the PCM head unit. The module utilizes an external antenna and microphone within the vehicle.

The telephone module utilizes a Subscriber Identity Module (SIM) card supplied by the customer for mobile phone service. The SIM card slot in the front of the PCM is provided for this service. A mobile phone is then not required to place calls directly from the PCM.



1.3.2.1. SIM Access Profile

If the PCM is equipped with both the Telephone module and Bluetooth® Handsfree, the PCM can utilize SIM Access Profile (SAP) to place calls. This allows a Bluetooth® connection to be established to a mobile phone, the PCM then accesses the SIM card within the mobile phone, and the call is placed through the Telephone module; **not** the mobile phone.

A mobile phone is required for SAP phone calls. The telephone module and vehicle antenna are directly responsible for placing the call. The mobile phone is only used for network authorization via the mobile phone's SIM card.

1.4. XM Radio

XM Radio is a subscription based (at a cost to the customer) radio service broadcast via satellites in orbit over North America. A PCM equipped with the optional XM service has a unique radio identifier that is specific to the head unit. An unobstructed view of one satellite is required for reception.

1.4.1. Traffic and data services

Additional features via further subscriptions from XM Radio (at a cost to the customer) are available. Traffic information is available in select metropolitan areas. The PCM 3.1 navigation system can use this information for dynamic routing based on current traffic information. Weather, sports scores, and stock prices are also available.

1.4.1.1. Transfer XM subscription

If the vehicle is equipped with XM Radio, the XM radio subscription must be activated when a PCM is replaced:

- 1) Move the vehicle outside to an unobstructed area with the engine running and the radio tuned to the preview station
- 2) Contact the SiriusXM OEM Call Center at 1-800-852-9696
- 3) Press '2' for 'Other Inquires'
- 4) Provide the Radio ID/ESN from the original and replacement PCM
- 5) Quality check operation of all PCM features

1.5. Multimedia interface, Bluetooth® audio, Aha Radio, and Jukebox

The PCM supports multiple (optional) external audio inputs both via wireless and wired connections.

1.5.1. Auxiliary

The auxiliary port allows a standard 3.5mm stereo analog audio input to be utilized for playback via the PCM. Depending on the model type and year, the auxiliary port may be mounted in the center console or in the glove compartment.

1.5.1.1. AuxBT (Bluetooth® audio streaming via A2DP/AVRCP)

The Auxiliary Bluetooth® (Aux BT) connection allows for audio streaming from a Bluetooth® device. This connection is separate from the Bluetooth® Handsfree profile used for telephone communication. Depending on the connected devices capabilities, playback controls may be on the PCM or the device. Additional information such as song title is also dependent on the connected devices capabilities. The AuxBT connection can be turned on / off from within the PCM independently from a Bluetooth® Handsfree telephone connection.

1.5.2. USB and iPod®

The USB and iPod® connections allow for digital music playback from an external source. The music playback can be controlled by the PCM from supported devices. Depending on the model type and year, the multimedia interface may be mounted in the center console or in the glove compartment.



A minor revision of the PCM 3.1 in Panamera models has been introduced starting with vehicles produced in March 2010. The optional universal audio interface (I No. 870) will no longer include a separate iPod® connection. Various iPod® and iPhone® models may now be connected via the USB port instead, using the customer's own USB interface cable.

1.5.3. Jukebox

The Jukebox function allows for storage of up to 5,000 audio files (maximum 40GB) and album art in the PCM via the USB connection of the universal audio interface (Note: copying files from iPod® or iPhone® may not be possible due to copyright and licensing reasons.)

1.5.4. Aha Radio

The Aha Radio app enables listening to Internet radio, news feeds, podcasts and audiobooks on the PCM via a smartphone. The PCM can also receive local information, e. g. weather reports. Points of Interest can be searched for and then transferred to the navigation system as destinations. Internet content is received via a smartphone, but is controlled from the PCM. Online services can only be used in conjunction with the universal audio interface (iPhone®) or the mobile phone preparation or telephone module (Android® phones). The Aha Radio app can be obtained from iTunes® or Google Play®.

1.6. Instrument cluster

The Instrument Cluster interfaces with the PCM via CAN networking. Starting with PCM 3.1, the PCM also supplies a dedicated video connection to the Instrument Cluster for additional features such as mapping display within the Instrument Cluster.

Many PCM functions can be directly controlled via the Instrument Cluster and steering wheel controls (via stalk or multi-function buttons if equipped). Some PCM settings are controlled via the Instrument Cluster, e.g. setting the time zone.

1.7. Antennas

The PCM utilizes multiple different antennas for reception. The antennas are located in various positions within the vehicle and may incorporate additional components to improve reception.

1.7.1. Antenna amplifiers

External amplifiers are utilized for AM, FM, and remote locking of the vehicle. Remote locking is not a PCM system, the antenna is connected to the Front Control Unit.

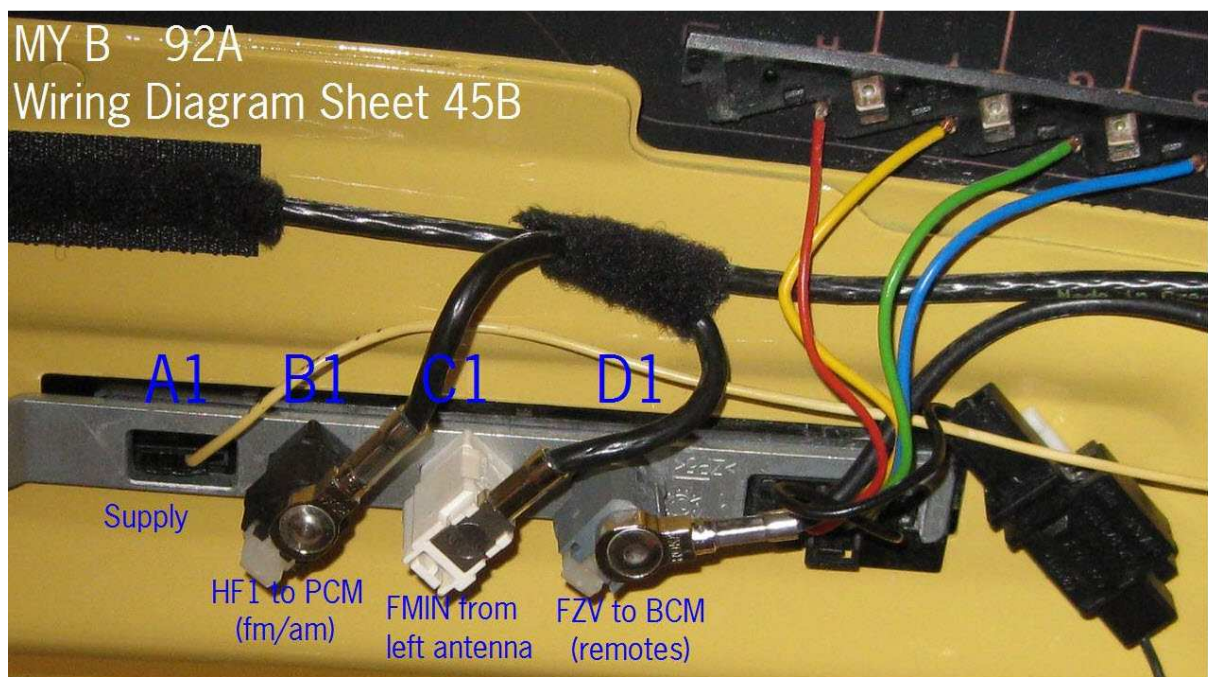
The right side amplifier is shared with the PCM and the Front Control Unit. There are connections for FM/AM to the PCM, remote signal to the Front Control Unit, and possibly a connection to the left antenna amplifier (depending on vehicle type).

The left side amplifier is utilized by the PCM only. There is a connection either to the diversity module or the right amplifier depending on vehicle type for FM signal.

FM signal reception utilizes a diversity system with 3 separate antennas. Depending on the vehicle type, this is controlled via the right amplifier or a separate diversity module. In either case, the strongest signal is utilized from any of the 3 antennas.

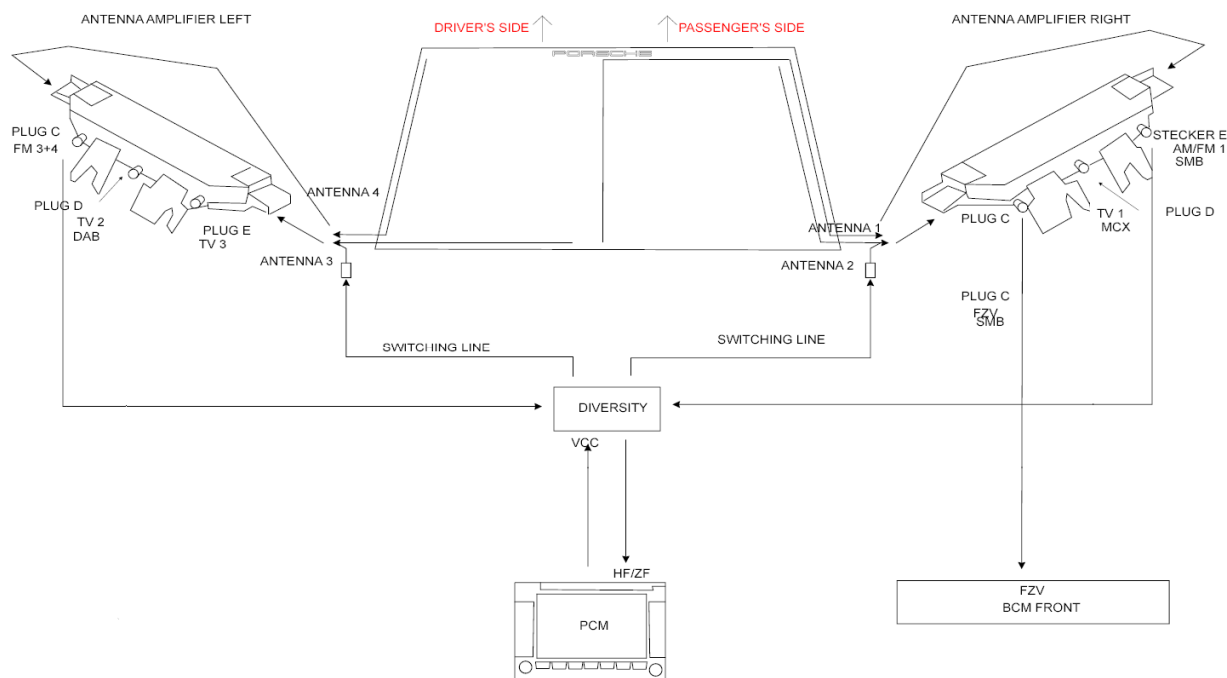
1.7.1.1. Amplifier connections for 92A

The following example is from a 2011 Cayenne. The wiring diagrams do have the connections labelled, although the abbreviation's meaning may not be apparent at first glance. The diagrams can be traced to clarify each signal lead. Other vehicle types are similar but may utilize a separate diversity module.



1.7.1.2. Diversity antenna overview for 9X1

The following was taken from Wiring Diagram sheet 38 for 9X1 vehicles (TV control unit removed for clarity). This block diagram of the diversity antenna system provides a good overview for PCM 3.X. Other vehicle types are similar, although some are located in the rear glass instead of the windshield and may not utilize a separate diversity module.



1.7.2. AM / FM antennas

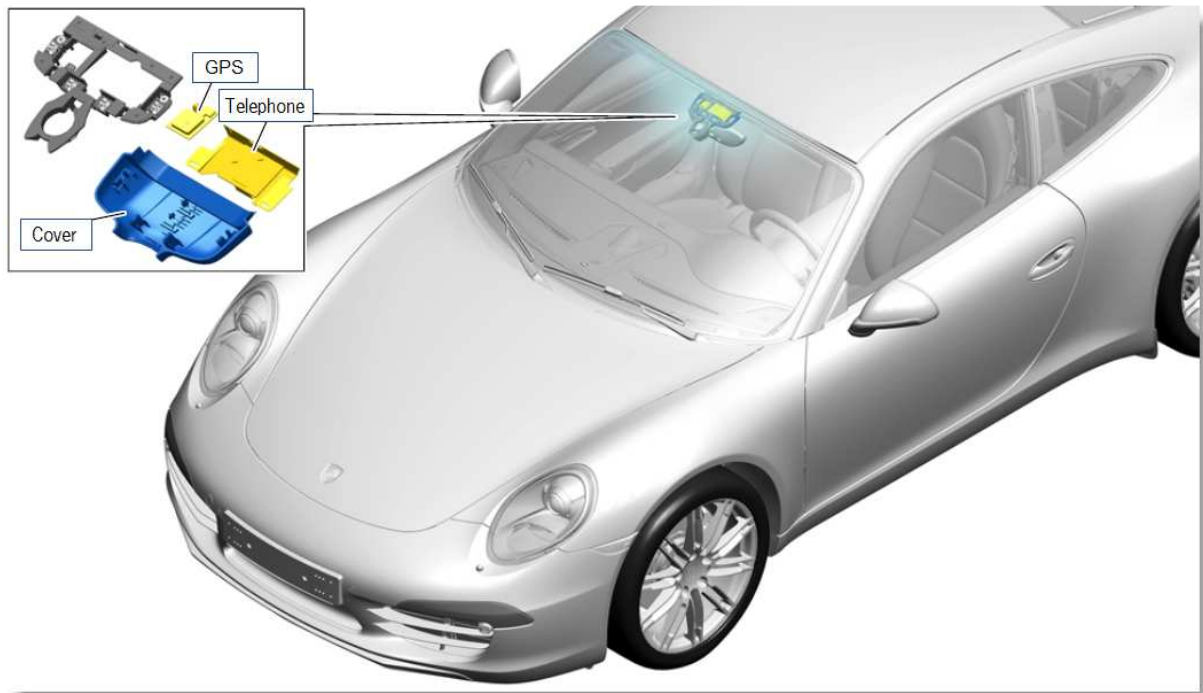
The AM/FM antennas are integrated directly within the front windshield or the rear glass depending on vehicle type. Upon close examination, the thin metallic antennas can be seen within the glass.

1.7.3. XM antenna

The XM antenna is mounted externally on the vehicle's body. Great care must be observed when handling the XM antenna. Precautions against Electrostatic Discharge (ESD) damage should be taken as outlined in the *ATI: 9x1 XM Radio Antenna-Amplifier Failures due to ESD (Electrostatic Discharge) Damage*.

1.7.4. GPS antenna

The GPS antenna is mounted under the windshield behind the rear view mirror. The Telephone antenna is mounted next to the GPS antenna.



1.7.5. Telephone antenna

The Telephone antenna is mounted under the windshield behind the rear view mirror. The GPS antenna is mounted next to the Telephone antenna.

1.8. Audio amplifiers

Depending on the equipment level of a specific vehicle and model, there are up to 3 different audio amplifiers available.

1.8.1. Burmester

Burmester amplifiers support MOST communication with the PCM and PIWIS Tester.

1.8.2. Bose

Bose amplifiers support MOST communication with the PCM and PIWIS Tester.

1.8.3. ASK

ASK amplifiers do not support data connections to the PCM or the PIWIS tester.

2. Glossary

Aha Radio

With the Aha Radio smartphone app (iPhone® or current Android® device), the customer can access additional data services such as web radio, online weather updates or online searches directly from PCM inside the car. In order to use Aha Radio, iPhone® devices must be connected to PCM by cable, whereas Android® devices connect via Bluetooth®.

Audio player

An audio player is a software application on a portable device (e.g. mobile phone) for playing audio files stored on the device.

Auto-connect

If two devices have been registered or 'paired' with each other, i.e. authorized to exchange data, either device can be configured to automatically transmit a connection request that is automatically answered by the other device. It is therefore possible for a Bluetooth® mobile phone to be connected automatically every time the car is started. In order for the mobile phone to accept a request from the in-car system, the system must be authorized in the device list on the mobile phone.

Authorization

In order for a Bluetooth® connection to be established automatically, the device requesting the connection must be authorized on the other device. This authorization is performed automatically on some phones, while on others it must be performed explicitly by the user in the Bluetooth® device list.

AUX BT

AUX BT is an external audio source in PCM (similar to an iPod® or USB source) by means of which audio data stored on a mobile device can be streamed by Bluetooth® and played on PCM's sound system. Bluetooth® profiles required are A2DP and AVRCP.

Bluetooth®

Bluetooth® is an industry standard for the wireless networking of electronic devices over short distances of up to 10 meters. It allows mobile electronic devices such as mobile

phones and PDAs as well as PCs and peripherals, e. g. keyboards, to communicate wirelessly with each other, with Bluetooth® as the interface.

Bluetooth® Advanced Audio Distribution Profile (A2DP)

Bluetooth® Advanced Audio Distribution Profile (A2DP) enables digital audio data (e. g. MP3s) to be streamed wirelessly from a data source (portable MP3 player or mobile phone) to a receiver (headphones or vehicle sound system). It is used by PCM for the AUX BT source.

Bluetooth® Audio/Video Remote Control Profile (AVRCP)

The Bluetooth® Audio/Video Remote Control Profile (AVRCP) enables remote control of an audio player installed on a mobile device (e. g. portable MP3 player or mobile phone). Supported functions depend heavily on the actual software implementation on the mobile phone or Bluetooth® player in question. Minimum functions are 'Start Player', 'Pause', 'Next Track' and 'Previous Track'. Newer devices already support the transfer of some metadata (name, artist and album of the track currently playing) and even the launching of the audio player when the relevant AUX BT source is selected on PCM, or advanced player functions such as 'Shuffle' or 'Repeat'.

Bluetooth® Handsfree Profile (HFP)

The Bluetooth® Handsfree Profile (HFP) enables an in-car audio system to be used as a hands-free facility for a Bluetooth®-enabled mobile phone. It also gives the user access to phone functions from the controls in the vehicle. The Bluetooth® Handsfree Profile (HFP) is supported in all phone variants in PCM and even in CDR. Typical functions include making, receiving and ending calls, as well as setting up and terminating the handsfree audio connection. The Bluetooth® Handsfree Profile (HFP) defines how the phone should be controlled and how the necessary audio data are transferred. The implementation of the Bluetooth® Handsfree Profile (HFP) tends to vary among manufacturers, from one phone model to the next, and even in different firmware versions for the same phone. As a result, one mobile phone may behave differently from another even though all phones are said to support the Bluetooth® Handsfree Profile (HFP).

Bluetooth® Message Access Profile (MAP)

The Bluetooth® Message Access Profile (MAP) allows e-mails and text messages to be transferred between the mobile phone and PCM. Messages that are already stored on the mobile phone or are received while the car is being driven can then be displayed on PCM or

read aloud. The current implementation in PCM gives readonly access to messages. It is not possible to compose or reply to messages at present. However, it is possible to extract phone numbers from messages and use this information easily to call the sender back. Although this profile is not so widely supported as yet, take-up is increasing, particularly in the high end of the smartphone market.

Bluetooth® Phone Book Access Profile (PBAP)

Bluetooth® Phone Book Access Profile (PBAP) is designed to allow the transfer of phone book content and phone lists from a mobile phone. This download takes place after a Bluetooth® connection has been established between PCM/CDR and the mobile phone. However, the transfer of phone content is always dependent on the device involved. This is why some parts of the phone book (e. g. SIM card entries) may be omitted from the transfer because they are not shared by the phone. The Phone Book Access Profile (PBAP) is only supported by newer phone models.

Bluetooth® SIM Access Profile (SAP)

The Bluetooth® SIM Access Profile (SAP) enables both the network-specific information used to authenticate the subscriber as well as certain data on the SIM card to be transferred from one device to another. A typical application of the Bluetooth® SIM Access Profile is in the car, where it allows the user to operate a permanently installed car phone using the SIM card residing in a mobile phone. For users of PCM with built-in telephone module*, the Bluetooth® SIM Access Profile (SAP) makes it possible to use the car's external aerial without having to insert a SIM card into PCM. Users can also access the phone book contacts and text messages on their SIM card and, depending on the mobile phone's range of functions, the contacts in the device memory. At present, the Bluetooth® SIM Access Profile (SAP) is supported only by a limited number of phone models.

Bluetooth® search – inquiry

The one-off process of pairing between two devices requires a search (inquiry) to be initiated by one of the devices, the purpose of which is primarily to identify potential Bluetooth® partners. After devices have been paired, the connection will be established in response to a direct connection request rather than a search.

DTMF

DTMF (Dual Tone Multiple Frequency) is a method of telephone signaling, which can be used, for example, to transmit tones whenever the keypad is operated during a call, e. g. to operate a voice mailbox or telephone menu system.

In-band ringing

Some mobile phones are able to transfer their ringtone to the vehicle via Bluetooth®. When a call comes in, PCM then rings with the tone set on the phone rather than with its own tone. In this case, the ringtone settings in PCM are not active. The ringtone can only be set via the phone. This function is not supported by CDR.

Mobile phone preparation

Mobile phone preparation (in conjunction with CDR or PCM) is a typical Bluetooth® hands-free system based on the Bluetooth® Handsfree Profile (HFP). The Bluetooth® mobile phone preparation supports the following functions in principle:

- pairing of a mobile phone with search initiated from the car or phone
- automatic connection of a paired device at system start-up
- basic phone functions (making, receiving and ending calls)
- hands-free capability via the in-car audio system
- status displays such as network name and signal quality

Since the range of supported functions varies greatly between different mobile phones, please refer to the detailed information relevant to your vehicle equipment and mobile phone in the mobile phone compatibility list at www.porsche.com (search for 'Bluetooth' or 'Mobile Communication').

Online services

Online services is how we refer to those functions that download their information to the car through a mobile Internet connection. Since November 2012, PCM working in conjunction with the Aha Radio app installed on a smartphone has been able to access online services that include web radio, online weather updates and online searching. The data are transferred to PCM via cable (iPhone®) or Bluetooth® (Android® device), where they can be displayed or output through the in-car audio system.

Online search

The online search feature in PCM from November 2012 onwards uses the Google Places interface. The user is able to look for points of interest in various search localities (near car,

near destination or free location input) by entering a search term. The query is sent by the Aha Radio app to a Google server and this returns a response. The results are presented in a list on PCM.

Online weather

When PCM is connected to the Aha server by a smartphone with the Aha Radio app, it is possible to retrieve the latest weather information from the CustomWeather service. Possible locations for weather querying include the locality near the car or destination or any location that you choose to enter. Weather forecasts for the next three days are available.

Pairing

Before a connection can be established between two Bluetooth® devices, they have to undergo a one-off registration or 'pairing' process for their own security. To begin this process, a Bluetooth® search (inquiry) to find all devices within range is initiated on one of the devices. A list of visible devices is then displayed (device class permitting). Once the desired device has been selected, it will be necessary to enter the same numeric code or 'passkey' into both devices. If both devices to be paired support Secure Simple Pairing (PCM as of November 2012), it will only be a case of confirming whether the six-digit codes displayed on both devices are identical. This reduced effort for the user is intended to simplify the pairing process. If pairing was successful, the devices will now be authorized to exchange data (either system or user data, e. g. voice, audio or video) unless the pairing is deleted on either device.

PCM with telephone module

PCM with telephone module is a permanently installed car phone that not only supports operation with a SIM card (inserted in PCM or accessed via Bluetooth® SIM Access Profile) but also offers hands-free use with the ability to control various functions supported by the Bluetooth® Handsfree Profile. Pairing of a mobile phone that can use either profile for connecting to the car takes place preferably by means of a 16-digit Bluetooth® code for the more sophisticated SIM Access Profile (PCM from November 2012 onwards supports Secure Simple Pairing, where the user is no longer required to enter a Bluetooth® code manually). If the connection via the SIM Access Profile fails, an alternative connection is always established via the less sophisticated Handsfree Profile (HFP mode). In this case, the range of supported functions is reduced to the scope of functions offered by mobile phone preparation (no text messaging, no Bluetooth® headset).

PCM with telephone module supports the following functions in principle:

- basic phone functions (making, receiving and ending calls)
- hands-free capability via the in-car audio system
- status displays such as network name and signal quality
- sending of DTMF tones
- compiling of call lists
- starting and ending a second call, call toggling and conference call
- pairing of a Bluetooth® mobile phone with search initiated from the car
- automatic connection of a paired device at system start-up
- transfer of phone book entries from the mobile phone (contacts on the SIM card and address book contacts from the device) or from the inserted SIM card
- transfer of call lists from the mobile phone
- transfer of e-mails and text messages from mobile phone via Bluetooth® Message Access Profile (MAP, only in HFP mode)
- use of the Bluetooth® handset to hold conversations in privacy mode (not in HFP mode)
- use of Bluetooth® headsets (optional, not in HFP mode)
- sending and receiving of text messages (not in HFP mode)

Registration status

Registration status refers to the current status of the connection to a mobile phone network. If the phone is currently connected to a mobile network, the network name will be displayed (provided the phone transfers this information). Other possible states include 'network search' or 'registration failed'.

Secure Simple Pairing (SSP)

Secure Simple Pairing is a new method for the authorization (pairing) of Bluetooth® devices whereby the user is no longer required to enter a Bluetooth® code. A six-digit code is generated and displayed on both devices to be paired. The user simply has to confirm that the codes match each other. This makes the pairing process significantly more user-friendly. In PCM, this method has been supported since November 2012.

Signal strength

Signal strength is an indicator of the general reception quality that the mobile phone is experiencing in a given location. It cannot, however, be used to evaluate the quality of a particular call because the quality of individual voice channels in a mobile network cell can

vary considerably. The signal strength is displayed on PCM/CDR whenever the phone is connected to a network cell, provided the phone shares this information.

SIM card

A SIM card (SIM – Subscriber Identity Module) is a mandatory requirement to gain access to a GSM network. In addition to network-specific information used to authenticate the subscriber, a SIM card can be used to carry user data, e. g. phone book contacts and SMS text messages. The card can be PIN-protected to prevent unauthorized access to these data.

Toggling/conferencing

During an active call, the user has the option of accepting a further incoming call and then switching between the two calls (toggling). The user can also merge the two calls into a three-way conference call. These functions are supported by many mobile phones. Whether or not these functions can be controlled by PCM depends on the mobile phone's range of Bluetooth® functions. These functions are not supported by CDR.

Web radio

Web radio (or Internet radio) is an audio service distributed by radio stations online. In PCM, web radio is accessible via the Aha Radio app installed on a compatible smartphone (iPhone® or Android® device), a feature that has been supported since November 2012.