Table of Contents

Telephone Diagnostics

Initial Print Date: 02/04 Revision Date:

Telephone Diagnostics

Model: All with Motorola CPT 9000

Production:

OBJECTIVES

After completion of this module you will be able to:

- Explain Telematics and how it applies to BMW
- Understand the communication between the TCU and mobile phone
- Understand eject box operation
- Diagnose eject box problems

Telematics

Frequently Asked Questions

1. What is telematics?

   Telematics combines wireless voice and data to provide location-specific security, information, productivity, and in-vehicle entertainment services to drivers and their passengers.

2. How does a telematics system work?

   The heart of a telematics system within the car is a telematics Communications Unit (TCU) that is connected (wirelessly) to a central service center. The TCU serves as the central platform of a telematics system, where all telematics-related technologies are deeply integrated. It communicates location-specific information to a central service center and in turn the center helps deliver telematics services to a driver via the cellular phone.

   These services can include dispatching ambulance services to a driver in an emergency situation, or sending roadside assistance to a driver whose car has broken down. Other services include the ability of a central server to deliver navigation assistance and real-time traffic information, among others. What's more, the TCU is also connected to the engine control unit (or the onboard computer) which enables enhanced services such as remote engine diagnostics and automatic airbag notification.(01)

3. What is the difference between telematics and navigation systems?

   A telematics system provides numerous services to drivers, and navigation is simply one of the services offered. Navigation systems that are starting to appear in high-end cars today are referred to as autonomous navigation systems. Here, the navigation database resides in the car on a CD. These systems are relatively expensive. telematics systems provide navigation assistance "off-board". This means that the database resides outside the car, making the service far more affordable to a wider number of people.

4. Where does the word "telematics" come from?

   The term originated in Europe and remains widely used in the European automotive industry to describe automotive communications technologies.

5. Can you explain a telematics system in technological detail? What are its components?

   The main component in a telematics system is the telematics Communications Unit (TCU). In North America, a TCU contains a Motorola GPS receiver, cellular transceiver, and modem/transceiver control board. In Europe, a TCU contains a Motorola GPS receiver and GSM transceiver. Motorola's European telematics systems do not require a modem due to the already existing digital data transfer services, such as SMS (short message service) available with GSM.

   Every telematics system developed by Motorola contains Motorola's automotive-grade telematics software, which is uniquely programmed to deeply integrate the components of a TCU, enabling simplified delivery of telematics services from one centralized area.

6. What services does a telematics system offer today?

   Today, telematics systems offer drivers emergency and roadside assistance, air bag deployment notification, navigation, remote door unlock, vehicle security notification and stolen vehicle tracking services.(01)(02)

7. What services will telematics offer in the future?

   Just as today's telematics safety and security features are a direct result of initial consumer demand, future telematics services will also be a direct result of what drivers want in their cars. These systems may provide customized services such as travel information (traffic updates, parking availability, airline status), messaging (voice mail and email retrieval), information (sports, weather, stock market updates and Internet access) and entertainment (audio games, books, magazines and newspapers). These are only a few of the applications which will evolve with telematics to keep drivers and their passengers in touch.

   Eventually, telematics will even reach outside the car and communicate with the office and home, extending far beyond voice conversations. Drivers will be able to turn on home lights, start and stop the sprinkler system, set their office security system -- all via their telematics systems.

8. How does a driver interact with a telematics system?

Drivers activate telematics systems via buttons located on the dashboard or the overhead console of the car. Motorola works with each automaker to help develop a purpose-built system for the projected ergonomic desires of drivers. The BMW Mayday telematics system has an emergency and roadside assistance button located on a cellular handset. The Mercedes TeleAid system has an S.O.S. button located behind the rear view mirror and "Information" and "Roadside Assistance" buttons located in the armrest.

9. Can a Global Positioning System (GPS) phone handle telematics services?

We have several concerns about integrating GPS functionality into a phone handset, instead of the vehicle itself.

Our first issue is the ability of a GPS phone to operate inside of the automobile without an external GPS or cellular antenna. GPS antennas must have an unrestricted view of the sky to track satellites. So the decision must be made whether it's more cost-effective to have the GPS in the phone or in the car.

Furthermore, integrating telematics into a portable phone may be very attractive from a cost and convenience perspective, but does not support the stolen vehicle alarm, door lock/unlock, and other features that require the device to remain in the car when the occupants have left.

Finally, GPS is only one part of the locating solution. In addition, cellular infrastructure positioning, such as cell tower triangulation, can help. Given current technology, GPS does not operate as effectively inside multiple story, concrete or metal buildings, where many emergency calls originate.

All of these issues, and many others, are taken into account when designing telematics systems and service.

10. How does the airbag deployment notification feature work?

The TCU is constantly "listening" or on the lookout for any sign of emergency. Because the TCU is connected to the engine control unit, when the airbag sensor sends a message to the engine controller to deploy the airbag, the controller alerts the TCU as well. Automotive-grade software that enables these functions and assures their reliability.

Once the TCU is alerted, it automatically makes a cellular call to the response center. The call gets priority call status and jumps ahead of other telematics calls, and the operator is alerted that a call has been received from an airbag deployment. That way, emergency crews can be sent immediately to the scene.(01)

11. What services do consumers really want in their cars?

Initially, autonomous navigation-only systems caught the fancy of drivers in Europe and Japan, while in North America, consumers were more interested in emergency response or emergency call systems. Increasingly, consumers are attracted to the broader spectrum of telematics services, such as the delivery of personalized information and entertainment.

12. Do Motorola's systems use digital cellular technology?

Yes. In Europe, Motorola’s telematics systems use the European digital standard, GSM.

In North America, however, only AMPS offers the broad geographic coverage essential for reliable emergency response services. That's why it's the system being utilized in North American telematics right now.

13. What do telematics systems cost?

While each automotive company determines its own pricing, system prices currently range from $500 to $2000 in Europe and North America. Some GM vehicles include the OnStar system at no additional equipment charge, and require only a low monthly service fee. Monthly service costs vary, depending on the services offered. Like other new technologies, we anticipate that consumer demand will ultimately drive these costs down.

14. Do European and North American drivers expect different features?

It's clear that Europeans and Americans are all interested in navigation, safety and security services. But the degree to which they prioritize these services varies.

In Europe, there is a greater emphasis on navigation. At the same time, frequent cross-border travel creates language barriers, making familiar navigation and security services even more welcome. In the United States and Canada, safety and security are the most desired services. North Americans are also interested in navigation, but the need for it is not as great. All drivers are interested in getting real-time traffic information.

15. When will North American telematics make the shift to digital?

In North America, the growth of telematics depends on digital cellular standards providing service over a larger geographic area, especially in cities.

Unlike the European-wide GSM standard, North America has multiple standards including AMPS, TDMA, CDMA, GSM and iDEN®.

Today, only AMPS offers wide enough geographic cellular coverage for emergency response services. That's why it is utilized in the Motorola telematics systems Motorola currently installed in North America. For data transmission on analog AMPS, modems can be added to the telematics hardware and central service center. In the future, systems will be based on digital wireless, to allow a richer array of features in metropolitan areas.

In addition, as the industry endeavors to deliver comprehensive data services such as Internet access and customized entertainment services, the migration to digital communications technology will be even more essential.

Companies such as Motorola, Nokia, Ericsson and Unwired Planet are addressing these issues for a wide variety of wireless devices. Through the Wireless Applications Protocol (WAP) consortium, we are working together to ensure a reliable and standard method of transferring data over wireless networks worldwide.

16. What new technologies will help deliver greater telematics services?

An important, ongoing initiative that will help drive telematics growth is the ITS Data Bus, or IDB. IDB is based on an open protocol for networking car audio, video, communication and computing devices. Lead by the Society of Automotive Engineers (SAE) and supported by several corporations (including Motorola), IDB will allow seamless integration of multiple technologies inside the car.

IDB will allow simple plug-and-play use of any consumer electronics, regardless of the manufacturer. In addition, a firewall contained in the IDB will allow all electronics in the car to operate independently of each other, eliminating signal interference.

17. How will IDB specifically impact telematics?

Many companies are expected to integrate IDB into their telematics components and other electronics systems. Motorola, for example, plans to integrate IDBs into our telematics Communications Units, enabling the system to act as the central hub for all electronics interacting within the car. This will allow consumers to simply plug and play various electronics via their TCU, and take advantage of additional telematics services, without requiring multiple wires and cables overlapping in different areas of their vehicle. Not only will IDB allow easier installations, but it enable drivers to add new services without being concerned about propriety systems and wiring. With IDB, consumers will have greater choice, resulting in greater market growth.

Automatic airbag deployment notification, information services and other telamatics services must be supported by your carrier's network, depend on service availability and coverage, and require a subscription. These services are not available in all areas. Check with your service provider for availability. All location based services are subject to the availability of GPS signal or alternative location tracking means. GPS coverage is not available in all areas.

The use of wireless devices and their accessories may be prohibited or restricted in certain areas. Always obey the laws and regulations on the use of these products. All navigation systems select routes based on several criteria: geographic distance, type of route, and in some cases dynamic traffic information. While these systems usually opt for the shortest travel time to your destination, it is important that you take into account factors including road and driving conditions, terrain and local environments, some of which may contain hazards to you or your vehicle. Always use your best judgment when deciding on a route. As the driver of your vehicle, you are always the final decision-maker, and despite the many advantages of using any Telematics system, you are ultimately responsible for ensuring your safety.

Glossary

AMPS Advanced Mobile Phone System

The first-generation analog cellular phone system that originated in the United States.

APCO

Association of Public Communications Officials

CDMA Code Division Multiple Access

An advanced digital cellular and PCS platform that converts audio signals into a stream of digital information (made up of 1s and 0s). This "digital speech packet" is transmitted via a wide-band channel consisting of several radio frequencies. CDMA differs from the other popular digital cellular platform, TDMA, in that it uses several frequencies instead of just one. These digital platforms ensure greater call clarity and security, prevent cloning fraud and allow a greater number of calls to be handled by a tower or response center at one time.

CDPD Cellular Digital Packet Data

Using the existing AMPS system to carry digital data, by transmitting dense packets of information across vacant analog channels.

CTIA

Cellular Telephone Industry Association

Data Bus

The central collection of wires that carry instructions to electronic components throughout the vehicle.

DCS-1800

The low-power variant of GSM (the European digital standard). Uses a 1.8 GHz carrier. Example: Mercury One-2-One.

DCS-1900

The proposed use of GSM (the European digital standard) with a 1.9 GHz carrier for PCS applications.

DCTU Digital Cordless Telephone U.S.

A standard based on a micro-cellular radio system that provides low-power cordless access between a subscriber and a base station up to a few hundred meters away. DCTU is a version of its European counterpart, DECT.

DECT Digital European Cordless Telephone

A standard based on a micro-cellular radio system that provides low-power cordless access between a subscriber and a base station up to a few hundred meters away.

ETACS Enhanced TACS (Total Access Communication System)

European analog cellular.

ETSI European Telecommunications Standards Institute

The standards body responsible for GSM.

FDMA Frequency Division Multiple Access

Used for AMPS and TACS, the two key analog systems and their variants, this system gives each conversation its own unique radio channel.

FLEX® Protocol

Created by Motorola, FLEX is the global de facto standard for high-speed, one-way alphanumeric paging. With its ability to handle more robust code transport messages effectively, Motorola's FLEX protocol is laying the foundation for graceful growth from 1600 to 6400 bits per second (bps) transmission rates.

Gateway

A device that allows consumer products to interface with the communication system in vehicles, while protecting the vehicle's system from defective devices or inappropriate messages.

GPS Global Positioning System

Also refers to Global Positioning Satellite. A system using satellites, receivers and software to allow users to determine their exact geographic position.

GSM Global System for Mobiles

A European digital standard.

Half-Rate

A variant of GSM, Half-Rate doubles system capacity by more efficient speech coding.

IDB ITS Data Bus

A medium-speed multiplexed bus intended for command and control of devices in vehicles. It has been proposed by Motorola and the Society of Automotive Engineers (SAE) as an industry standard. Should this happen, IDB will allow device manufacturers to create products that will be compatible with all vehicles -- versus today's data bus systems which differ by automobile manufacturer. The IDB would interface with an existing vehicle bus through a gateway.

iDEN® Integrated Digital Enhanced Network

A new generation of digital wireless technology developed by Motorola to enable multiple services to be delivered from a single, integrated wireless communications system. iDEN is the backbone of the Nextel all-digital cellular service.

InFLEXion®

A Motorola protocol which enables transmission and storage of voice messages and offers enhanced privacy, channel efficiency and ease of use. What's more, InFLEXion allows greater detail and expression to come through.

IS-41

The protocol for "roaming" within the U.S., describing how services should "hand over" between operators.

IS-54

The TDMA standard for U.S. digital cellular.

IS-95

The CDMA standard for U.S. digital cellular.

ISO 9000

The International Organization for Standardization (ISO) published the ISO 9000 series of quality management and quality assurance standards in 1987 as a means to rationalize the many various national approaches to the subject of product quality. The ISO 9000 series has been widely recognized as an aid in developing manufacturing and service organizations' quality management as an additional assurance to product purchasers that the products and services they buy will consistently meet quality objectives.

ISO 9001

This standard is used when conformance with specific requirements is to be assured by the supplier during several product stages including design and development, production, testing, inspection and servicing.

ITS Intelligent Transportation Systems

A broad range of diverse technologies, including information processing, communications, control and electronics, which, when applied to our transportation system, can save time, money and lives.

ITS America Intelligent Transportation Systems of America

An organization mandated by the U.S. Congress in 1991 to foster public and private partnerships to increase the safety and efficiency of surface transportation through the application of advanced ITS technologies.

JDC Japanese Digital Cellular

Now renamed PDC.

JTAC Japanese Total Access Communication

Like the European TACS, JTAC is the Japanese analog cellular system.

LMR Land Mobile Radio

Wireless communication for specialized applications, such as taxis and emergency services.

MMI Man/Machine Interface

Also known as User Interface. The means by which the user interacts with a machine or device. In the past, knobs, dials and displays manipulated by a user's hand were common interfaces on technical devices. Today, MMI includes more advanced functions such as Voice Dialing, speech synthesis and touch screens.

NAMPS Narrowband AMPS

PCS Personal Communications Service

Service that bundles voice communications, numeric and text messaging, voice mail and other features into one device, service or bill.

PCS-1900

Like DCS-1900, this refers to the proposed use of a 1.9 GHz carrier for PCS applications.

PDC Personal Digital Cellular

The Japanese cellular standard.

PHS Personal Handy System

The Japanese cordless phone standard.

Protocol

A standard set of rules that governs how computers or other electronics communicate with one another. Protocols define a message's format as well as how they are exchanged. Agreeing to a standard protocol allows different types of computer systems to communicate with one another in spite of their differences.

PSAP Public Safety Answering Point

PSTN Public Switched Telephone Network

QS 9000

The quality system standard established by Chrysler, Ford, General Motors, truck manufacturers and other subscribing companies. This standard includes the ISO 9000 requirements, plus additional requirements for all aspects of the business. QS 9000 includes a detailed Advanced Product Quality Planning, Control Plan, Continuous Improvement, Production Part Approval Process, Manufacturing Capabilities methodologies and more.

ReFLEX®

The world's first two-way alphanumeric paging protocol, created by Motorola. ReFLEX enables pagers to confirm receipt, respond to and initiate messages.

SAE Society of Automotive Engineers

A one-stop resource for technical information and expertise used in designing, building, maintaining and operating self-propelled vehicles for use on land or sea, in air or space.

SIM Subscriber Identification Module

A card used in GSM to personalize a handset.

TACS Total Access Communication System

European analog cellular.

TCU Telematics Control Unit

The embedded vehicle control unit that communicates with the automobile controls, GPS satellite and customer service center to provide Telematics features to a driver.

TDMA Time Division Multiple Access

An advanced digital cellular platform that converts audio signals into a stream of digital information (made up of 1s and 0s) and divides it into "digital speech packets" according to time. The packets are then transmitted one a single radio frequency. TDMA differs from the other popular digital cellular platform, CDMA, in that it uses one channel instead of many. These digital platforms ensure greater call clarity and security, prevent cloning fraud and allow a greater number of calls to be handled by a tower or response center at one time.

TETRA TErrestrial Trunked RAdio

European digital cellular land mobile radio system.

TIA Telecommunications Industry Association

The United States' telecommunications standards making body.

User Interface

Also known as Man/Machine Interface (MMI). The means by which the user interacts with a machine or device. In the past, knobs, dials and displays manipulated by a user's hand were common interfaces on technical devices. Today, User Interfaces include more advanced functions such as Voice Dialing, speech synthesis and touch screens.

VR Virtual Reality

Used in a variety of Motorola products and services, it is a type of computer-generated environment in which the user interacts with the environment in three dimensions that provide sensory information to make an individual feel that they are in a different place.

WAP Wireless Application Protocol

A standard that aims to align industry efforts to bring advanced applications and Internet content to digital cellular phones.

Workshop Exercise - Telephone

Vehicle does not recognize the portable phone. Customer places Handset in eject box but display continues to read Car Phone. It is not possible to make a phone call from the CID.

1. *List the four parts of a good diagnostic plan.* _____

   _____

2. *Can the complaint be verified?* _____
3. *Perform a Short Test and list the relevant faults?* _____
4. *What is the next diagnostic step?* _____
5. *Is there a wiring diagram available in the DISplus or GT1?* _____
6. *What is the part number of the correct adapter for diagnosing eject box problems?* _____

   Which breakout box is used? _____
7. *Perform a pin-out test of the eject box, with and without the mobile phone installed?*

Terminal	Terminal Use	With Mobile installed	Without Mobile installed
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

8. *Compare the pin-out just performed with the wiring diagram handed-out.*

   Is there a signal or voltage reading that is incorrect? _____

9. *Repair the problem and retest that circuit.* _____

10. *While scoping pin #13 speak into the microphone.*

    What happens? _____

11. *How could this be used in situations where the customer states the other party can not here them?* _____

12. *Is it possible for the person in the vehicle to speak to loud?* _____

    Too soft? _____

13. *Are there any solutions for either of these problems?* _____

14. *Install device #5 and re-perform the scope procedure?* _____

15. *Install device #1 and re-perform the scope procedure?* _____

16. *Did you see a difference in the scope pattern?* _____

Eject Box

Pin #	Everest 54 ELO MOST US Pin Name	Description	Wiring Requirements	Ejectbox front 18 pin ELO	Phoenix cradle E65 26 pin ELO	Cradle for BT portable
1	MIC1+	Microphone 1 Positive	24 AWG			
2	MIC2+	Microphone 2 Positive	24 AWG			
3	Gnd			14		13
4	Gnd					
5	Gnd					
6	Gnd					
7	Gnd					
8	Gnd					
9	P2K RXAudioOn/Off	Wired Portable Analog Audio From Phone	22AWG	15	6	
10	P2K Audio Ground	Wired Portable Audio Ground	22 AWG	4	4	
11	P2K TX Audio	Wired Portable Analog Audio To Phone	22 AWG	13	13	
12	CAN-H	Tel-Commander Interface, for E65 only	22 AWG			
13	CAN-L	Tel-Commander Interface, for E65 only	22 AWG			
14	MDI	Motorola Diag Interface (MOT Use Only)	24 AWG			
15	IBUS	IBUS Interface (for Airbag)	22 AWG			
16	AuxBattery+	Auxiliary Battery Positive Terminal	18AWG			
17	Battery+	Main Battery Positive (KL30)	18AWG	5	1	5
18	Battery+	Main Battery Positive (KL30)	18AWG			
19	MIC1-	Microphone 1 Negative	24 AWG			
20	MIC2-	Microphone Negative	24 AWG			
21	MIC Shield	Microphone Shield	24 AWG			
22	Hookswitch Portable	Hookswitch to detect portable phone	24 AWG	10		
23	Gnd					
24	DFA FL	Wheelspeed, Front Left	22 AWG			
25	DFA FR	Wheelspeed, Front Right	22 AWG			
26	Gnd					
27	RS232 RTS	Serial Debug Port RTS	24 AWG			
28	RS232 Ground	Serial Debug Port Ground	24 AWG			
29	P2K TXD	Wired Portable Serial IF TxD	22 AWG	9	25	
30	P2K RXD	Wired Portable Serial IF RxD	22 AWG	18	26	
31	Ecall Button	Emergency Call Button	24 AWG			
32	Charger On Off	Charger: on if +12V, off if Gnd	24AWG	1	5	
33	MOST Wakeup	MOST Wakeup Output	24 AWG			
34	TEL ON	Telephone On Indicator for compensator	24 AWG			
35	Gnd					
36	Battery Ground (KL31)	Main Battery Ground	18AWG	2		2
37	Vehicle Speaker+ (emergency)	Vehicle Speaker Positive	24 AWG			
38	Vehicle Speaker- (emergency)	Vehicle Speaker negative	24 AWG			
39	P2K Shield	Wired Portable Serial IF Shield	22 AWG			
40	Gnd					
41	Gnd					
42	Gnd					
43	RS232TX	Serial Debug Port TxD	24AWG			
44	RS232 RX	Serial Debug Port RxD	24 AWG			
45	RS232 CTS	Serial Debug Port CTS	24 AWG			
46	Gnd			16		1
47	Gnd					
48	Gnd					
49	P2K Ground	Wired Portable Serial IF Phone Ground	22 AWG			
50	MAYDAY LED	MAYDAY LED Output	24 AWG			
51	Gnd					
52	58g	Lighting Intensity Dimming Signal; signal via bluetooth to handset (not for Japan)	22 AWG	3		
53	Aux Battery Ground	Auxiliary Battery Ground	20 AWG			
54	Battery Ground (Klemme31)	Main Battery Ground	20 AWG		2	

E60, E63/64 E65

Eject Box Schematic