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SECTION I – DELIVERABLE SUMMARY

Report on Optimized Application of video surveillance system	
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Type of Deliverable	Report
Input / Starting stage	<i>Previous Deliverables Others MODURBAN Subproject WP13 Main European Urban Transport Operators</i>
Output / Final stage	<i>Main guidelines (technical and legal) for video surveillance applications</i>

Lead partner(s)	
Achievement to date (%)	100 %
Expected date of achievement	
Type of exploitation	
Exploitation potential	
Expected budget	<i>See relevant table (WP13 costs)</i>
Actual costs	<i>See relevant table (WP13 costs)</i>
Expected costs to completion	
Protection	<i>Not Relevant</i>
Protection date	<i>Not Relevant</i>

IP's	Partners, (type, identification, date)
Pre-existing Know-How	Not Relevant
Exploitation Rights	Not Relevant

Associated Risk analysis	Type, solution envisaged, action, actors	Actual Reduction
Before start		
During task implementation		



Report on Optimized Application of video surveillance system

Deliverable Abstract

In this document there are listed the main guidelines both legal and technical to carry out video surveillance systems in security application. These guidelines have been obtained on the base of the European directive 95/46/EC for the legal aspects and on the base both of the EN 50132-7 and of the kind collaboration of RATP and LUL for the technical aspects.

The deliverable describes also the technical proposal for the implementation of video surveillance and PIS functions into the MODACCESS demonstrator.

Associated Milestone (if relevant):

Contribution to MODURBAN Objectives as mentioned in the Description of Work

<i>Objective Definition</i>	<i>Comments</i>	<i>Quantification</i>
Objective 1 -		
Objective 2 –		
Objective 3 ...		
Objective 4 ...		

SECTION 2 – DELIVERABLE DETAILED DESCRIPTION

Glossary

CCTV	Closed Circuit Television
CEE	Comunità Economica Europea (European Economic Community)
DCS	Data Communications System
ETH	Ethernet
GCR	Ground Control Room
H	Height
HMI	Human Machine Interface
I/O	Input/Output
OCC	Operations Control Centre
PAL	Phase-Alternation-Line
PIS	Passenger Information System
PRM	Person with Reduced Mobility
PVSS	Platform Video Surveillance System
RS	Recommended Standard (i.e. RS232 or RS485)
SAS	Safety Alarm System
TV	Television
TVCC	TV a Circuito Chiuso (Closed Circuit Television)
TVL	TV Lines
V	Voltage
VoIP	Voice over IP
VSS	Video Surveillance System
W	Width

1 European Community Directive on Privacy

The European Community Directive 95/46/EC on the protection of the personal data of natural persons and the free circulation of such data, was the culmination of five years of negotiations and meetings between Member States. This Directive must also be applied to the processing of images of all video surveillance systems where recorded images allow physical and legal persons to be identified, even indirectly.

1.2 Directive 95/46/CE

In accordance with this Directive, Member States shall protect the fundamental rights and freedoms of natural persons and in particular their right to privacy with respect to the processing of personal data.

The main articles of the Directive are:

- Definitions
- General Conditions for the processing of personal data
- Controller for the processing of personal data

1.3 Definitions

For a better understanding of how personal data is processed, the Directive precisely defines the terms that will be used herein. The definitions are important for a correct application of the Directive itself. For the purposes of the Directive:

“personal data “	shall mean any information relating to an identified or identifiable natural person
“processing of personal data”	shall mean any operation which is performed upon personal data, whether or not by automatic means, such as collection, recording, organization, storage, processing, transmission or destruction
“personal data filing system”	shall mean any set of personal data which are accessible according to specific criteria.
“controller”	shall mean the natural or legal person who determines the purposes and means of the processing of personal data.

1.4 General Conditions for the Processing of Personal Data

According to the Directive the processing of personal data can be performed only with the consent of the interested party. However, in the case of video surveillance the consent of the person is not required; all that is required is that video surveillance be adequately signalled. This is valid only when images (comparable to personal data) are recorded to guarantee public safety in particularly unsafe locations and where safety is an important factor. There are many such scenarios in the public transport sector, especially for passenger safety and to safeguard civil structures that can respectively fall victim to aggressions or vandalism. In these circumstances video surveillance is a useful means of prevention and also to gather valid evidence in the event of legal proceedings. Recorded images must be processed in such a way as to guarantee that only authorized persons have access to them and that they do not undergo intentional manipulation.

1.5 Personal Data Processing Controller

Each Member State of the European Union must nominate a public authority to ensure that the Directive is applied on its own territory. The public authority shall have the following powers:

- Powers of investigation:** The authority shall have access to personal data and any other information that has been collected and processed to verify correct application of the Directive.
- Powers of intervention:** The authority shall have the faculty to express an opinion on how personal data is processed in specific cases and consequently order the cancellation of data collected or the modification of the collection methods if necessary.
- Powers of legal action:** The authority shall have the power to promote legal action when the Directive is not respected.

Every year the controlling authorities of European states shall publish a report on the activities performed and on the extent to which the Directive is respected on their territory. The various national controlling authorities may work together to verify that the personal data transmitted between States is treated in respect of the Directive.

A person who processes data on behalf of the controller and has access to sensitive data has the obligation to observe professional secrecy even after cessation of activities.

2 Integration of European Community Directive into Member States

The European Community conducted an investigation in the Member States to ascertain to what extent the Directive 95/46/EC was integrated into the legislation of the individual States. The investigation terminated with a conference in Brussels in September-October 2002 during which the results obtained were made known (Table 1). At the end of 2002 the Directive still had not been completely integrated into the various European States, hence the Commission did not consider it timely to promote new initiatives to revise the text of the Directive.

Table 1 – List of Integration of European Community Directive into the Member States

State	National Integration Legislation	Effective
Austria	Law on personal data protection: Datenschutzgesetz 2000	January 2000
Belgium	Privacy protection law Amendment of Law 11 of 1998	September 2001
Denmark	Law 429 of May 2000	July 2001
Finland	Law 523/99	June 1999
Germany	Federal law on personal data protection: Bundersdatenschutzgesetz 2001	May 2001
France	Law “ Informatica e Libertà ” (1978) and subsequent amendments	April 2003
Greece	Law on protection of persons with respect to personal data processing: Law 2472 of April 1997	November 1997
Ireland	Data Protection (Amendment) Act 2003	July 2003
Italy	Law on protection of persons and other subjects with respect to personal data processing: Law 675	May 1997
Luxembourg	Loi du 2 août 2002 relative à la protection des personnes à l’égard du traitement des données à caractère personnel	December 2002
Netherlands	Law for personal data protection of July 2000: Wet bescherming persoonsgegevens	March 2001
Portugal	Law on data protection of October 1998: Legge 67/98	October 1998
Spain	Law on personal data protection of 1999: Ley Organica 15/1999, de Proteccion de Datos de Carácter Personal	January 2000
Sweden	Law on personal data 1998: Personuppgiftslagen	October 1998
UK	Law on data protection of 1998: Data Protection Act 1998	March 2000

3 Evaluation of the Main Functionalities of Video Surveillance Systems (Guidelines)

The European Community published a document outlining and describing the basic rules to be respected by each public or private party who means to employ video surveillance. These basic rules have already been integrated into the legislation of the various European states.

According to this document the functionalities of video surveillance activity are to be carried out in conformity with legislation and the purposes of the activity must be legitimate and explicit. The main guidelines for the video surveillance functionalities are:

- Every measure must be adopted to guarantee that the activity conforms to the EC directive and the relevant national legislation.
- The collection of personal data (images) related to the video surveillance activity must be pertinent to the aim pursued, meaning that the quantity of filed personal data must not go beyond the purposes of the video surveillance, particularly in terms of times of data conservation.
- Video surveillance activity may not be performed exclusively to control from a remote location the political opinions, sexual habits or behaviour of individuals.
- The person in charge of processing must put into practice all technical and organizational measures to protect data collected from accidental destruction, alternation, unauthorized access or distribution. The measures adopted must be in line with the risks represented by the nature of the data and the type of processing.

4 Evaluation of Main Performance Requirements of Video Surveillance Systems

Thanks to the helpful collaboration of RATP and LUL it was possible to carry out an analysis of the requirements of video surveillance systems used today in their underground networks. The requirements are divided according to the coverage needs of different areas of stations (Table 2) in relation to passenger security in accordance with the European standard EN 50132-7 (Alarm System CCTV surveillance system for use in security applications). The size of a target (i.e. object on station/train floor or passenger) on the monitor screen should be in relation to the operator task, such as identification, recognition, detection and monitoring. In particular, if the target is a person, using a CCTV with resolution of 400 TV lines, the recommended minimum size of the target in relation to the image height (figure 1) is:

Identification	target should represent not less then 120% of screen height
Recognition	target should represent not less then 50% of screen height
Detection	target should represent not less then 10% of screen height
Monitoring	target should represent not less then 5% of screen height

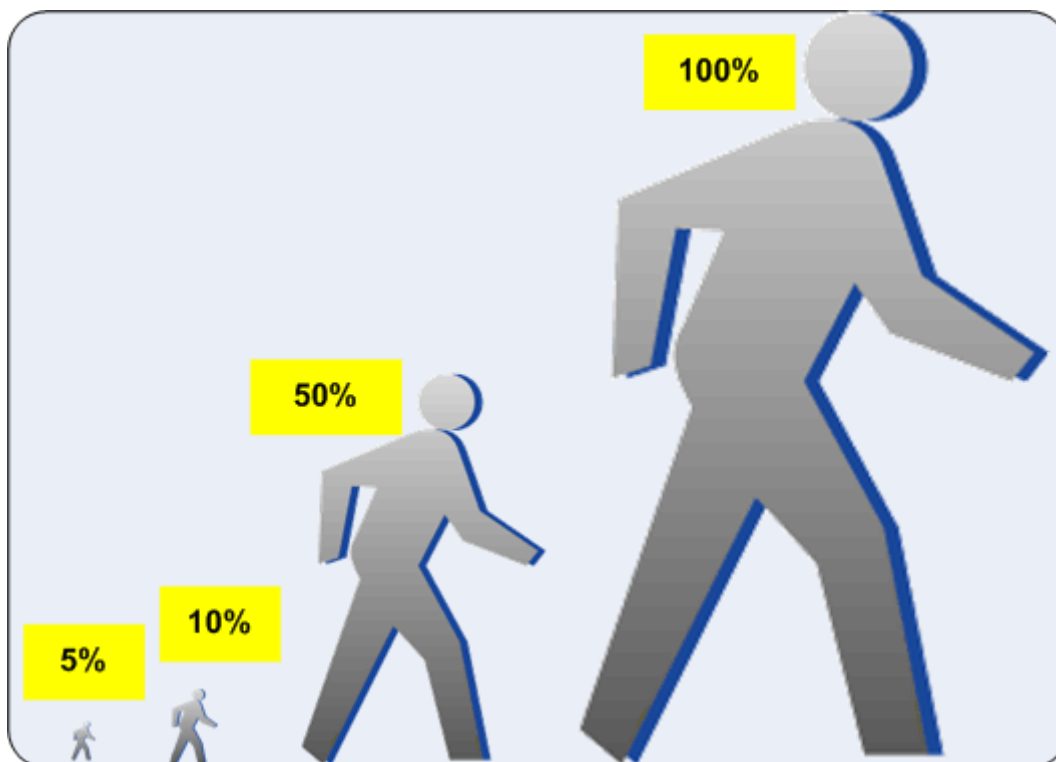


Figure 1 – Indication of the relative sizes of a target (person) on screen



Table 2 – Target size in relation to the different station levels and passenger areas

		Recommended Object Sizes			
Station Level	Passenger area	Monitor (5%)	Detection (10% or 20%)	Recognition (50%)	Identification (120%)
Egresses					
	Entrances & Exits		X		
	Ticket Office Area			X	
	Automatic Ticketing Machine			X	
	Help Point			X	X
	Photo Me Booths		X		
	Lift		X (Entrance & Exit)	X (inside)	
	Escalator		X	X (Beginning & End)	
	General Area		X		
	Emergency Exits		X		
Mezzanine					
	Passageways		X (Beginning & End)	X	
	Emergency Exits		X		
	Lift		X (Entrance & Exit)	X (inside)	
	Escalator		X (Beginning & End)	X	
Platform					
	Train Entry End			X	
	Train Exit End			X	
	General Area		X		

A video surveillance system shall as a rule cover a minimum of 95% of all public areas in a station with the cameras installed at a minimum average height of 2m from floor level. Any single part of the station not covered by the video surveillance system shall not exceed 4 square meters. The camera images shall be able to be scrutinized by personnel in the station or based in a remote OCC. Personnel could have the possibility to visualize the images in sequenced or permanent mode.



Cameras of the system shall have vandal-proof housing. They shall be clearly visible and they shall be installed where it is not easy to damage or evade them. Cameras shall guarantee the same quality of image in all environmental and temperature conditions compatible with a station.

The video surveillance recording system shall guarantee a sufficient storage capacity in line with the national privacy law requirements. The recorded images shall be kept in a secure place protected not only from the environment but also from unauthorised removal or viewing.

4.1 Basic Requirements of Main Passenger Areas

Because passenger behaviour and possible dangers change according to the different areas inside a station every kind of passenger area has different needs in terms of video surveillance coverage. For example the quality level of the surveillance inside a lift shall be higher than on the platform, because an aggression is more probable inside a lift than on a platform where a passenger is amongst many other people.

4.2 Entrances & Exits

The video surveillance system shall cover all the internal areas of the station entrances and exits. In particular, the system should provide a view not only of the inside of entrances and exits, but also a view of the street and of the station environs. The recommended size for video surveillance in entrance and exit areas is detection level 10% or 20%.

4.3 Ticket Office and Automatic Ticketing Machine

Due to the fact that in this area passengers buy tickets and consequently money is exchanged, the video surveillance system shall provide 95% coverage to give the passenger the perception of being protected against aggression. On the basis of these considerations the recommended object size for video surveillance in Ticket Office areas is recognition level 50%.

4.4 Help Point Areas

In these areas the video surveillance system shall provide the possibility to view the passenger who activates an emergency device and also the surrounding areas to give to the OCC personnel the right perception of the situation.

The recommended object size for video surveillance in Help Point areas is recognition level 50% for the surrounding view and identification level 120% for the view of the passenger who activates the device.

4.5 Lift and Escalator Areas

These areas shall have 95% video surveillance coverage due to the fact that they are places with a high probability of aggressions or thefts. In particular, a lift is a suitable place for an aggression and the escalator is a suitable place for a theft, because passengers not only are standing still, but normally they cannot be careful due to the crowd on the escalator.

The recommended object size for video surveillance in the Lift and Escalator areas is detection level 10% or 20% for the beginning and end of such areas and recognition level 50 % for the view of the passenger inside such areas.

4.6 Emergency Exits

The emergency exits shall be covered by the video surveillance both inside and out. In this way in an emergency the OCC personnel will have a real perception of the station evacuation event. For the same reason the video surveillance system shall provide a view also of the station vicinities around the emergency exits.

The recommended object size for video surveillance in the Emergency Exits areas is detection level 10% or 20%.

4.7 Passageways

These areas are considered very important for passenger security especially at night when there are not many passengers. For this reason it is necessary that the video surveillance system provide 95% coverage of all passageways.

The recommended object size for video surveillance in Passageways is detection level 10% or 20% for the beginning and end of such areas and recognition level 50% for the view of passenger inside such areas.

4.8 Platform

This area of the station has two very important sections for the safety of passengers and also for the security of transport operations: train entry end, train exit end. Here it is very important that video surveillance guarantee surveillance to prevent accidents due to the accidental falling of passenger or objects. The remaining parts of the platform need video surveillance coverage not only of boarding and alighting operations during the normal service, but also crowd situations during the rush hours. The recommended object size for video surveillance in the Passageways is detection level 10% or 20% for the train entry and exit end sections of platform and recognition level 50 % for the rest of the platform area.

5 Conclusions

5.1 Main European Legal Guidelines for the Video Surveillance Application

In the following there are listed the essential guidelines to install video surveillance systems in conformity with the European directive basic rules, that have already been integrated into the legislation of the different members of the European Community.

- Every measure must be adopted to guarantee that the activity conforms to the EC directive and the relevant national legislation.
- The collection of personal data (images) related to the video surveillance activity must be pertinent to the aim pursued, meaning that the quantity of filed personal data must not go beyond the purposes of the video surveillance, particularly in terms of times of data conservation.
- Video surveillance activity may not be performed exclusively to control from a remote location the political opinions, sexual habits or behaviour of individuals.
- The person in charge of processing must put into practice all technical and organizational measures to protect data collected from accidental destruction, alternation, unauthorized access or distribution. The measures adopted must be in line with the risks represented by the nature of the data and the type of processing.

5.2 Main Performance Requirements of Video Surveillance Images Recording

In the following tables there are listed the recommended object (target) sizes for the visualization of the video recorded images, in relation to the different station levels to guarantee the security of passenger and the safety of the daily metro service.

5.2.1 Egresses

In table 3 there is the recommended minimum size of target, that is visualized on the recorded images of the video surveillance, in relation the different passenger areas of the station level. These target sizes are recommended by EN 50132-7 (Alarm System CCTV surveillance system for use in security applications), for the operations of identification, recognition, detection and monitoring.

Table 3 – Video Surveillance Performances (Minimum Target size on the screen) in relation to the different passenger areas of the Egresses

Egresses									
	Passenger Area								
Target Size (video surveillance Performances)	Entrance & Exits	Ticket Office Area	Automatic Ticketing Machine	Help Point	Photo Me Booths	Lift	Escalator	General Area	Emergency Exits
Monitor (5%)									
Detection (10% or 20%)	X				X	X (Entrance & Exit)	X		X
Recognition (50%)		X	X	X		X (inside)	X (Beginning & End)		
Identification (120%)				X					

5.2.2 Mezzanine

In table 4 there is the recommended minimum size of target, that is visualized on the recorded images of the video surveillance, in relation the different passenger areas of the station level. These target sizes are recommended by EN 50132-7 (Alarm System CCTV surveillance system for use in security applications), for the operations of identification, recognition, detection and monitoring.

Table 4 – Video Surveillance performances (Minimum Target size on the screen) in relation to the different passenger areas of the Mezzanine

Mezzanine				
	Passenger Area			
Target Size (video surveillance Performances)	Passageways	Lift	Escalator	Emergency Exits
Monitor (5%)				
Detection (10% or 20%)	X (Beginning & End)	X (Entrance & Exit)	X (Beginning & End)	X
Recognition (50%)	X	X (inside)	X	
Identification (120%)				

5.2.3 Platform

In table 5 there is the recommended minimum size of target, that is visualized on the recorded images of the video surveillance, in relation the different passenger areas of the station level. These target sizes are recommended by EN 50132-7 (Alarm System CCTV surveillance system for use in security applications), for the operations of identification, recognition, detection and monitoring.

Table 5 – Video Surveillance Performances (Minimum Target size on the screen) in relation to the different passenger areas of the Platform

Platform			
	Passenger Area		
Target Size (video surveillance Performances)	Train Entry End	Train Exit End	General Area
Monitor (5%)			
Detection (10% or 20%)			X
Recognition (50%)	X	X	
Identification (120%)			

6 Technical Proposal for the Implementation of Video Surveillance and PIS Functions into the MODACCESS Demonstrator (Metro Madrid Test)

This paragraph describes the architecture of the PIS and Video Surveillance Demonstrator System both on board and wayside proposed by WP13 (Frensissemi in cooperation with EUROTELEC) for MODACCESS Metro Madrid Test.

6.1 Architecture of the Demonstrator

It will be provided just one system which must work independently from the way of travel.

The onboard demonstrator system consists of:

- VSS
- SAS
- Passenger Information PIS
- Interface with DCS

Figure 2 shows the block diagram of the onboard demonstrator system.

The Ground demonstrator consists of:

- Operational Control Center Emulator with system HMI OCCE+HMI
- Platform Video Surveillance PVSS
- Interface with Data Communication DCS
- Figure 3 shows the block diagram of the ground demonstrator.

6.2 Functionalities of the Demonstrator

6.2.1 On Board

Here below the main functionalities implemented by the onboard system are described.

1. Information to Passenger via the internal and external alphanumeric displays (travel information, safety information in case of emergency). Automatic travel information will be provided on the base of the position of the train acquired by the signalling system via the serial port of the PIS Server. The list of messages for automatic announcements will be stored by the PIS Server and downloaded from ground via DCS.
2. Passenger's area video surveillance by means of 2 colours TVCC connected to a recorder unit. The images can be recorded, displayed on the onboard HMI or transmitted to ground through the DCS
3. Passenger alarm: The SAS device provides the audio communication with the onboard personnel or with the ground operator via the DCS. A camera allows the operator to see the calling passenger
4. Video monitoring of the platform while the train is approaching the station. The view of the platform transmitted by DCS is made visible on the onboard HMI (Touch Screen Monitor)
5. Data Communication: a DCS gateway unit is installed on the train; it is connected to VSS, PIS and SAS for operative and diagnostic data transfer and interfacement to the DCS.

6.2.2 On Platform

The devices which be installed on ground will simulate partially both OCC and platform system. The main implemented functions are the following:

6. Platform Monitoring: a camera will monitor the platform. The images will be transmitted onboard via the DCS for early warning surveillance of the platform itself
7. PIS control: by means of the OCC HMI it will be possible to drive the on board PIS (transmission of alphanumeric video and audio messages, diagnostic)
8. SAS control: by means of the OCC HMI it will be possible to talk with a passenger who has called for assistance. The face of the passenger can be seen on the HMI screen.
9. DCS interface: OCC will be interfaced to the DCS by a dedicated interface unit which can be considered as a DCS gateway.

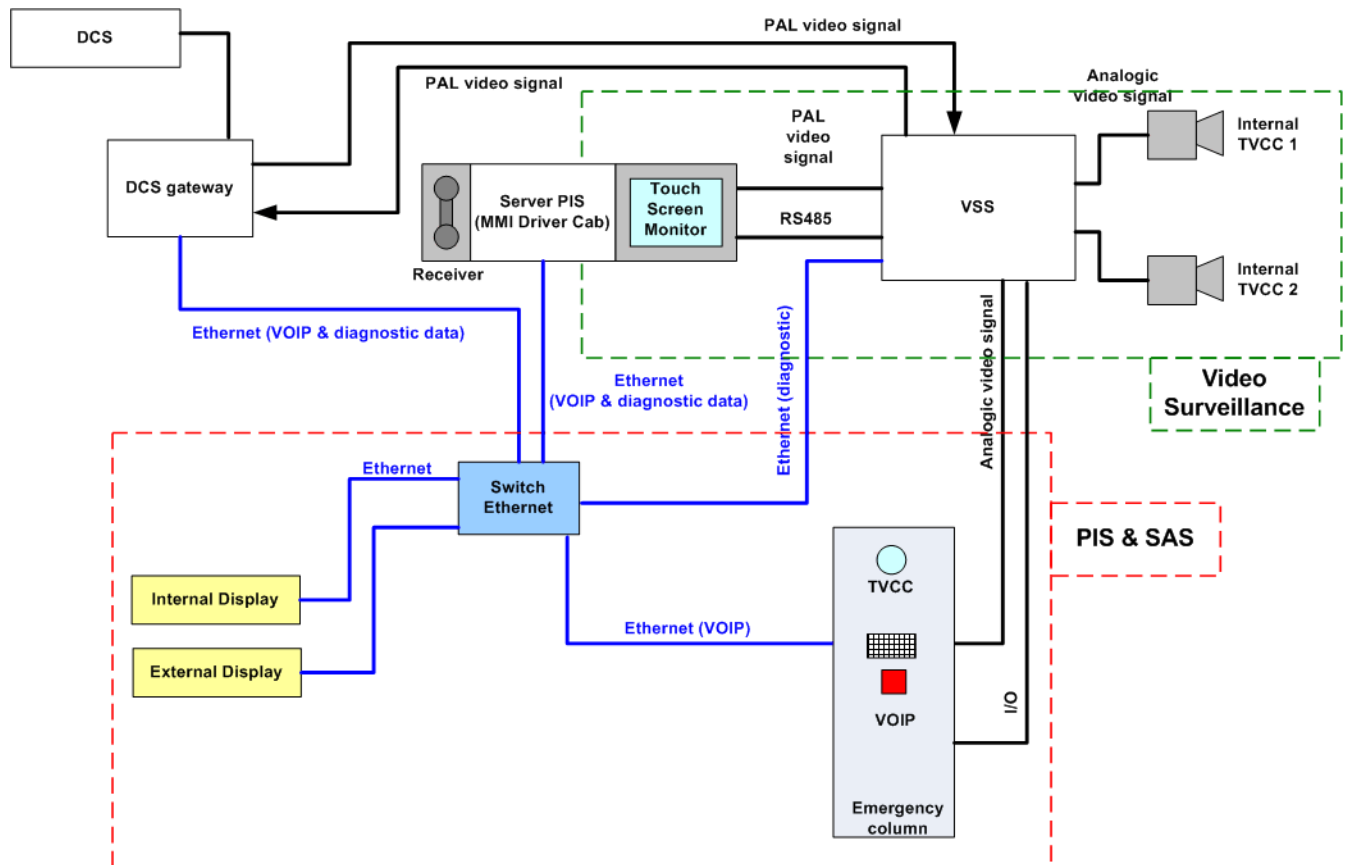


Figure 2 – General architecture of the PIS & VSS on board

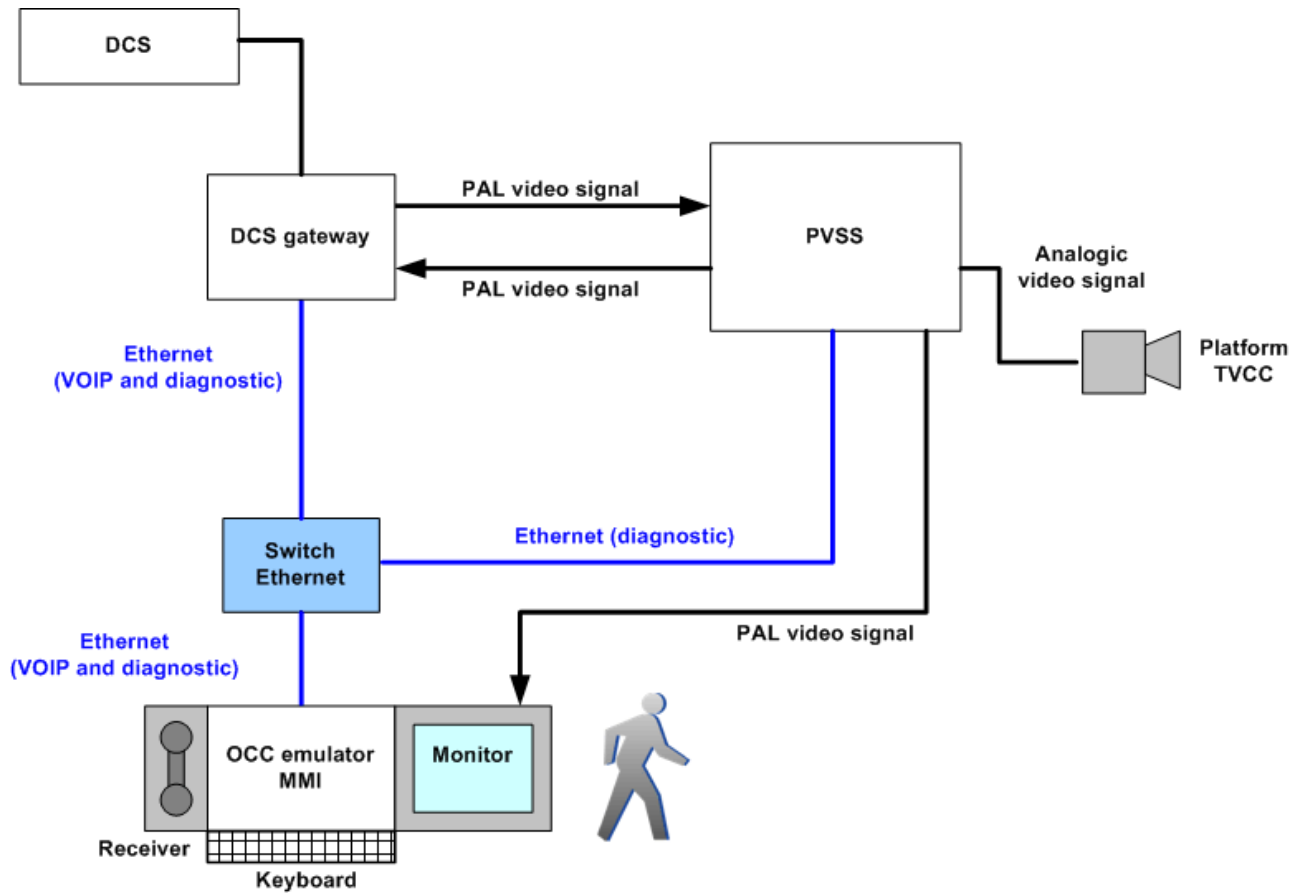


Figure 3 – General architecture of the PIS & VSS on way side



6.3 Requirement Specifications for Interface Compatibility with DCS Gateway

In the following tables there are listed the interface requirements for every on board device (table 6) and on the platform (table 7)

Table 6 – Interface Requirement Specifications for the PIS and VSS on board devices

On Board Interfaces					
Device	Function	I/O	Connection to	Kind of Interface	Notes
Emergency Column					
	TV Camera PA	O	VideoSurv Unit	PAL	
	Alarm pushbutton	O	VideoSurv Unit	Digital 24Vcc tbd	
	Loudspeaker	I	CAB MMI	VOIP on ETH	
	Microphone	O	CAB MMI	VOIP on ETH	
CAB MMI					
	Video	I	VideoSurv Unit	PAL	
	Audio	I	PA	VOIP on ETH	
	Audio	O	PA	VOIP on ETH	
	Diagnostic	I	PIS Server	ETH	
	Ground video selection	I	DCS Interface	ETH	
PIS Server					
	Diagnostic	I	CAB MMI	ETH	
	Diagnostic	I	Ext Display	ETH	
	Diagnostic	I	Int Display	ETH	
	Diagnostic	I	VideoSurv Unit	ETH	
	VOIP PABX	I/O	PA	ETH	
	Ground video selection	I	DCS Interface	ETH	
	Ground video selection	O	CAB MMI	ETH	
	Ext Display management	O	Ext Display	ETH	
	Int Display management	O	Int Display	ETH	
VideoSurv Unit					
	TV Camera 1	I	TV Camera 1	PAL	
	TV Camera 2	I	TV Camera 2	PAL	
	TV Camera PA	I	PA	PAL	
	Video from Ground	I	DCS Interface	PAL	Maybe a Video server will be placed between DCS Interface and VideoSurv Unit
	Video selection	I	CAB MMI	RS485	
	Video signal	O	CAB MMI	PAL	
	Video signal	O	DCS Interface	PAL	Video to be trasmitted to ground
	Diagnostic data	O	PIS Server	ETH	
Ext Display					
	Data & Diagnostic	I/O	PIS Server	ETH	
Int Display					
	Data & Diagnostic	I/O	PIS Server	ETH	



Table 7 – Interface Requirement Specifications for the PIS and VSS on platform devices

Way Side Interfaces					
Device	Function	I/O	Connection to	Kind of Interface	Notes
GCR MMI					
	Diagnostic	I	DCS Interface	ETH	CAB MMI
	Diagnostic	I	DCS Interface	ETH	Ext Display
	Diagnostic	I	DCS Interface	ETH	Int Display
	Diagnostic	I	DCS Interface	ETH	VideoSurv Unit
	VOIP Emergency Column	I/O	DCS Interface	ETH	as option
	On Board video selection	O	DCS Interface	ETH	
	TVCC Platform	I	VideoSurv Unit	PAL	
	Sending of the Platform images	O	VideoSurv Unit	ETH	
VideoSurv Unit					
	TVCC Platform	I	TVCC Platform	PAL	
	Sending of the Platform images	O	DCS Interface	PAL	
	Video from On Board	I	DCS Interface	PAL	Maybe a Video server will be placed between DCS Interface and VideoSurv Unit
	Diagnostic data	O	PIS Server	ETH	
	Visualization data	I	GCR MMI		
	Visualization	O	GCR MMI	ETH	

6.4 Video Surveillance System

The Video Surveillance System consists of:

- *On Board:*
 - 2 Passenger area TVCC
 - 1 Video Surveillance Recording Unit (figure 4; figure 5)
 - 1 Cab Monitor with touch screen for the visualization of the images
- *Way Side:*
 - 1 Platform TVCC
 - 1 Video Surveillance Ground Unit
 - GCR HMI for the visualization of the images

The TVCCs have full colour capabilities and PAL resolution (500x582) with 400 TVL. They are connected to the video surveillance unit by a balanced video PAL signal. The video surveillance unit acquires video signal not only from the passenger area TVCC but also from the TVCC inside the emergency column. The touch screen monitor of the Driver Cab HMI used for the selection of the visualization of the TVCC images and for diagnostic. The video surveillance unit is connected directly to the DCS interface to send, on demand, to OCC HMI the images of the internal TVCC and to receive the images of the platform TVCC. On the Driver Cab HMI is possible to visualize the diagnostic status of the video surveillance system. The images coming from the TVCC inside the emergency column are displayed automatically, on the Driver Cab HMI, only in case of the activation of the emergency call by a passenger. These images in case of necessity could be seen also from the OCC HMI.

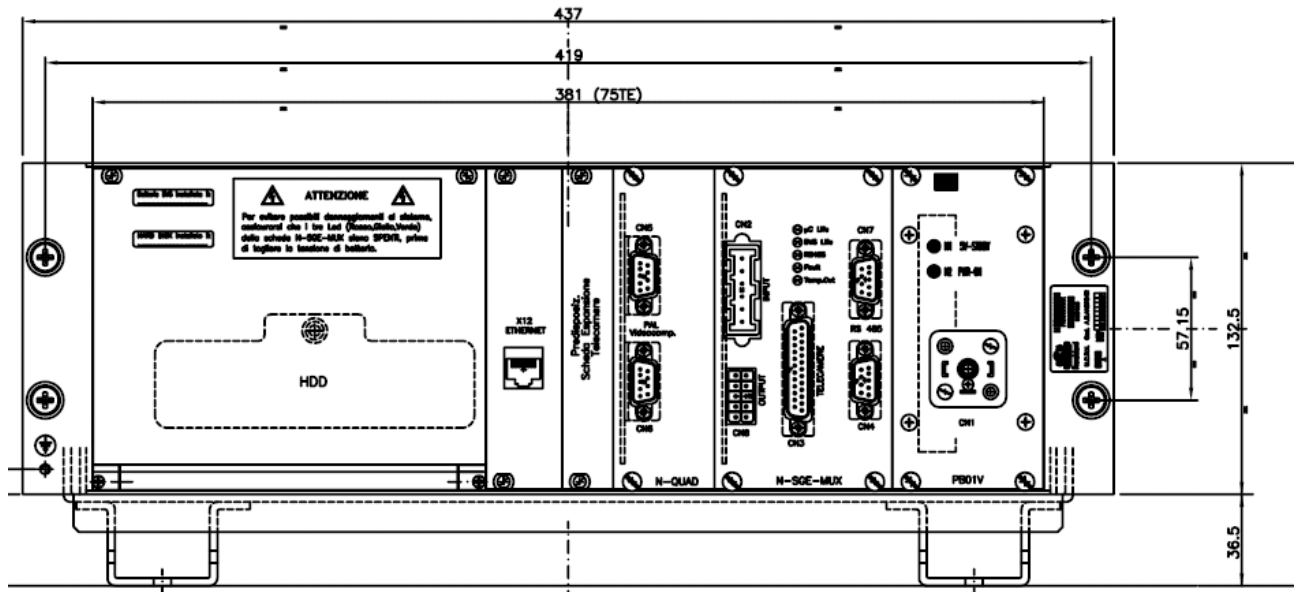


Figure 4 – Drawing of the Video Surveillance Recording Unit (Frontal View)

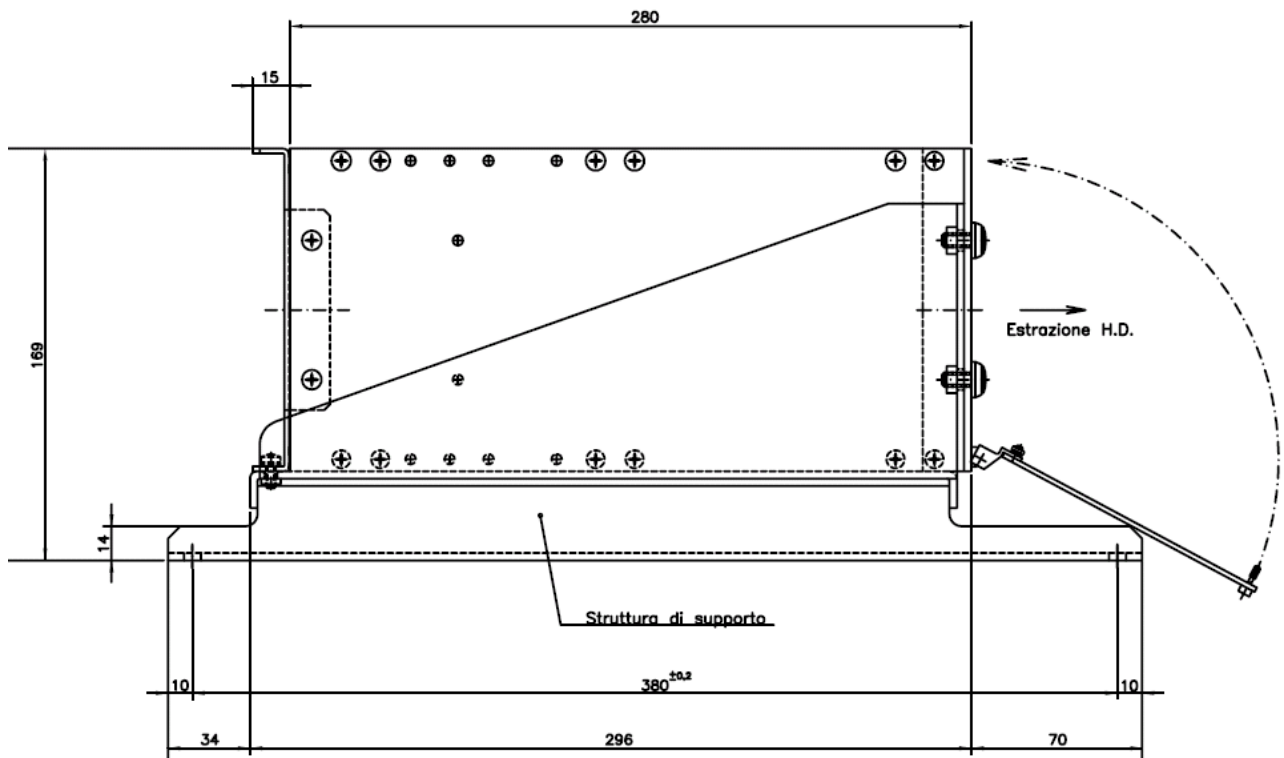


Figure 5 – Drawing of the Video Surveillance Recording Unit (Lateral View)

6.5 PIS

The PIS consists of:

- *On Board:*
 - 1 Internal Display
 - 1 External Display
 - 1 Emergency Column with TVCC and VOIP
 - 1 Driver Cab HMI with receiver and Monitor touch screen
- *Way Side:*
 - OCC HMI for with receiver and Monitor touch screen

The core of the PIS on board is the Server PIS, with Driver Cab HMI, that is connected to displays, to emergency column and video surveillance unit via Ethernet for diagnostic data, up-dating and VOIP communication.

The Driver Cab HMI is connected to the video surveillance unit also via an analogic video PAL signal for the visualization of the TVCC images and via an RS485 line for the selection of the configuration to visualize.

The PIS Server, with Driver Cab HMI, has the following functions:

- Control of displays (management of database messages to be displayed and diagnostic)
- Control of the video/audio communication with the emergency column
- Control of the video surveillance unit (diagnostic and images visualization)
- Voice communication with the OCC HMI

On the Platform side the core of the PIS is the OCC HMI, that is able to manage the information and diagnostic of the on board PIS via DCS.

The main functions of the OCC HMI are the following:

- Manage the diagnostic data of the on board PIS & VSS and of the Platform PVSS
- Manage the information data of the on board PIS
- Manage of the voice communication train ↔ platform
- Visualization of the VSS images coming both from the on board and from the platform

6.6 Displays

Both internal and external displays are Led Matrix indicators. One internal display and one external display will be installed on the train.

Each display is provided of an Ethernet/RS485 port and an RS232 port.

The Ethernet/RS485 port is used for the communication with the PIS Server (commands, visualization messages, status and diagnostic data)

Interface RS232 is used for test and maintenance operations.

Texts and pictures may be visualized on the display. Visualization effects may be defined for each presentation.

A list of visual effects is:

- stationary text
- scroll from right to left;
- scroll from left to right;
- scroll up from down;
- scroll down from up;
- open from centre to both ends;
- open from both ends to centre;
- text formed by piled up single horizontal line;
- random dot.

The main characteristics of the External display (figure 6) are listed in table 8.

Table 8 – Main Characteristics of External Display

Main Characteristics of External Display	
LIST	SPECIFICATION
Size of viewing area display	(W) 1205 x (H) 90 mm
Number of dots (Columns x Rows)	(W) 241 x (H) 18 dots
Colour	Amber (587 nm)
Dot diameter	Ø 4.4 mm
Dot pitch	5 mm
Brightness	2000 cd/m ²
Viewing angle (H)	± 35°
Viewing angle (V)	± 20°
Levels of brightness	3
Readable distance	20 m
External Interface	Ethernet
Operating temperature	-25°C, +70°C
Dimension of mechanical case	1320x200x90 mm



Figure 6 – Example of the External display view

The main characteristics of the Internal display (figure 7) are listed in table 9.

Table 9 – Main Characteristics of Internal Display

Main Characteristics of Internal Display	
LIST	SPECIFICATION
Size of viewing area display	(W) 793,6 x (H) 49,6 mm
Number of dots (Columns x Rows)	(W) 256 x (H) 16 dots
Colour	Green (570 – 575 nm), Red (620 – 630 nm), Amber (as mixing)
Dot pitch	3,1 mm
Brightness	1300 cd/m ² (Amber)
Viewing angle (H)	± 60°
Viewing angle (V)	± 60°
Levels of brightness	3
Readable distance	8 m
External Interface	Ethernet
Operating temperature	-25°C, +70°C
Dimension of mechanical case	900x160x100 mm



Figure 7 – Example of the Internal display view

The internal display could have full colour capability (8 colours available). Colour coding could be used to clarify the messages, for example:

- Red for emergency
- Green for travel information
- Amber for service information (i.e. delay)

6.7 SAS

The SAS is composed by the Emergency column with the possibility to realize a voice and video link communication between the train and the ground. It is possible also to realize a voice and video connection with the HMI Driver cab on board.

6.7.1 Emergency Column

The Emergency Column (figure 8) is realized on the base of the PRM – TSI guidelines.

Inside the column there are installed a TVCC and an emergency call unit. When a passenger pulls the emergency handle or the emergency egress handle automatically it is activated a voice communication (VOIP) with the driver and also on the driver cab monitor appears the images coming from the TVCC inside the column. In case of driverless vehicle simulation will be activated a voice and audio communication between the emergency column and the OCC, but the images will come from one of the passenger area TVCCs, because in this way the operator inside the OCC could have a better view of the emergency situation inside the coach.

The emergency column has the following ports:

- Ethernet for VOIP communication
- Analogic video PAL signal for the TVCC
- Digital I/O for diagnostic

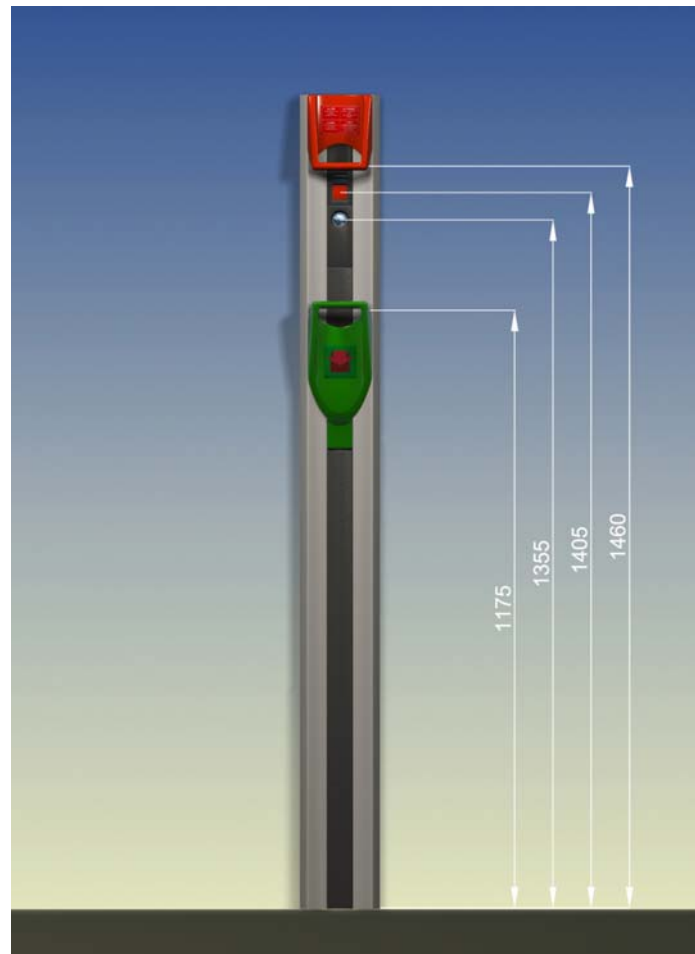


Figure 8 – Rendering of the Emergency Column

6.8 Software requirements

The onboard system is managed by the PIS server and by the DCS interface. The PIS server implements commands and functions for control and diagnostic of PIS, VSS and SAS while the DCS gateway encapsulates such commands and functions according to the DCS protocols in order they can be transmitted to ground.

The Software requirements will be defined in detail during the design phase.

6.9 Installation Requirements

Here below the main installation requirements are listed. A more detailed description will be done after a general overview of both the site and the train.



6.9.1 On Board

The on board test site will have the following installation requirements:

- 220 Vac Power Supply with dedicated circuit breaker (200 W, tbd)
- Availability of an Internet Connection
- Cabling will be movable and consequently the metro coach is not usable for normal passenger service
- Device installation drawing will be provided not later than TBD
- Fixing tools and installation will be provided by Metro Madrid personnel

The on board demonstrator, as described in cap.2.1.1, could be arranged inside a movable rack powered by 220 Vac via a Network adapter CEE 2P+T 220 Vac 16A BLU

6.9.2 On Platform

The platform test site will have the following installation requirements:

- 220 Vac Power Supply with dedicated circuit breaker

The on Platform demonstrator, as described in cap.2.1.2, could be arranged inside a movable rack powered by 220 Vac via a Network adapter CEE 2P+T 220 Vac 16A BLU

6.10 DCS and DCS Interface

The purpose of the Data Communication System is to transmit numeric information between ground and on board equipments by radio. According to MODCOMM specification this system will propose standard interfaces under IP on board and on ground.

In the case of Madrid demo 3 interchangeable DCS will be provided. Only 1 of these system will be active (powered on) at the same time. Interchangeability tests/demo will consist in alternatively connecting applications to each DCS.

In addition, a dedicated gateway will be supplied to encode analog video into a numeric data flow adapted to the 3 DCS transmission capacities. This "DCS gateway" will be the same for the 3 DCS.

The DCS Interface consists of:

- *On Board:*
 - 1 video coder
 - 1 video decoder
 - 1 Ethernet switch
- *On Ground:*
 - 1 video coder
 - 1 video decoder
 - 1 Ethernet switch



Gateway units connect to a single DCS terminal which from this point on may be different according to the DCS supplier.

More detailed information about DCS architecture and installation for Madrid Demonstration can be found in document D118 (DCS demo “trunk network” design) from Modcomm WP12.

7 Exclusions

- Connectors between the cars
- Installation (it will be carried out by Metro Madrid Personnel)
- Mechanical works, tools and devices to install the PIS and video items
- Housings to be adapted to the interiors of the train.
- Any kind of interiors for the devices inside the Ground Control Room.