

# APPLICATION NOTE

Development of 2nd  
generation remote  
control system for COPE  
Radio Broadcasting  
network based on AEQ  
AUDIOPLUS system.



## INDEX

1. INTRODUCTION. OPERATIONAL SCENARIO
2. REMOTE CONTROL IN RADIO BROADCASTING NETWORKS
  - 2.1. Parts comprising a Remote Control system
  - 2.2. Features of a Remote Control system
3. DESCRIPTION OF REMOTE CONTROL OPERATIONS IN THE AudioPlus SYSTEM AT COPE
4. CLASSIFICATION OF THE AVAILABLE REMOTE CONTROL SYSTEM TYPES FOR AudioPlus
  - 4.1. Digital satellite links
    - 4.1.1. Contact-closure Remote Control.
    - 4.1.2. Remote Control over continuous data channel.
  - 4.2. Terrestrial channels.
5. DESCRIPCION AudioPlus DTMF-BASED REMOTE CONTROL SYSTEM DESCRIPTION
6. AudioPlus CONTINUOUS DATA CHANNEL-BASED REMOTE CONTROL SYSTEM DESCRIPTION
7. REMOTE CONTROL MANAGEMENT USING CONTINUOUS DATA CHANNEL
  - 7.1. Setting up Servers and Programs
  - 7.2. Assigning programs to the playout templates.
  - 7.3. Remote Control management
    - 7.3.1. Stations and Remote Control groups creation
    - 7.3.2. Assigning stations to groups.
    - 7.3.3. Creation of Remote Control commands.
    - 7.3.4. Remote Control commands edition.
    - 7.3.5. Remote Control commands deletion.
    - 7.3.6. Remote Control commands audit.
    - 7.3.7. Templates containing the selected command.
  - 7.4. Playout machine with Remote Control Commands.
8. CONTINUOUS DATA CHANNEL REMOTE CONTROL SERVER DESCRIPTION
9. CUSTOMIZATION OF THE TECHNICAL INFRASTRUCTURE
10. CONCLUSIONS

## DEVELOPMENT OF 2ND GENERATION REMOTE CONTROL SYSTEM FOR COPE RADIO BROADCASTING NETWORK BASED ON AEQ AUDIOPLUS SYSTEM.

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### 1.- INTRODUCTION. OPERATIONAL SCENARIO

**COPE** (acronym for **Cadena de Ondas Populares Españolas**), formerly named **Radio Popular**, is a Spanish, nationwide radio network broadcasting general contents. It has more than 3 millions listeners. Besides the general COPE programming, Cadena 100, MegaStar FM and Rock FM music programs are also broadcast. Further, some more specific programs are produced, such as Cope+ and Megastar Alcalá.

Our main station is located in Madrid, but we have studios deployed across more than 70 cities. We have more than 250 transmitters installed, most of them in the FM band, broadcasting the generalist program, with customized regional and local contents, both for stations with studios and stations without. We also broadcast in the web and Digital Terrestrial Television (DVB).

COPE developed its first remote control network back in 1994 with AEQ MarSystem software, for two independent programs (called "frequencies" from here on). Now we are finishing the deployment of a second version together with AEQ. This newer version is ready to manage up to 8 frequencies and operates on Audio+, the current AEQ automation suit, which is adapted to suit our specific needs.

Besides COPE-owned transmitters, we count on a large number of associated stations that have

special programming needs. There are also particular requirements for the transmitters in some particular geographic areas, where a mix of our general COPE and music programs is required at certain time slots.

AEQ has asked us to provide a description of the technical deployment and operation of the remote controls system implemented at COPE for those readers interested in radio broadcasting technology, and specially to enlighten those without experience in this kind of systems. It is not precisely novel -as our first system is more than 20 years old now-, but the latest version it reaches quite a high level of complexity. The level of details provided has the objective to help covering similar needs and to increase the confidence in these systems in people considering these systems potentially unsafe or fragile.

Let's describe, with the help of the engineers from AEQ, the radial remote control system, in a generic way but certainly based on our satisfactory experience.

## 2.- REMOTE CONTROL IN RADIO BROADCASTING NETWORKS

A common need in radio stations, specially in large broadcasting networks, is the ability to remotely operate and control certain systems or machines, usually audio sources, in order to make them start or stop playing as required by the scheduling, all this without requiring the presence of an operator.

Radio broadcasting networks consist in a set of stations that are distant from each other. They may broadcast a single program, -generated by one of them, usually the "head station"-, or differentiated programming for each location. In the first case, that is, when there is a single program ("network scheduling"), a need arises for a means of switching to a different program – local contents or advertising- at certain defined hours, and for a limited amount of time. Once this block finishes, broadcasting of the signal from the head station resumes. There are other requirements for radio networks affecting their program quality, such as the time synchronization between all of the stations.

The main target of a REMOTE CONTROL SYSTEM is to cover all the above described requirements, in such a way that the devices requiring control within every remote station can be controlled from the head station, thus not requiring operator interventions.

### 2.1.- Parts comprising a Remote Control system

Several elements are required in order to implement a Remote Control system:

#### **A- Remote Control play-out system.**

This is the system that generates and sends the commands to the rest of remote radio stations in the network.

It is usually located in the head station. The play-out system usually comprises one or several devices that generate a kind of information that can be interpreted by other devices or systems in the broadcast station network.

#### **B- Distribution channel.**

This is the media channel through which the remote commands are sent to the different stations in

the network. It may be the same media channel that sends the audio or a parallel one.

### **C- Remote Control receiver system**

These systems, distributed among the different stations in the network, are the command receivers. Their purpose is to receive and interpret the received commands and generate the required actions.

The receiver system may trigger local programming that is stored in an automation system, or act on an external signaling, synchronization or audio switching device.

#### **2.2. Features of a Remote Control system**

The amount of features offered by a Remote Control system is greatly determined by the distribution channel. A simple or full-featured Remote Control system may be installed depending on the quantity of information that the channel is able to convey and make available to the receivers. Another limitation is related to the play-out/receiver system as a whole, depending on the technology they use.

A very simple and low-cost remote control system can be implemented based on sending DTMF tones using the audio distribution channel itself. This in-band system allows us to operate other devices, but some of its drawbacks are that it is not transparent (the signaling is audible), and the quantity of information that we can send is very limited, while serially chaining several tones to increase capacity makes them too audible, so the broadcast quality is degraded.

A professional system requires a dedicated data channel that is independent to the audio distribution. This allows for the implementation of a Remote Control system with ample possibilities and also transparent to the broadcast, not degrading its quality. This channel may be transported in parallel to a satellite transmission system as an IP data flow using IP audiod codecs. On occasions, this can be as an ancillary data channel using ISDN codecs, but these are becoming less frequently used nowadays due to the lack of ISDN infrastructures and the elevated running costs associated.

### **3.- DESCRIPTION OF REMOTE CONTROL OPERATIONS IN THE AudioPlus SYSTEM AT COPE**

A main program is generated from the head station. The most important part of this program is common to all stations: music, international or national news, company or program jingles, etc.

The Remote Control system generates commands that allow a computer located in each station – let it be part of the company network or an associated station- to interrupt the incoming satellite audio from the head station in order to broadcast the local program contribution, consisting in elements such as local station identifiers, local news blocks and / or local advertising.

This way, a customized program can be elaborated for each affiliated station even in time slots where the local studio is unattended. This is especially useful when inserting local advertising in magazines and Talk-shows or large-audience national sports programs, as well as to create a customized programming for each city during hours with low commercial interest, usually overnight and during weekends.

## 4.- CLASSIFICATION OF THE AVAILABLE REMOTE CONTROL SYSTEM TYPES FOR AudioPlus

The different types of Remote Control systems can be classified according to the transmission channel used and the capability to distinguish different commands, as follows:

- 4.1 Digital satellite channels
  - 4.1.1 Contact-closure Remote Control
  - 4.1.2 Continuous data channel Remote Control
- 4.2 Terrestrial channels
  - DTMF Remote Control
  - Continuous data channel Remote Control
    - Independent transport via IP networks
    - IP audiocodec-based transport
    - ISDN ancillary data channel transport

### 4.1. Digital satellite links.

Digital satellite links for audio distribution commonly include ancillary data channels that can be used to remotely command systems such as **AudioPlus** independently of the audio channel/s.

#### 4.1.1. Contact-closure Remote Control.

Some digital satellite receivers feature a set of relays which react to the remote control commands from the corresponding compatible digital encoder. Using these relays, a simple Remote Control system can be implemented offering, for instance, the following functions:

- A) Local program Pass and broadcast of a pre-selected program template.
- B) Primary circuit Pass (end of local block).
- C) Regional program Pass with terrestrial broadcasting and control.
- D) Main program Pass with satellite-based broadcast and control.
- E) Auxiliary relay ON
- F) Auxiliary relay OFF
- G) Clock synchronization.

#### 4.1.2. Remote Control over continuous data channel.

A more sophisticated Remote Control system can be implemented using digital channels. This system would be able to send much more complex commands:

- Selective commands towards a particular station or group stations.
- Commands to broadcast templates at times different to those programmed.
- Commands to control audio switching between different programs using a relay box.

### 4.2. Terrestrial channels.

A DTMF-based Remote Control system similar to the one described in paragraph 4.1.1. can be implemented using audio transport media such as audio streaming and audiocodecs.

The most common approach is to use a continuous ancillary data channel using an ISDN or IP audiocodec, or, if more bandwidth is required, an IP data channel can be established independent from the audio transport devices.

This terrestrial circuit is very often used as a secondary path to remote command local stations from regional stations at particular time slots, and while the primary remote-commanding circuit uses a satellite link, as described in paragraph 4.1.2.

## **5.- AudioPlus DTMF-BASED REMOTE CONTROL SYSTEM DESCRIPTION**

### **Command generation**

7 audio files are available in AudioPlus system, each one corresponding to one of the 7 functions already described in section 4.1.1.

When we want to generate an command, we must load the corresponding tone (audio file) on a playout machine within AudioPlus, according to the description in AudioPlus manual and catalogue. This can be done independently or within a template. Also, tones can be included into a playout folder.

### **Command broadcasting**

When a tone is played from a playout machine, it will be broadcast through the audio distribution network, either via satellite, using audiocoders, streaming or any other means, and it will reach the DTMF inputs of all the remote playout computers.

### **Command reception**

The computers running the remote playout machines are ready to receive the following DTMF commands:

- A) “Pass to local programming and playout of a pre-selected template” command will cut incoming audio from the network program and, in turn, it will broadcast the audio programmed in the “Remote template/Autoloader Managers” for the current time range.
- B) “Pass to network audio (end of local block)” command will void the previous one and will return to network program broadcasting.
- C) In cases where audio and control may come from national as well as regional programs, the “Pass to regional programming with terrestrial broadcast and control” command will cut the audio coming from the national network and will give pass to regional audio, and at the same time the regional commands will be accepted as valid.
- D) The “Pass to national program with satellite broadcast and control” command will void the previous one.
- E and F) “Auxiliary relay ON” and “Auxiliary relay OFF” commands will produce the switching of the corresponding relays in remotely commanded stations incorporating such relay boxes. They allow to start / stop external devices and set audio switching.
- G) The “Clock sync” command will synchronize all the computer clocks once a day to correct deviations and keep the time windows when A and B commands act properly scheduled.

## **System operation**

This system allows for unattended operation of all audio studios that are correctly scheduled in “autoloader” type remote playout machines. This eases the creation of customized programming with indicative jingles, local news and advertising without the need for an operator at each place, except when local windows need to be recorded or scheduled to be broadcast when triggered by remote commands.

## **6.- AudioPlus CONTINUOUS DATA CHANNEL-BASED REMOTE CONTROL SYSTEM DESCRIPTION**

Please observe the schematic shown in next page.

### **Command generation**

There is a local area network at the head station where all broadcast studio computers are connected. Also, several computers that receive commands from broadcast studios and plays them out to the remote devices are connected to the same network.

Besides, an AudioPlus manager exists in the AudioPlus system that makes possible to create many different commands, which will be automatically available so that any broadcast studio can send them to the remote locations.

### **Command broadcasting. Remote Control servers**

When an command is sent, it reaches the Remote Control server through the local area network. The Remote Control server prepares a data frame with the received commands to be broadcast to the stations in the network. It also prepares a time synchronization frame that is broadcast in programmable intervals.

A server can manage up to 4 different programs, but as many servers as required can be installed until all the programs are controlled.

The Remote Control server performs an additional function: it creates a control loop; if a satellite receiver is installed locally that receives the sent command and this is, in turn, input to the server again, the received data can be compared with the original command in order to have an error control and send alarms in case that any command is not properly received.

### **Command broadcasting. Distribution channel.**

So-generated command frames reach the satellite uplink system, and they are currently sent using the associated data channel. In the past, when satellite links were analog for audio used in analog television, the command frames were embedded into the audio but were not audible, thanks to the use of a data encoder.

The satellite receiver at each of the remote stations receives the commands and delivers them to each remote playout computer using its data input or using a data decoder if they were transparently embedded into the audio.

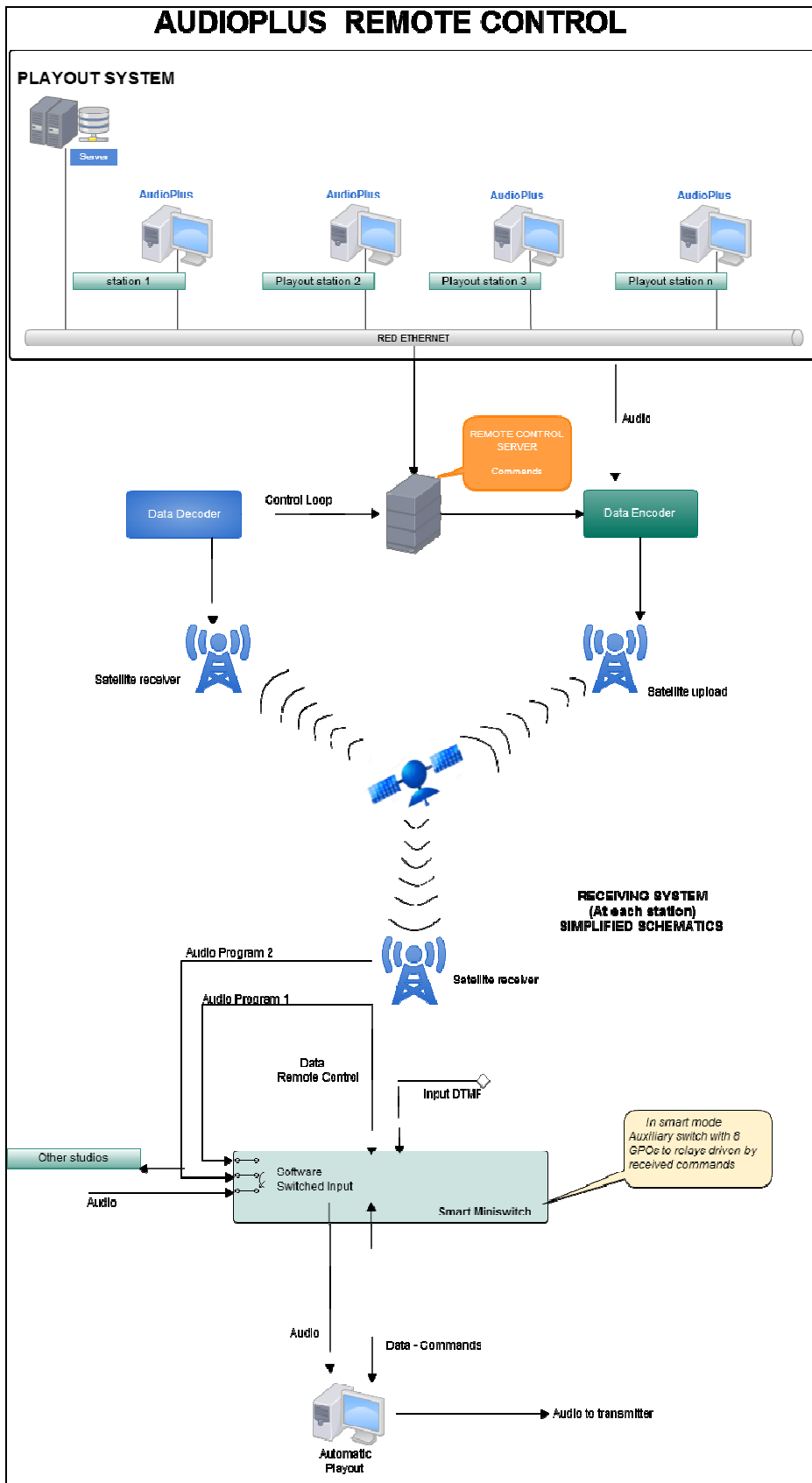
### **Command reception and execution.**



Computers working with the remote playout screen are ready to receive commands through the continuous data channel.

Software controls that each computer doesn't respond to commands that were not addressed for it. This way, commands can be sent to particular stations or groups of stations. The Remote Control receiver computers can also be integrated in local area networks.

Furthermore, the terrestrial line supporting the regional program can be incorporated to a DTMF input in each remote playout computer for greater flexibility: this way, the system can be controlled from the regional line at certain time slots, as explained in chapter 4.



## Auxiliary relay, port mirroring and audio switching boxes

In order to increase the system flexibility when managing received commands, and be able to adapt it to receiving infrastructure from third-parties, that are commonly found with affiliate radio stations, an automatic switching box is usually connected to the receiver equipment.

AEQ manufactures two different models:

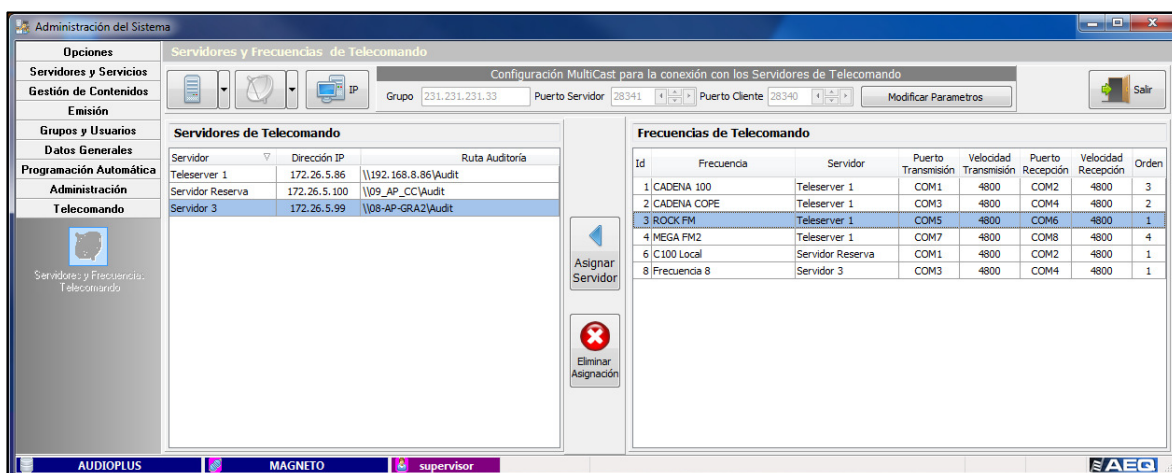
- Miniswitch:
  - Allows each playout PC to accept up to three different stereo audio sources. For example, two satellite national programs and an additional regional terrestrial one. The acknowledged signal can be switched via software to the local scheduling prepared in the local automation system and, in turn, to the program loaded in an external audio source. All this switching can be controlled from the command generation system.
  - DTMF decoding for remote control of the application. This box decodes either RS-232 data from a satellite receiver or DTMF from an external audio input.
  - Connections for a Fader Start, transmitting the command to a PC by means of either the serial or parallel port.
  - Distribution and grouping of serial port commands: it has a port for connecting satellite receivers, another for an audiocodec receiving regional commands and another port for the PC serial interface.
- Smart Miniswitch includes all Miniswitch features plus some additional ones:
  - 8 auxiliary GPO relays, activated by serial port commands or DTMF.
  - Autonomous switching function, not requiring a PC running AEQ applications, in order to interact with third-party work places.

## 7. REMOTE CONTROL MANAGEMENT USING CONTINUOUS DATA CHANNEL

### 7.1. Setting up Servers and Programs

The required servers to manage the different programs are created from AudioPlus Administration module.

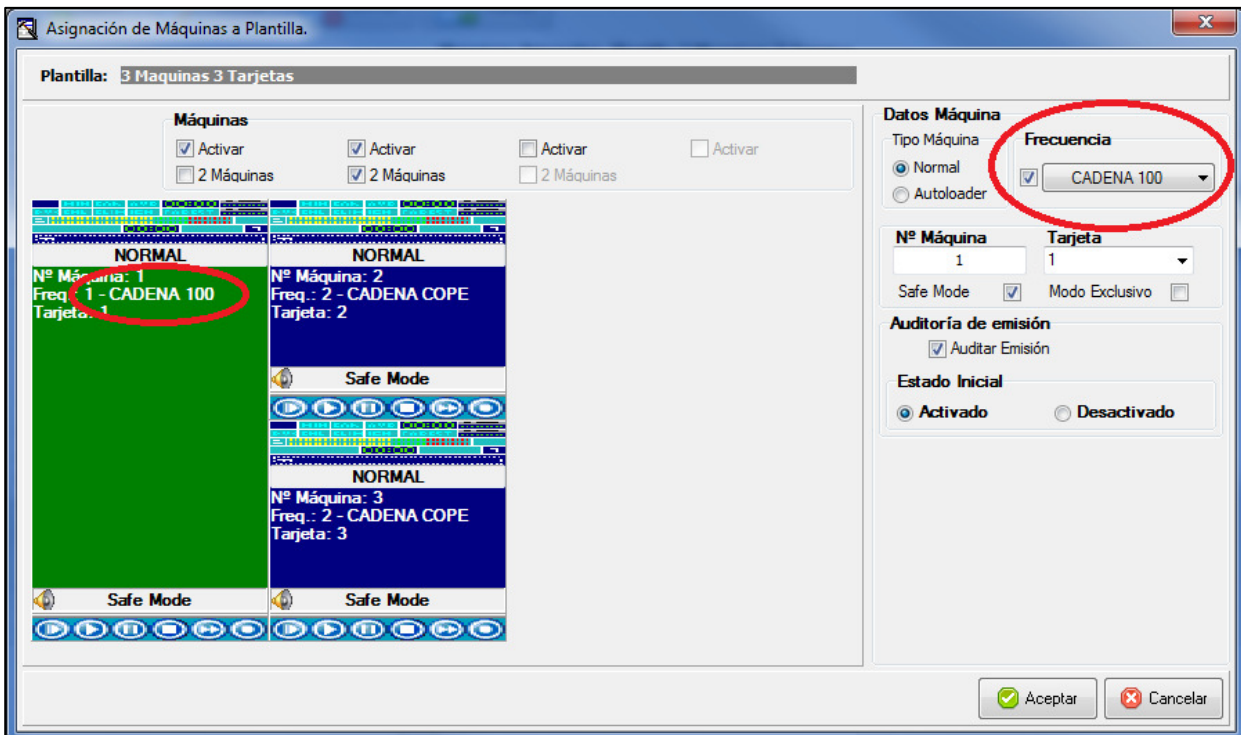
Once the programs and Telecom Servers are created, each program has to be assigned to any of the servers. This assignment can, however, be modified at any time, so spare servers may be configured and the tasks can be switched between one and another quickly if required.



### 7.2. Assigning programs to the playout templates.

A template for the Remote Control playout machine is created in the user software within the playout studio, assigning a program to each machine so that commands loaded into each one are linked to the corresponding program.

Each of the available playout machine configurations can be set up to launch commands. To do that, it is necessary to assign a single program to each machine. A template may have different programs for each playout machine or the same program for all of them.



### 7.3. Remote Control management


For a set of 4 different programs -some of them divided into two-, more than 70 cities with their own production centers, and more than 250 stations and transmitters that may want to customize their broadcasting, it is absolutely necessary to organize the stations, assigning a name to each one within the system, and creating groups that respond to the same commands, thus simplifying the creation of these commands.

It is also a requirement to be able to create, edit, delete and audit the commands. That's why a Remote Control command management tool was created back in 1995. Now, the second generation has just been installed, adding some additional features to simplify management.

These are the available options:

- Remote Control groups
- Remote Control stations
- Remote Control command creations
- Remote Control command edition
- Remote Control command deletion.

- Remote Control command audit.
- Displaying templates containing the selected command.



The screenshot shows the 'Ordenes Telecomando' window in the AEQ+AudioPlus software. The window title is 'AEQ+AudioPlus 11:49:37'. The main area displays a table of commands with columns 'Orden' and 'Descripción'. Below the table is a toolbar with several icons. Blue lines connect these icons to labels: 'Remote control groups' (network icon), 'Remote control stations' (station icon), 'Add command' (plus icon), 'Edit command' (wrench icon), 'Delete command' (minus icon), 'Lists containing the control command' (list icon), and 'Remote control command audit' (audit icon).

Orden	Descripción
PROGRAMA-1 / ALL	Paso a PROGRAMA-1. Todos los puestos
PROGRAMA-1 / E1	Paso a programa 1 la estación 1.
PROGRAMA-1 / E5	Paso a PROGRAMA-1. Est. 5 modificada 2
PROGRAMA-1 / GR109	Paso a PROGRAMA-1. Grupo 109
PROGRAMA-1 / GR15	P1 todo el Grupo 15
PROGRAMA-1 / P1	Paso a PROGRAMA-1. Est prog 1
PROGRAMA-1 / P2	Paso a PROGRAMA-1. Est prog 2
PROGRAMA-2 / ALL	Paso a PROGRAMA-2. Todos los puestos
PROGRAMA-2 / E8	Paso a PROGRAMA-2. Est 8
PROGRAMA-2 / GR252	Paso a PROGRAMA-2. Grupo 252
PROGRAMA-2 / P1	Paso a PROGRAMA-2. Est en prog 1
PROGRAMA-2 / P2	Paso a PROGRAMA-2. Est en prog 2
RELE-OFF / ALL	Desactivar Relé Auxiliar. Todos los puestos
RELE-OFF / E8	Desactivar Relé Auxiliar. Est 8

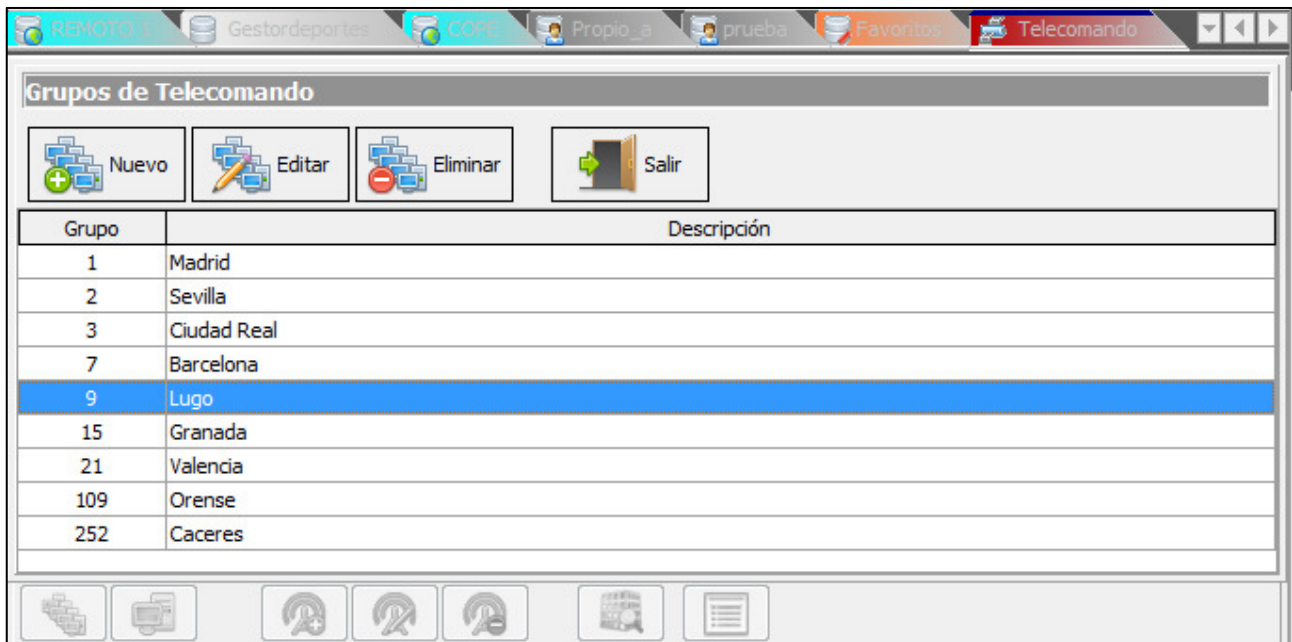
### 7.3.1 Stations and Remote Control groups creation

A Remote Control group is a set of remotely commanded stations to where we send simultaneous and common commands.

A station may be part of several groups, and in this case it will attend to the commands sent from any of these groups, general commands addressing all the stations in the network, as well as those intended for that station only.

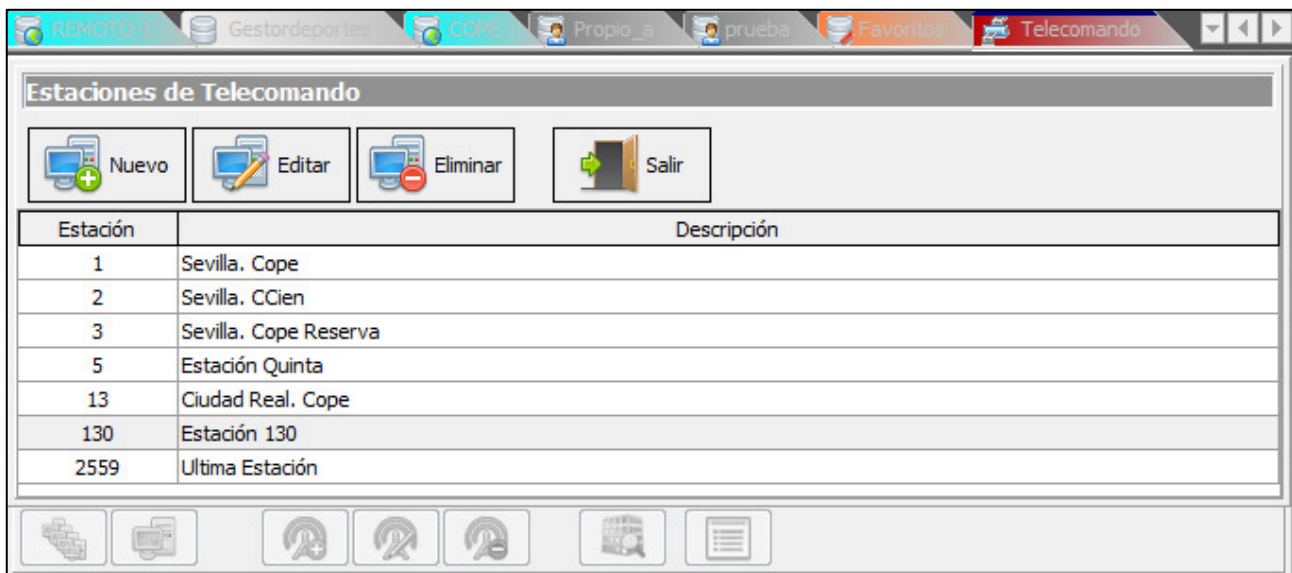
#### Remote Control Groups:

Each of the Remote Control groups we need is labeled with a name in command to classify the stations that need to react to a particular collective command.



### Remote Control Stations:

Once the groups are created, we have added the stations. One station for each program broadcast in each city is added, so the commands can be properly customized for each of these programs.



### 7.3.2. Assigning stations to groups

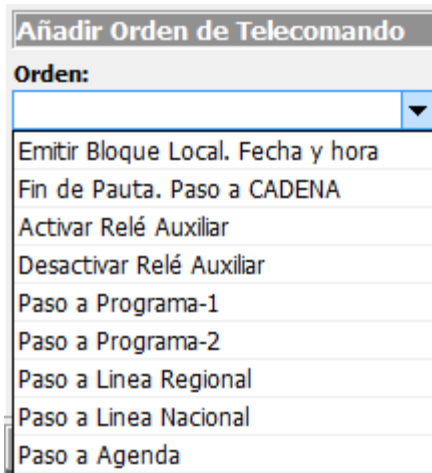
AudioPlus Remote station Automation System requires that each remote location is assigned a unique station number; that makes possible to differentiate it from all the other remote stations to control remotely.

### 7.3.3. Creation of Remote Control commands

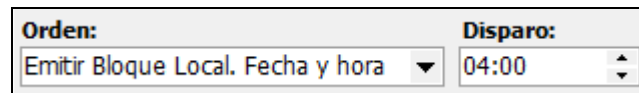
9 different command types have been defined for the current Remote Control version:

- Advertisement payout.
- Block end.
- Pass to program 1.
- Pass to program 2.
- Pass to regional line.
- Pass to national line.
- Auxiliary relay ON.
- Auxiliary relay OFF.
- Return to hourly schedule.

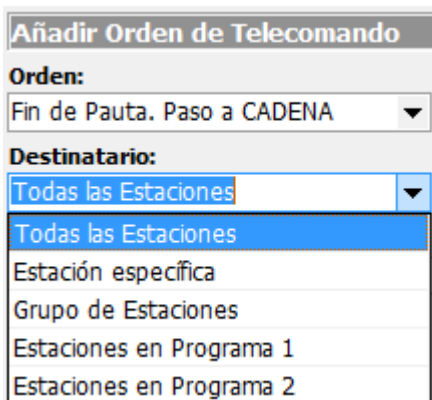
The **desired** command must be selected in the top box.



In case that *Broadcast Local Block. Date and Time* is selected, the template time must be specified in hours and minutes, so when that command arrives to the destination computer, it is able to know which template to broadcast.



On the other hand, please have in mind that the theoretical payout time of a template doesn't need to match the real broadcast time: the operator may choose the actual time when a template broadcast command is sent, independently of its scheduled time.



Next, the command **Destination** must be indicated:

- If *All Stations* is selected, the command will be decoded by all remote stations.
- The *Specific Station* option is used to send an command to a single remote station.
- Using the *Group of Stations* option, the command will be sent to all the stations that are part of the group designated next.

**Añadir Orden de Telecomando**

**Orden:**  
Fin de Pauta. Paso a CADENA

**Destinatario:**  
Estación específica

**Estación:**

Nombre Estación	Id
Sevilla. Cope	1
Sevilla. CCien	2
Sevilla. Cope Reserva	3
Estación Quinta	5
Ciudad Real. Cope	13
Estación 130	130
Ultima Estación	2559

**Destinatario:**  
Grupo de Estaciones

**Grupo:**

Nombre Grupo	Id
Madrid	1
Sevilla	2
Ciudad Real	3
Barcelona	7
Lugo	9
Granada	15
Valencia	21
Orense	109

If Stations in Program 1 or Stations in Program 2 is selected, the only stations that will attend the command will be those assigned to programs 1 or 2 when the command is executed.

Once the type of command and which stations it will affect are defined, we only need to assign it a descriptive label.

#### 7.3.4. Remote Control commands edition

The descriptive label of a command may be changed at any moment, while it is not possible to alter the command contents and destination, since this may have been already executed or is just about to be launched.

#### 7.3.5. Remote Control commands deletion

Any Remote Control command may be eliminated using this option.



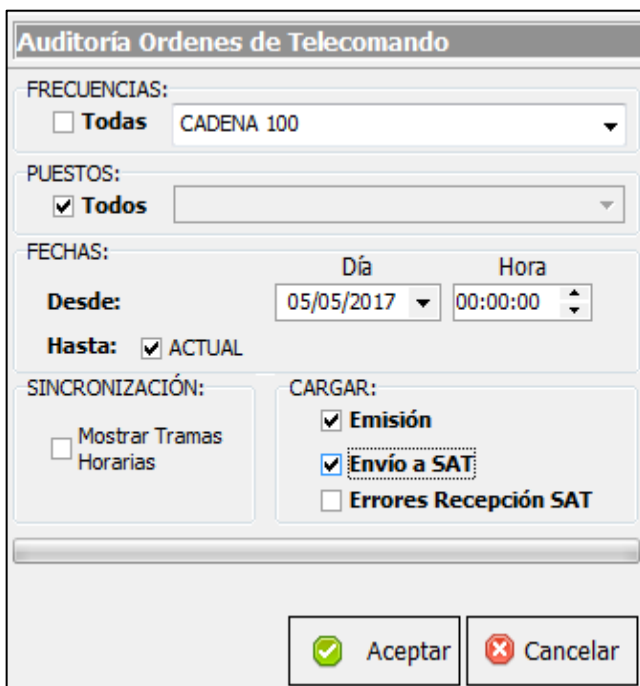
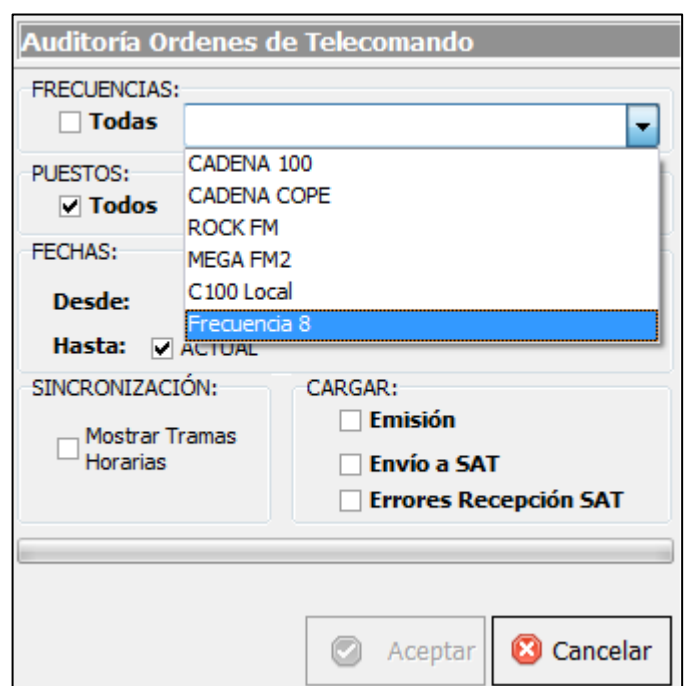
### 7.3.6. Remote Control commands audit

Managing a large number of stations in such a flexible and customized way and in order to cover the needs for each one of them, implies a high level of complexity. Errors may occur, either during programming, when launching, transporting or executing a command. That's why it is so important to be able to verify the correct execution of many thousands of collective or individual commands, and audit the errors to be able to prevent them from happening in the future. For this reason, it is necessary to filter the audit information to conveniently check those particular commands that are suspicious of not having been properly executed.

It is possible to check this audit from any AudioPlus workstation, showing commands that have been launched from the playout machines to the Remote Control servers, the sending status from these servers towards the remote ones, as well as any potential reception error.

The available parameters that may be used to filter the audit data are:

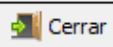
- Selection of a particular program or all of them.
- Filtering for a single playout location or any.
- Time interval we want to check (current day, by default).
- Whether we want the time synchronization frames displayed or not
- Show the launched commands from each playout station.
- Show commands processed and sent from the servers to the outside world.
- Show server reception errors.





Auditoría Ordenes de Telecomando						
Tipo	Fecha	Puesto	Tarjeta	Orden	Frecuencia	
▶	24/04/2017 11:30:48	EST-A2	2	LINEA-N / GR14	MEGASTAR ALCALA	
▶	24/04/2017 10:22:00	EST-A2	2	LINEA-N / GR14	MEGASTAR ALCALA	
●	24/04/2017 10:19:37	EST-A2		LINEA-N / GR17	COPE MAS	
▶	24/04/2017 10:09:33	EST-A2	1	LINEA-N / GR17	COPE MAS	
▶	24/04/2017 10:09:29	EST-A2	1	LINEA-N / GR17	COPE MAS	
●	10/04/2017 14:15:01	EST-A2		CADENA / GR14 [ OFF ]	COPE MAS	
▶	10/04/2017 13:13:52	EST-A2	1	LINEA-R / E162 [ OFF ]	COPE MAS	
▶	10/04/2017 13:13:51	EST-A2	1	CADENA / GR14 [ OFF ]	COPE MAS	
▶	10/04/2017 13:11:41	EST-A2	1	LINEA-R / E162 [ OFF ]	COPE MAS	
▶	10/04/2017 13:11:40	EST-A2	1	CADENA / GR14 [ OFF ]	COPE MAS	
▶	07/04/2017 9:00:14	EST-A1	1	LINEA-R / GR18	COPE MAS	

### 7.3.7. Templates containing the selected command.

This option lets us know which templates are containing a certain Remote Control command at a given moment, showing where it is assigned, its latest modification date, whether it is marked for deletion to the trash bin, or even whether it is scheduled to be executed in the near future.

Listas en las que está contenida la Orden.				
Orden <b>PROGRAMA-2 / ALL</b>				
				
Nombre de la lista	Gestor	Fecha Modificación	En Papelera	En Autoloader
primera lista telecomandada	MUSICA	06/03/2017 12:54:40	<input type="checkbox"/>	<input type="checkbox"/>
aaaaa	PUBLICIDAD	06/03/2017 10:32:39	<input type="checkbox"/>	<input type="checkbox"/>



### 7.4. Playout machine with Remote Control Commands.

For a simple use and fast learning curve, we requested AEQ that Remote Control commands should be launched from standard AudioPlus playout machines, although some minor adaptations were required to the additional Remote Control function.

If any “machine” within a playout station has been configured to launch Remote Control commands, its presentation and functionality changes.



A new “REMOTE CONTROL COMMAND” button appears on top of any of the playout machines configured with Remote Control Commands, together with the description of the program it manages.

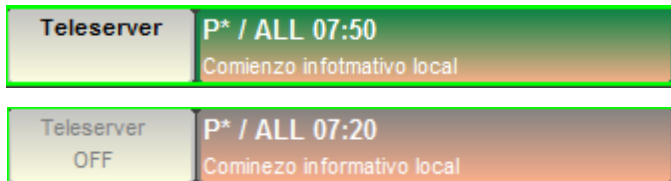
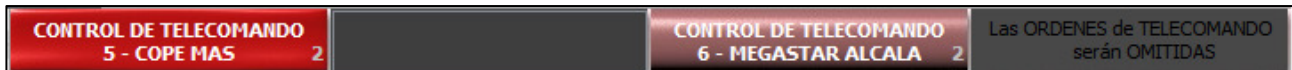
By default, the button (and its function) is off, implying that, if a Remote Control command is executed from that machine, it won't be sent to the server for its broadcasting.

It is necessary to click on that button so the machine is activated to send commands.

It is specially important that the operator knows whether the playout machine has Remote Control enabled or not, that is, whether the next command to be sent from that machine will be executed or not; that's why the active or disabled Remote Control status is clearly displayed at machine level

and also for each command.

In the attached example image, the machine at the left is enabled, while the one at the right is disabled. A blinking red/black label will appear in the latest one indicating that *REMOTE CONTROL COMMANDS WILL BE OMITTED*.



Whether a machine's Remote Control command sending is active or not can also be observed on the proper command lines themselves: if not active, the word "OFF" will appear on the label and the label is also dimmed.

## 8. CONTINUOUS DATA CHANNEL REMOTE CONTROL SERVER DESCRIPTION

This application receives the commands sent from the playout stations, processes, encodes and sends them. It also monitors the correct reception of each sent command, locally.

It is able to manage up to 4 different programs, requiring 2 x RS232 serial ports for each one, as one of them is used to send frames, while the other is used to check their reception. Both the port numbers and their baudrate can be configured.

The unified system time and date are presented at the top area.

A Sent, Received and Error frame counter exists for each of the 4 possible programs.

A frame is considered to have errors when the data control loop cannot be closed through the satellite and the system's control receiver.

The last frame with errors is highlighted in red. A parallel port pin can be activated whenever an error is detected, so an external alarm can be triggered.

Teleserver SAT - Versión: 3.1.0.4 - Iniciado: 05/05/2017 14:27:30

**SERVIDOR DE TELECOMANDO**  
TELESERVER AEQ 1

05/05/2017 14:28:37

Local Host : 192.168.8.77  
Grupo MCast : 231.231.231.32  
Server Port: 28340  
Client Port: 28341  
Sincronización Horaria : Cada 1 minutos

COPE				CADENA 100			
Envío		Recepción		Tramas Horarias		Telecomando	
COM4	4800	COM5	4800	1	4	1	1
<input checked="" type="checkbox"/> Transmisión de datos <input checked="" type="checkbox"/> Recepción de datos				Alarma Segundos de espera recepción de trama: 4 Pin: 3			
Próxima: 14:29:31				Próxima: 14:29:31			

Origen	Información	Enviada
	Info. Horaria	05/05/2017 14:28:31
192.168.8.66	PROGRAMA-1 / GR20	05/05/2017 14:27:58
192.168.8.66	CADENA / GR14	05/05/2017 14:27:54
192.168.8.66	CADENA / P1	05/05/2017 14:27:50
192.168.8.66	P* / ALL 01:20 05/05/17	05/05/2017 14:27:37

Origen	Información	Enviada
	Info. Horaria	05/05/2017 14:28:31
192.168.8.66	LINEA-N / GR17	05/05/2017 14:28:12

ROCK FM				MEGASTAR			
Envío		Recepción		Tramas Horarias		Telecomando	
COM6	4800	COM7	4800	1	3	1	0
<input checked="" type="checkbox"/> Transmisión de datos <input checked="" type="checkbox"/> Recepción de datos				Alarma Segundos de espera recepción de trama: 3 Pin: 5			
Próxima: 14:29:31				Próxima: 14:29:30			

Origen	Información	Enviada
	Info. Horaria	05/05/2017 14:28:31
192.168.8.66	CADENA / P2	05/05/2017 14:28:25
192.168.8.66	LINEA-N / GR03	05/05/2017 14:28:22
192.168.8.66	P* / ALL 01:20 05/05/17	05/05/2017 14:28:19

Origen	Información	Enviada
	Info. Horaria	05/05/2017 14:28:31

The timeout for frame reception can be configured in seconds, so frames that are not received within that lapse can be counted as an error.

A sent frame register is also displayed in this screen, showing which playout station it was sent from, and when.

## 9.- CUSTOMIZATION OF THE TECHNICAL INFRASTRUCTURE

A “Teleserver”, or remote control server, is incorporated for every 4 frequencies in order to receive the commands from the production studios and forward them to the satellite data input. They also retrieve the orders from the monitoring satellite receivers in order to check its correct reception. In some cases, a program isn’t transmitted through the satellite uplink, but feeds the transmitters using terrestrial lines and audiocoders, that feature a bidirectional ancillary data channel.

These “Teleservers” don’t have special requirements, so two Intel 7-based Fujitsu PCs with 8GB RAM, plus a third one for passive backup have been installed. Any of them can receive the commands from any production studio located at the main station in a flexible way.

Besides the audit of transmitted commands, each “Teleserver” features an optical and acoustic warning system to the control supervisor in the external loop which are activated whenever an order has not been received back from the satellite when closing the local loop. Please note that, if a local network failure makes the Teleserver loose a command from a production studio, the user in that studio will be warned by the software.

## 10 .- CONCLUSIONS

At this very moment, the old remote control system has been completely substituted by the new one, which was tested off-line, first at AEQ, then in our lab located in Madrid. Once the applications were tested off-line, the incidences found were not significant and followed the same failure patterns as the former system, that has been operating for more than 20 years: some were programming errors; others were due to remote machines not being ready to receive the orders, while others were due to hardware failures during the reception process. Transport failure rate has been minimized by re-sending the orders that have not been properly received as OK in the monitoring reception.

One source of problems that also degrades the quality perceived by the users is the use of DTMF tones to transmit custom orders in the latest hop, between some provincial / regional main stations and a particular transmitter, especially with some associated stations. We are finishing the installation of the required technical infrastructure to remove this issue.

The most satisfactory point about the system deployed system is the operational flexibility provided, and the way it adapts to the continuously changing scenarios, so our requests to AEQ for functional enhancements has been limited to very rare cases.



**APPLICATION NOTE:**

**By Juan Antonio Alamillo, IT Manager**

**CADENA COPE, MADRID, SPAIN. MAY 2017**

