WorldDAB Automotive – DAB Digital Radio In Car User Experience Design Guidelines

Version 2 - February 2019

Radio UX In Car

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1. Background – Radio in-car

Radio UX In Car

- Consumers love radio in their cars:
  - Live broadcast radio is the most popular source for entertainment on the road*
  - 82% of people wouldn't buy a car without a radio**
  - 75% of all audio consumed in the car is live radio**
  - 84% of people "always" or "mostly" listen to the radio on every journey**

- Radio in-car is going digital***:
  - 4.4 Million cars with DAB+ were sold in 2018, 7% more than in 2017
  - In Norway (98%), The UK (92%), Switzerland (85%), Australia (60%), Italy (46%) and Germany (39%) cars have DAB as standard

- European Electronics Communications Code Directive mandates digital radio in new cars
  - Came in to force on 20 December 2018
  - Member States then have two years to transpose rules into national legislation
  - All new car radios sold or rented in the EU will need to have digital terrestrial radio by end 2020
  - See the WorldDAB fact sheet here

*EBU IN-car radio study Jan 2018 https://tech.ebu.ch
**Radioplayer research 2016 http://www.radioplayer.co.uk/great-cars-need-great-radios*
****Source: WorldDAB, national industry associations, JATO*

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1. Background – In-car user experience group

Radio UX In Car

- The WorldDAB in-car user experience group was formed in 2016 to improve the user interface for in-car digital radios and:
  - Produce collaborative broadcast/car manufacturer user interface design guidelines
  - Identify and action the collaboration required between broadcasters and car manufacturers to improve and innovate UI design
  - Understand how future technology will impact on UI design

- The Group believes that we must put the consumer UX at the heart of the design process

- Group members include broadcasters from across Europe and Australia, leading car manufacturers and in-car technology providers.

- This is an unprecedented collaboration between broadcasters and car manufacturers to ensure the best radio experience possible in-car. To find out more about the group and how to join please contact rosemary.smith@worlddab.org

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1. Background – Document status and future work

Radio UX In Car

This is the second version of the UX guidelines which reflects some of the feedback we have received from car manufacturers. This is an ongoing project to help improve the user experience of DAB digital radio in-car. Please note:

- This document is live and may change over time as feedback is received from stakeholders and partners. Please ensure you have the latest version number from WorldDAB

- The current focus of the WorldDAB UX Group is to continue engagement with OEMs to help support the UX design, good DAB performance, and supporting the introduction of Hybrid radio and voice technology to enhance and improve the radio experience in connected cars

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2. A hybrid radio future in connected cars

Radio UX In Car

- Radio is also evolving in-line with increased connectivity in the car and the introduction of voice. The WorldDAB UX Group believes that Hybrid radio (FM, DAB, DAB+ and IP working together) provides the best radio experience in next generation connected cars by making the best use of the relative strengths of each platform.
- Cost-effective* broadcast radio: Free-to-air, robust, good coverage
- IP: Richer data, return path, interactivity, personalization

- Hybrid radio is already available in some new cars and on the roadmap for many car manufacturers. See Section 5 for guidance on implementing hybrid radio.

- Most importantly, it is evident that a good hybrid radio implementation enables car manufacturers to meet almost all the UX guidelines (with the exception of UX Guideline 5.1 which is a decision for the car manufacturer) and can provide the best possible digital radio UX for drivers

*See EBU study on the cost-benefit analysis of FM, DAB, DAB+ and IP: https://tech.ebu.ch/publications/tr_2017_radio

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2. A hybrid radio future in connected cars

Radio UX In Car

- The WorldDAB UX Group is committed to collaborating to ensure a great radio experience in all current and future cars. In particular, there are two areas of development that are important for radio.

- We are seeing the introduction of voice control, whether it be a car manufacturer proprietary platform, Amazon Alexa, Google Assistant or others. We support the introduction of voice to support hybrid radio. Voice lends itself perfectly to radio and significantly minimises driver distraction. See Digital Radio UK and Radioplayer research here

- Although the introduction of truly autonomous cars (Level 4 and 5) will not happen in the short term, work is also happening now on developing the infotainment and radio experience in a lean-back automotive environment and we want to ensure continued collaboration on the radio experience.

*DRUK and Radioplayer consumer research July 2018

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3. WorldDAB in-car DAB user experience research

Radio UX In Car

- The user experience group conducted the first ever qualitative consumer research on the DAB digital radio user interface in-car across five European markets: Germany, UK, France, The Netherlands and Belgium.

- The research summary, full findings and consumer videos can be seen on the WorldDAB website: https://www.worlddab.org/technology-rollout/automotive/user-experience

- The consumer research has been used to inform the Guidelines, in particular the sections in each Guideline titled; Consumer problems; Consumers want; Consumer quotes

- The headline findings were:
  - Drivers expect a great, simple UX
  - A radio button is essential to access DAB easily and quickly
  - An A-Z station list is the best search UX
  - Pre-sets should be easy to set and the process must be consistent and explained
  - Terminology must be easier to understand

- There was a high level of consistency in the consumer responses between regions

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4. Consumer use cases

Radio UX In Car

Informed by the research and discussion within the UX group, a number of consumer use-cases have been identified. If delivered together, they form a great, easy to use UI and provide a structure for the design guidelines:

I want……

1. to find DAB radio easily in the car media system
2. to find DAB stations easily
3. the list of stations to be up to date
4. to be able to easily set a station as a pre-set
5. To keep listening to my station if it's available
6. to know more about what I'm listening to
7. my DAB radio to be set up for me

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5. Design guidelines

Radio UX In Car

For each consumer use case the associated design guideline follows the same structure:

- The current consumer problems and research references
- What consumers want
- Consumer quotes
- Design guideline
- Hardware requirements and/or Technical references
- Visual example of how the guidelines could be implemented (unless not required)

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5. Design guidelines – Guiding principles

Radio UX In Car

- Design guidelines must be based on consumer use cases and what they want
- Every car manufacturer will design their own radio UI but guidelines are helpful
- Broadcasters and manufacturers must both follow the guidelines to deliver a great UX
- Keys/buttons should have consistent behaviour between FM and DAB
- For ease of use and to avoid driver distraction, actions and navigation should require the least number of button presses and menu layers as possible
- To ensure DAB performance enhances a great UX, dual DAB tuners and a good DAB antenna implementation are required

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5.1 I want to find DAB radio easily in the car media system

5.1 I want to find DAB radio easily in the car media system

Radio UX In Car

Consumer problems and research references:

- In cars without a “Radio” button on the dashboard or screen, most consumers find it frustrating and difficult to find the DAB radio quickly*
- This could cause driver distraction and impact safety
- When consumers want to move from listening to AM/FM to DAB they find it difficult to do*

Consumers want:

- A quick, easy and safe way to access the DAB radio. Research shows that cars with a “Radio” button provide this solution.

Consumer quote:

“*There are a lot of arrows on the dashboard….there was nothing to direct me to radio*”

**https://www.worlddab.org/technology-rollout/automotive/user-experience*

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5.1. I want to find DAB radio easily in the car media system

Radio UX In Car

Design guidelines:

- Include a permanent “Radio” button on the dashboard or the top level menu on the screen.
- Selecting “Radio” should default to DAB (when it is available) or go to a menu where radio platforms can be chosen
- In a hybrid radio the best platform signal will be automatically selected
- When listening to AM/FM, include a “DAB” button on the screen.
- Where there is no “Radio” button: Selecting a radio station is only 2 clicks from the home screen

Hardware/ technical reference:

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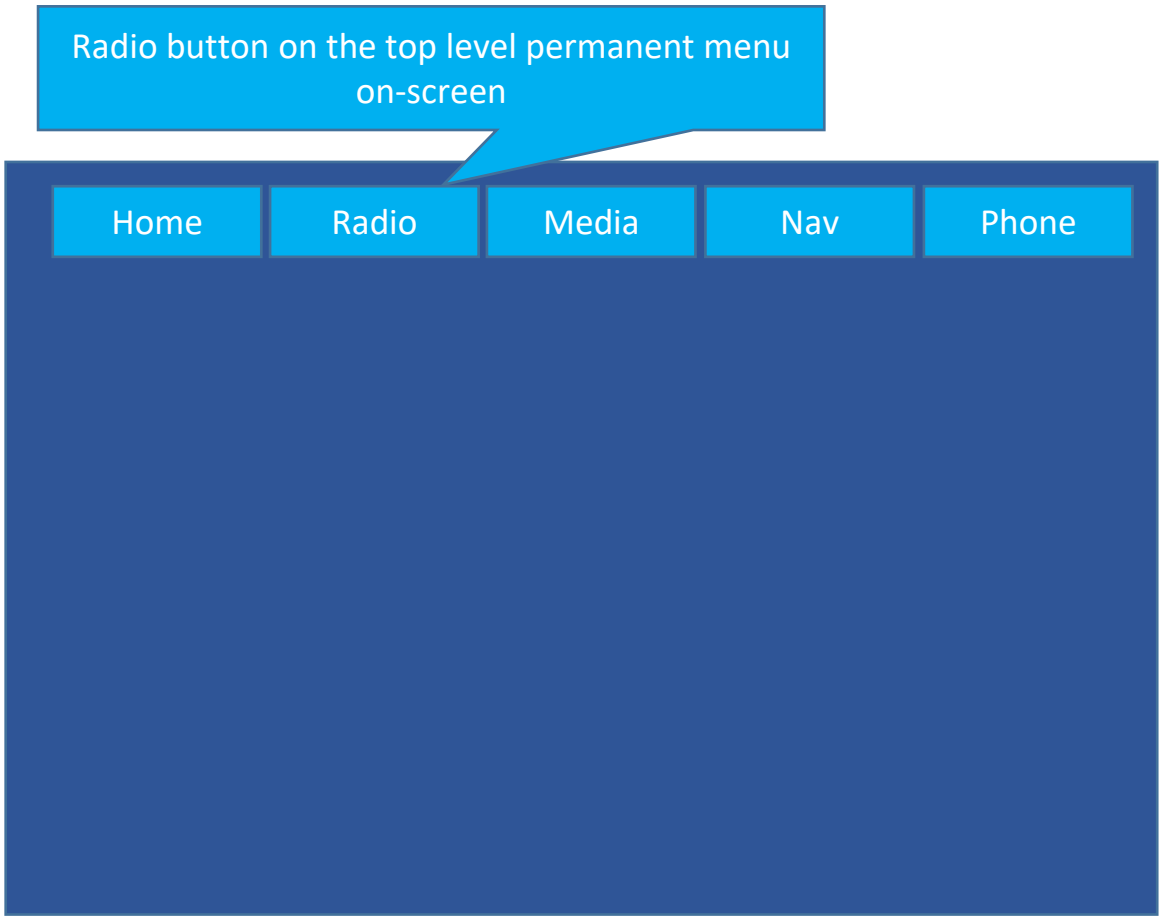
5.1. Example - I want to find DAB radio easily in the car media system



5.2 I want to find DAB stations easily

5.2 I want to find DAB stations easily

Radio UX In Car

Consumer problems and research references:

- Finding stations by multiplex can be difficult, confusing, and in some cases impossible*
- An A-Z station list of DAB stations provides the best experience for finding stations*
- Consumers may value the ability to search for specific stations via alphabetical characters

Consumers want:

- A quick, easy and safe way to search for and find their DAB stations that does not require knowledge of the DAB broadcast network. Research shows that an A-Z station list provides this.

Consumer quote:

"Once I'd found DAB radio I was thinking i'd be able to find stations by searching through a list within the DAB part but what I needed to was find another menu which I didn't realise"

**https://www.worlddab.org/technology-rollout/automotive/user-experience*

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5.2 I want to find DAB stations easily

Radio UX In Car

Design guidelines:

- Present an integrated and unified A-Z list of all available stations (FM, DAB, IP) which defaults to DAB *or* present an A-Z list of all available DAB stations
- Optional: It may also be useful to offer an A-Z list of alphabetic characters where consumers can choose the first letter of their wanted station and be presented with all available stations starting with that letter. A numerical “1” can be shown before “A” to denote stations that start with a number
- Note: Most users will not use ensemble information or channel codes, and don’t understand them, if they are shown within the station list

Hardware /technical requirements:

- Delivering a dynamic, accurate A-Z station list requires dual DAB tuners
- SPI via DAB or RadioDNS (https://radiodns.org/) can help create a single station listing

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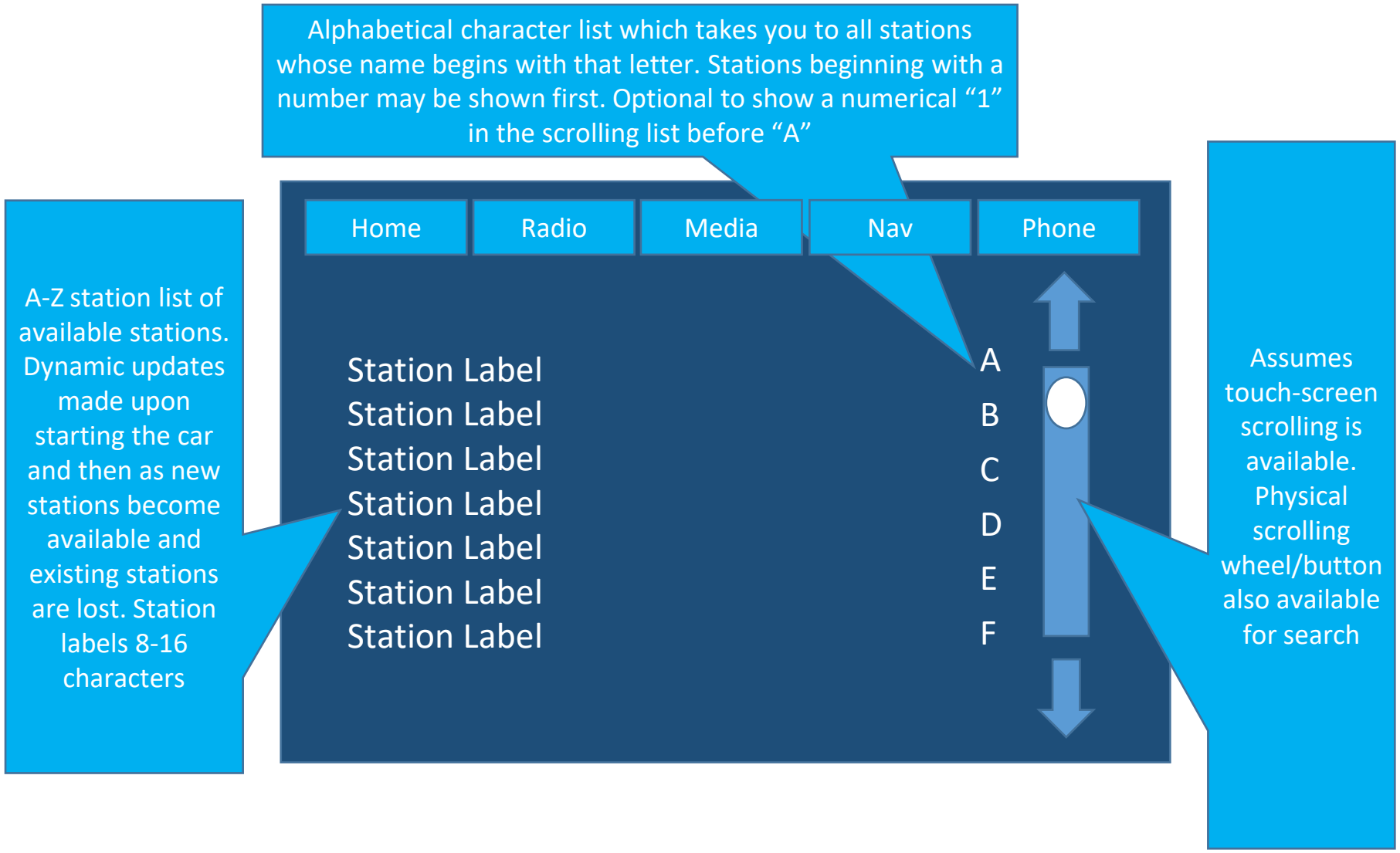
5.2 Example - I want to find DAB stations easily



5.3 I want the list of stations to be up to date

5.3 I want the list of stations to be up to date

Radio UX In Car

Consumer problems and research references:

- The WorldDAB UX Group believes it is a poor experience for consumers to be presented with stations that aren't available to them. This can be confusing and annoying if the station is selected but is unavailable

Consumers want:

- Their list of DAB stations to include all available stations and be current and dynamically updated.

Consumer quotes:

"I don't understand why the radio offered a station to me and then it wasn't even there?"

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5.3 I want the list of stations to be up to date

Radio UX In Car

Design guidelines:

- The station list should be automatically updated when new broadcast stations become available or unavailable
- Note: Pre-sets should remain even if service is unavailable

Hardware/technical references

- Delivering a dynamic, accurate A-Z station list requires dual DAB tuners
- ETSI 103 176 (v2.1.1); Digital Audio Broadcasting (DAB); Rules of implementation; Service information features.

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5.4 I want to be able to easily set a station as a pre-set

5.4 I want to be able to easily set a station as a pre-set

Radio UX In Car

Consumer problems and research references:

- Research showed that 36% of people found it difficult or impossible to set a pre-set*
- Those consumers who found it difficult had typically not set a pre-set before on a DAB radio at home or in a car, so had no experience of pressing-and-holding buttons to set pre-sets. Those that found it easy knew to try this method.

Consumers want:

- To be able to set DAB station pre-sets as it makes using the radio easier and safer.
- The action to set pre-sets to be consistent across all radio platforms and radios (at home and in the car).

Consumer quotes:

"I didn't know where to go on the menu. Maybe it should have a '+' sign somewhere?"

**https://www.worlddab.org/technology-rollout/automotive/user-experience*

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5.4 I want to be able to easily set a station as a pre-set

Radio UX In Car

Design guidelines:

- The action to set a DAB pre-set should always be to press and hold a button when listening to the wanted station. Recommend 5 seconds hold to set and less than 1 second response time when tapping to select.
- If the media system has physical numbered buttons, these should be used to press and hold when listening to the wanted station.
- If the media system has touch-screen soft keys, these should be numbered or clearly marked as pre-set buttons.
- Ensure clear instructions in the user manual for setting pre-sets
- Optional: If possible, on-screen prompts describing how to set a pre-set (until a pre-set has been set and therefore is understood)
- Optional: Audible feedback to confirm the pre-set has been saved

Hardware/technical references:

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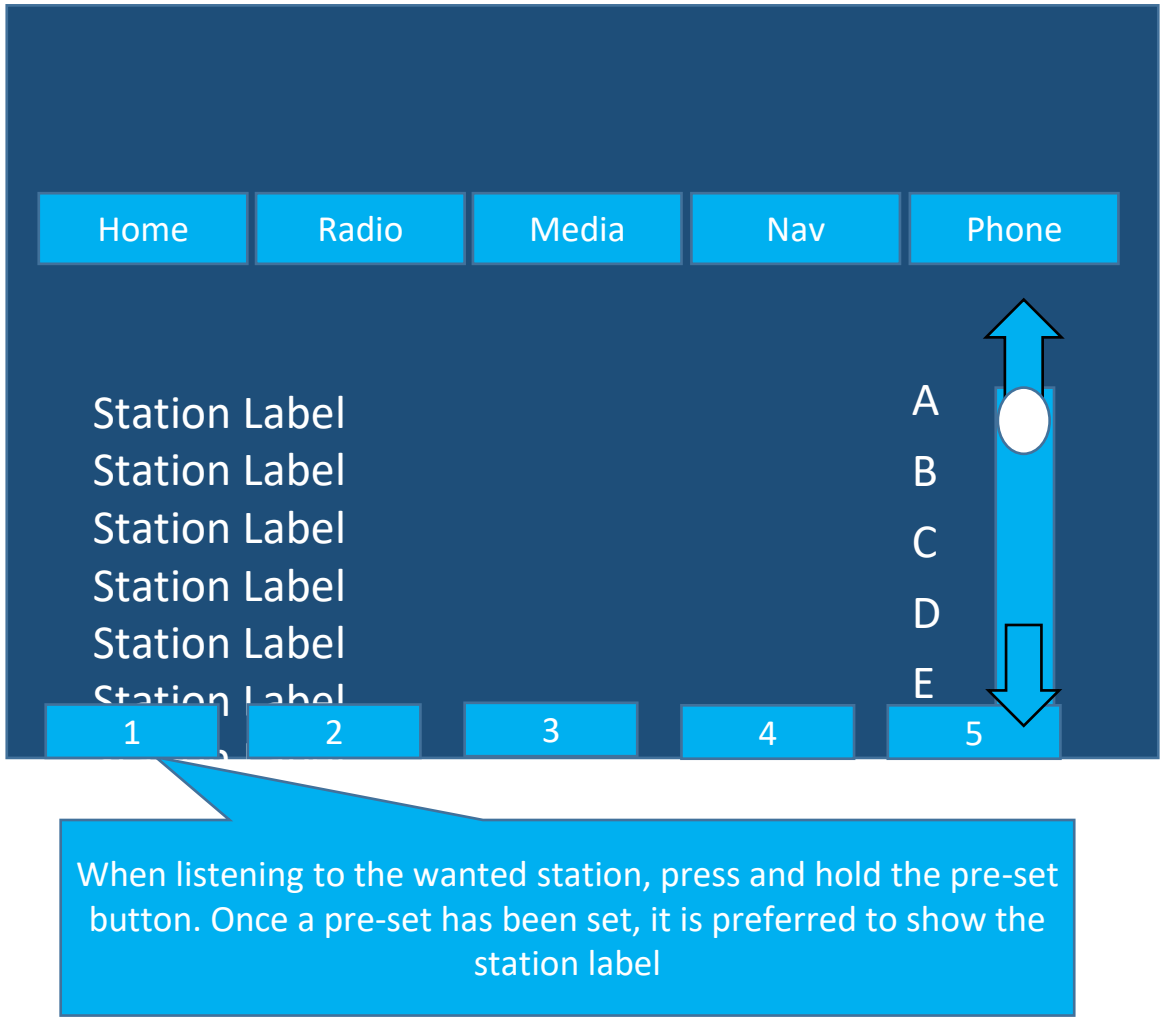
5.4 Example - I want to be able to easily set a station as a pre-set



5.5 I want to keep listening to my station if it's available

5.5 I want to keep listening to my station if it's available

Radio UX In Car

Consumer problems and research:

- Losing radio signal in the car can be frustrating for consumers.
- While any lack of DAB coverage should be addressed by broadcasters, the station may still be available on another DAB multiplex or on FM or IP

Consumers want:

- The radio to find the best signal (FM, DAB or IP) to ensure they can continue listening to their station

Consumer quotes:

"To be honest, I just want my radio to find the best signal and stick with it!"

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5.5 I want to keep listening to my station if it's available

Radio UX In Car

Design guidelines:

- For FM/DAB tuners, the radio should search for the best signal on FM, DAB, DAB-DAB, for the station being listened to. This happens automatically.
- If there is a delay in finding a station, display a message to say that "station tracking" is in progress
- This function which is known technically as 'Service Following/Linking" is turned ON in the car by default.* The driver is notified of 'best signal search is on' periodically so they understand if they don't want it. This notification should also include guidance on how to turn it OFF
- For FM/DAB tuners with IP access, the radio should search for the best signal on FM, DAB, DAB-DAB, for the station being listened to. This happens automatically.

Hardware and technical references:

- FM/DAB tuners including Implicit, Hard and Soft linking - ETSI 103 176 (v2.1.1); Digital Audio Broadcasting (DAB); Rules of implementation; Service information features.
- FM/DAB/IP – Radio DNS https://radiodns.org/

** Please note: Advised there is an option at importer level to turn off explicit Service Linking between DAB and FM as many non European countries will not have defined FM PI code systems and corresponding DAB SID codes for simulcast services.*

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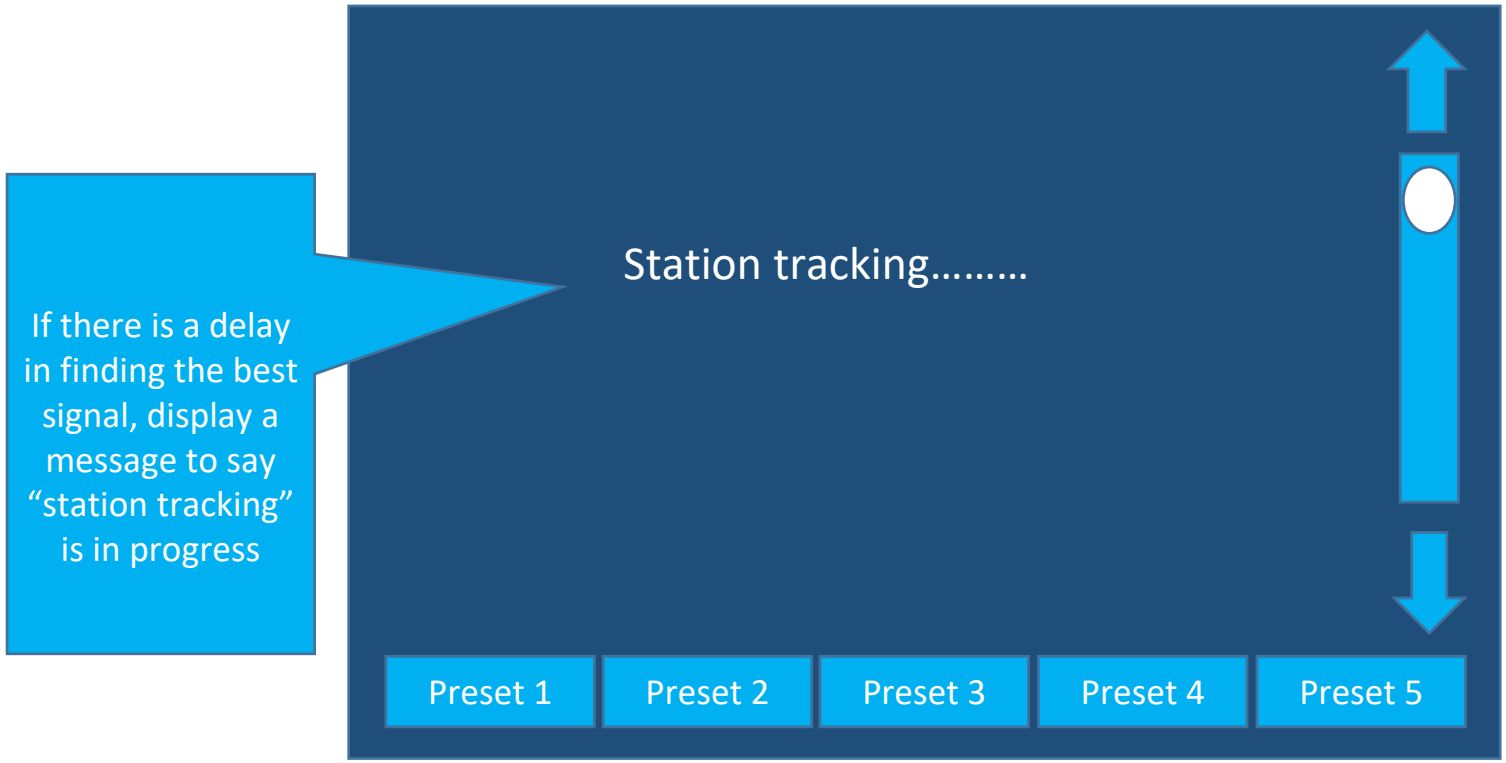
5.5 I want to keep listening to my station if it's available



5.6 I want to know more about what I'm listening to

5.6 I want to know more about what I'm listening to

Radio UX In Car

Consumer problems and research:

- Research shows that consumers value information such as station name, now playing, and potentially station logos*.
- Broadcasters should be providing this information – both as text (Dynamic Labels, or DLS) and as images (Slideshow) to enhance the experience in the car. When this isn't available it can be a poor experience in the car
- When that data is made available by broadcasters, it is sometimes badly presented on the screen or very hard to find, which is frustrating for listeners and broadcasters

Consumers want:

- Information about what they're listening (eg; station name, station logo, now playing, programme name) clearly presented on the screen

Consumer quotes:

"There were too many pieces of information on a large screen. Some of the information was good but felt cluttered"

**https://www.worlddab.org/technology-rollout/automotive/user-experience*

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5.6 I want to know more about what I'm listening to

Radio UX In Car

Design guidelines:

- Single-line text display – provide a button which shows the latest text message, scrolling if necessary to fit onto the screen
- Multi-line text display – always show the latest text message without the driver having to press any buttons
- Colour screen display – always show the latest text message. Show the station logo until the first visual is received, then show it automatically. Logos in the station list should be taken from broadcast DAB+ if available, or via IP through RadioDNS lookup for connected vehicles.
- Connected car – Request images at native screen resolution, for best quality

Hardware and technical references:

- DLS - ETSI EN300401
- Slideshow (Visuals) - ETSI TS101499
- Programme information and station logos – ETSI TS 102818
- Radio DNS / World DAB guidance paper - Provision of Station Logos to Automotive Receivers https://www.worlddab.org/public_document/file/1091/StationLogosDoc_FINAL_2019.pdf?1548678132

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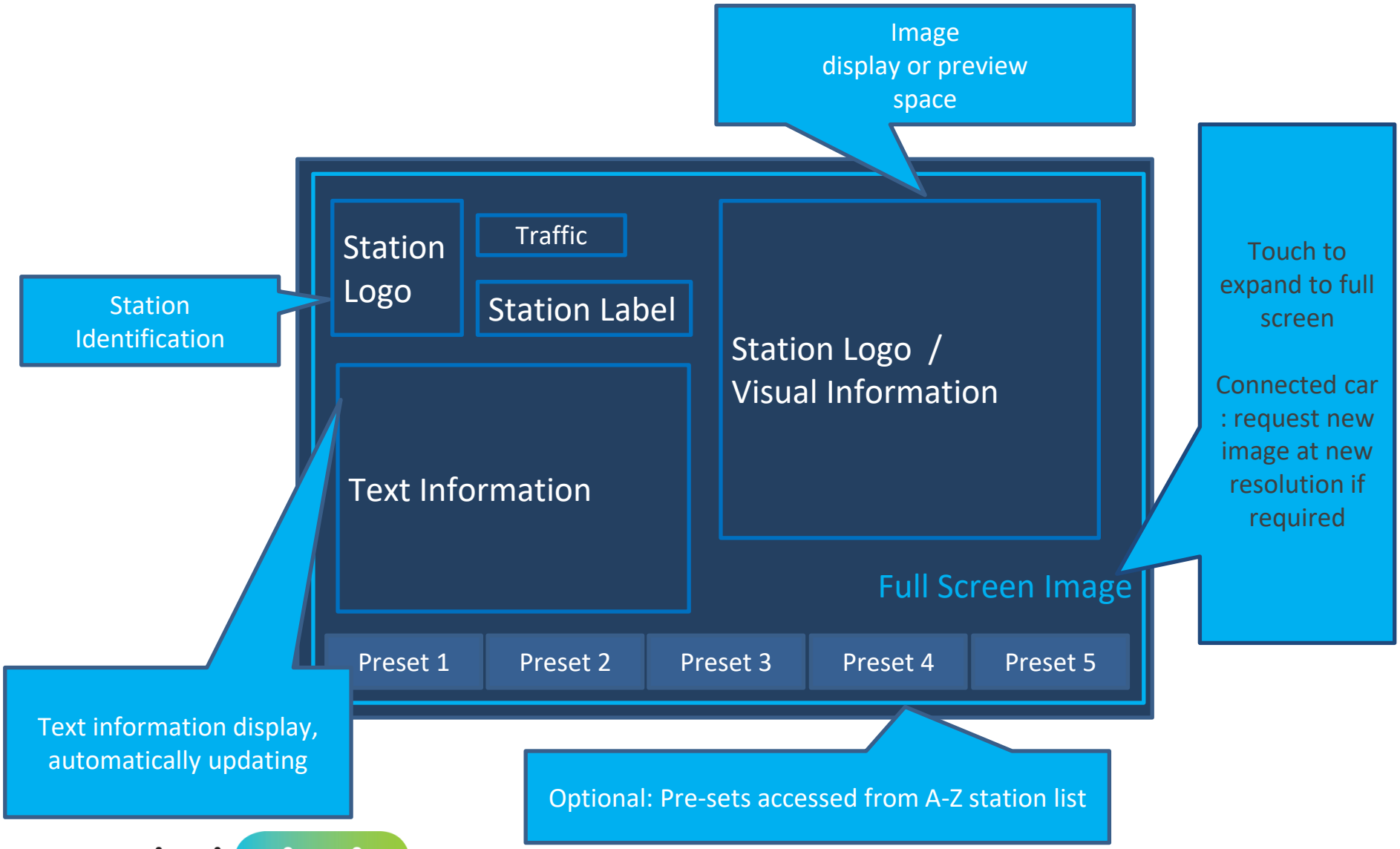
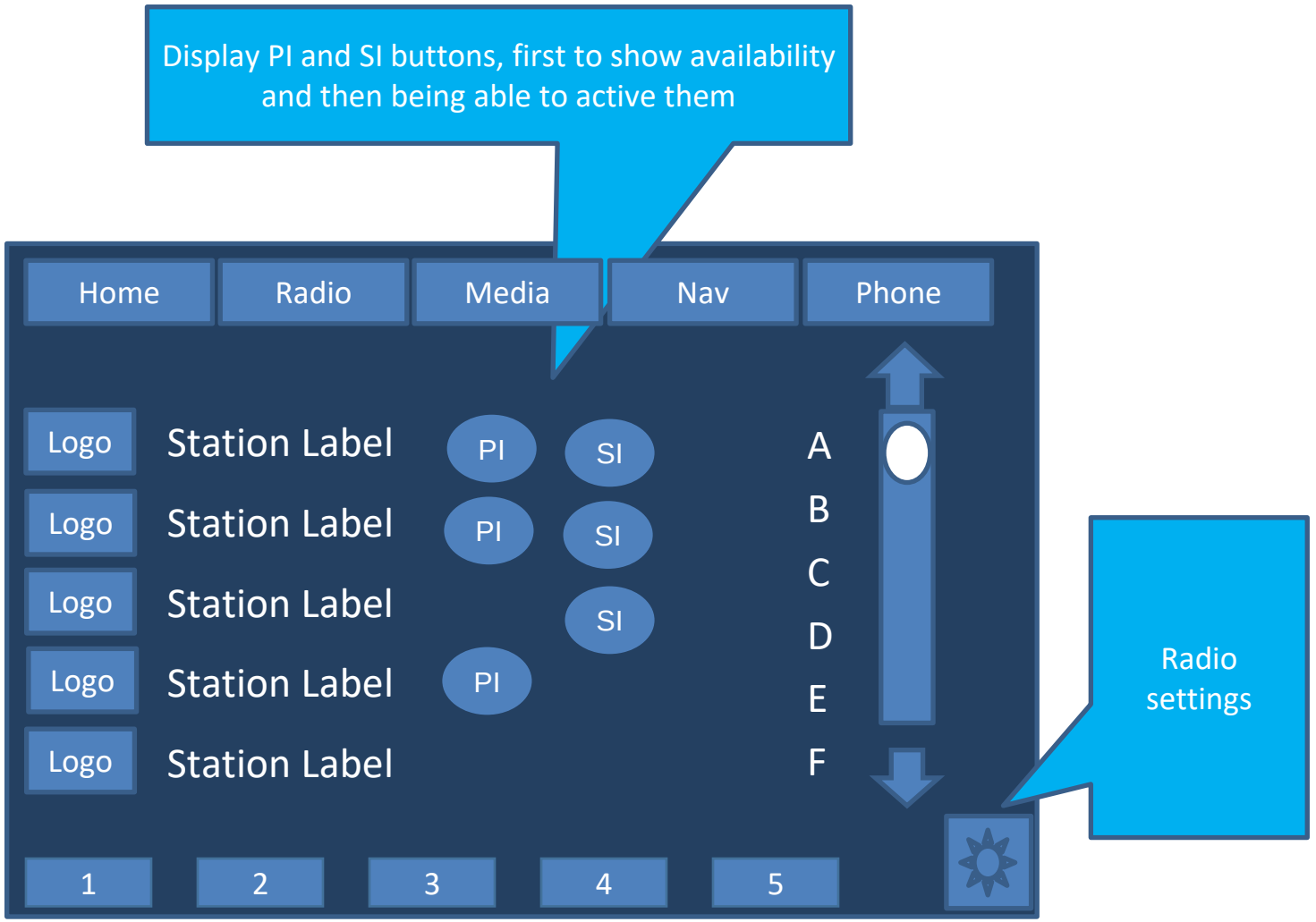
5.6 Example - Station Information



5.6 Example - Station Information



5.7 I want my DAB radio to be set up automatically

5.7 I want my DAB radio to be set up automatically

Radio UX In Car

Consumer problems and research:

- When consumers buy a new car, they are typically briefed by the dealer on how to use the functions and controls in the car. Unless it is specifically asked for, this briefing will not always include the DAB radio functionality and settings.
- Consumers do not understand what different functionality settings will mean for the UX or which settings they should have ON by default

Consumers want:

- Their default settings for the DAB radio to provide the best user experience

Consumer quotes:

"I didn't really know where to start, especially when I couldn't find a radio button"

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5.7 I want my DAB radio to be set up automatically

Radio UX In Car

Design guidelines:

- The following functions should all be on as default and form the basis of the factory re-set status of the car media system:
  - Service following – DAB-FM-DAB / Hard linking / Soft linking*
  - A-Z station list (default option to search)
  - Automatic station list updating
  - Default to DAB

- **Hardware and technical references:**
  - Automatic station list updating requires dual tuners

** Please note: Advised there is an option at importer level to turn off explicit Service Linking between DAB and FM as many non European countries will not have defined FM PI code systems and corresponding DAB SID codes for simulcast services.*

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6. Hybrid radio and voice

Radio UX In Car

Hybrid radio: Enables car manufacturers to meet the majority of the UX Guidelines

- Hybrid radio seamlessly combines Broadcast radio and the Internet. Your broadcast signal (FM, HD, DAB, DAB+) continues to carry audio (and some data), but a radio with an Internet connection (WiFi, 3G, 4G, LTE) can seamlessly connect back to your station for multimedia and interactivity.
- In the car, Hybrid radios offers:
  - Service following - The ability to seamlessly switch between broadcast platforms and IP, following the strongest signal
  - Great visuals - The matching of metadata over IP with the broadcast stream to provide station logos, artist information, news, weather and commercials
  - Interaction – Providing the listener with the ability to find out more about the content and offers the [potential for greater personalisation
- World DAB supports open standards for Hybrid radio and for more information go to https://radiodns.org/

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6. Hybrid radio and voice

Radio UX In Car

- There are also WorldDAB and Radio DNS member companies who are experts in hybrid radio development. For more information go to:
  - Radioplayer
  - DTS Connected Radio
  - Radiobridge

Voice: Enabling a safer radio experience in-car

- Voice control, whether it be an OEM proprietary platform, Amazon Alexa, Google Assistant or others, lends itself perfectly to radio and significantly minimises driver distraction. See Digital Radio UK and Radioplayer research here
- Voice assistants should be able to control broadcast DAB radio, as well as IP, via a hybrid radio implementation, working offline and online
- Voice assistants must also be able to provide accurate search results for all radio stations, recognising the phonetic detail of stations names and regional dialects

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7. Performance of DAB in-car

Radio UX In Car

WorldDAB's In-car Performance Working Group is committed to collaborating with car manufacturers to help ensure DAB+ performance is as good as possible, a huge factor in a good digital radio user experience. The Group has been collating performance testing and benchmarking from different markets, conducting new research and collaborating with car manufacturers.

All the conditions are in place to offer great performance of DAB+ in-car:

- DAB networks are maturing in many countries
- Broadcasters utilize the DAB capabilities: more and unique content, audio and visuals
- Latest DAB chips are lower cost with better performance and more features & functions

However, the challenge to get good in-car DAB reception is increasing, driven by:

- increased levels of radio interferences
- non-rooftop antenna systems with lower sensitivity. The Group has conducted and collated research on antenna performance including highlighting the significant shortfalls in performance of some antenna configurations and the substantial benefits offered by others

Car manufacturers have asked WorldDAB for DAB+ test routes in different markets to help development and performance measurement. WorldDAB has now published some DAB+ test routes in key European markets which can be found here

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Annexes

Radio UX In Car

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Annex - Glossary of Terms

Radio UX In Car

Text Message

DAB DLS, FM RT or RadioDNS /text.

Manufacturers

Text Messages must always be automatically updated on the display as they are received. Commands to “REMOVE” messages must be respected. The receiver may “throttle” message change rate to XX every YY seconds.

Broadcasters

Text Messages should describe accurately what is being broadcast now, or something directly relevant to the listener.

Text Messages should not be updated more than once every 30 seconds.

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Annex - Glossary of Terms

Radio UX In Car

Service Label

DAB Service Label, FM PS, or RadioDNS Name elements.

Manufacturers

There is no requirement to update a Service Label whilst receiving a Service (e.g. “Scrolling PS”)

In markets where PS is unreliable, it can be discarded in favour of DAB Service Label or RadioDNS Name elements, if the service is correctly identified (e.g. DAB SId = RDS PI = RadioDNS bearer match)

Display the longest Service Label that can fit the available display space without scrolling

1. RadioDNS <longName> element
2. DAB Service Label (16 characters) or RadioDNS <mediumName> element
3. FM RDS PS (8 characters) or RadioDNS <shortName> element

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Annex - Glossary of Terms

Radio UX In Car

Station Logo

DAB EPG <mediaDescription> element

RadioDNS <mediaDescription> element

Manufacturers

The Station Logo must be displayed at the highest resolution for the available display space.

The Station Logo with the closest available resolution must be selected for display, and scaled to fit, but the aspect ratio must not be changed

See WorldDAB / Radio DNS guidance on Provision of Station Logos here

Broadcasters

You must provide 5 versions of your logo on IP, and/or 4 versions over DAB SPI

The Station Logo should be allowed to be cached for up to 30 days.

The Station Logo must not feature any transparency layers

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About WorldDAB

Radio UX In Car

WorldDAB is the global industry association responsible for defining and promoting DAB digital radio. By bringing together radio industry professionals, WorldDAB provides knowledge and expertise that helps countries successfully adopt and implement broadcast digital radio.

Our 1200+ experts from over 100 member organisations cover 29 countries across the globe and include public and commercial broadcasters, regulators, network providers and manufacturers of receivers, chips, professional equipment and automobiles.

Together, we are shaping the future of radio, delivering advice and tailored solutions on all aspects of the switch from analogue to digital.

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