



AUSTRALASIAN  
RAILWAY  
ASSOCIATION INC

# **Train Radio Systems of Australia**

Map and Data sheets

November 2005



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# 1. Introduction

## 1.1 Purpose

The purpose of this document is to provide an overview of the train radio communications systems in use in Australia. It is not intended as a definitive technical guide to each system.

## 1.2 Scope

### 1.2.1 General

The scope includes the following:

- ▶ A map showing the railway lines on which the respective train radio systems are implemented;
- ▶ A summary of the systems;
- ▶ A data sheet on each system; and
- ▶ A summary of system interoperability.

### 1.2.2 Exclusions

The document does not include details of the radio systems and facilities for the following applications:

- ▶ Industrial Railways;
- ▶ Local train to train communications;
- ▶ Yard / shunting operations;
- ▶ End-of-train monitoring;
- ▶ Rail network maintenance; and
- ▶ Consignment tracking.

## 1.3 Terminology

The following terminology used throughout this report.

### 1.3.1 Abbreviations

APCO	-	Association of Public Safety Communications Officials International.
ARTC	-	Australian Rail Track Corporation
ARG	-	Australian Railroad Group
ASW	-	Alternative Safeworking
CDMA	-	Code Division Multiple Access



GPS	-	-	Global positioning system
GRN	-		Government Radio Network
GSM	-		Global System for Mobile Communications
MDC	-		Mobile Data Communications
MPT	-		Ministry of Posts and Telegraphs (UK)
NT	-		Northern Territory
PN	-		Pacific National
QLD	-		Queensland
ROA	-		Railways of Australia
SA	-		South Australia
SMR	-		State Mobile Radio
TAS	-		Tasmania
UHF	-		Ultra High Frequency
VHF	-		Very High Frequency
VIC	-		Victoria
WA	-		Western Australia

### 1.3.2 Definitions

#### **Interoperability**

For the purposes of this report **interoperability** means the capability of commercially available “off the shelf” land mobile transceivers to be configured to operate on the respective train radio network. Further details are provided in Section 5.

#### **Open Channel (all informed)**

The mode of radio system operation where all parties on a particular radio channel can hear and participate in the conversation.

#### **One to One (private call)**

The mode of operation of a radio system, where only sending and receiving party participate in the conversation.

#### **ROA Channels**

A group of land mobile radio channels in the UHF 400 to 420 MHz frequency band assigned for use by railways.

#### **Private (professional) Mobile Radio System**

A mobile radio communications network owned, operated and intended for use by a special group of users, for example a Government Agency.



### **Trunked Radio System**

A particular type of private mobile radio system implemented using technology, which enables users from different agencies and organisations to share the system.



## 2. Map

### 2.1 General

The map illustrates the train radio systems in use on respective track sections of the Australian railway network.

### 2.2 Guide to the Map

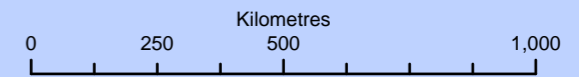
- ▶ Each radio system is identified by a unique colour coded line;
- ▶ The symbols T and S are used to identify mobile telephone and satellite systems respectively;
- ▶ Where more than one radio system is used on a particular track section, the system line coding is shown in parallel.



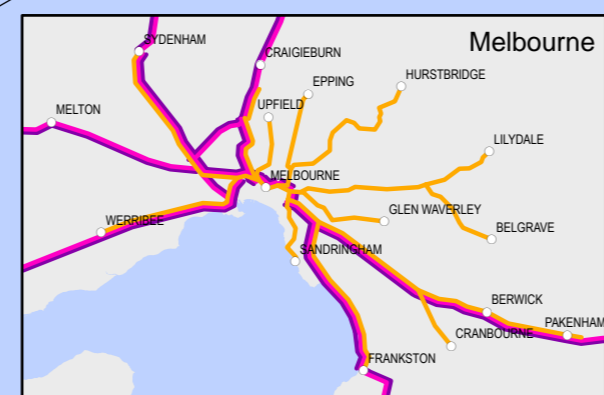
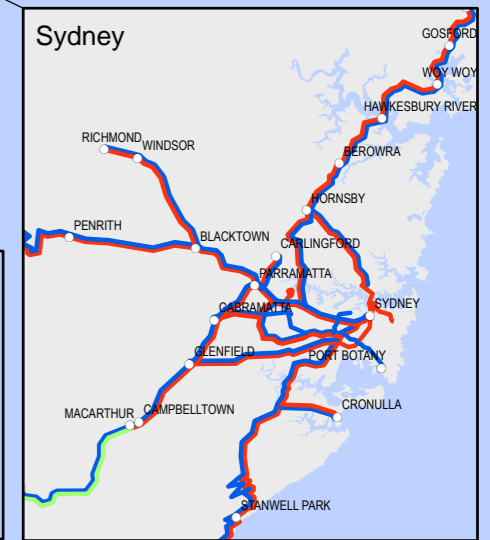
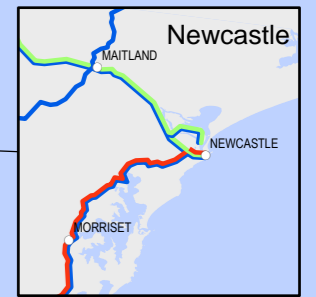
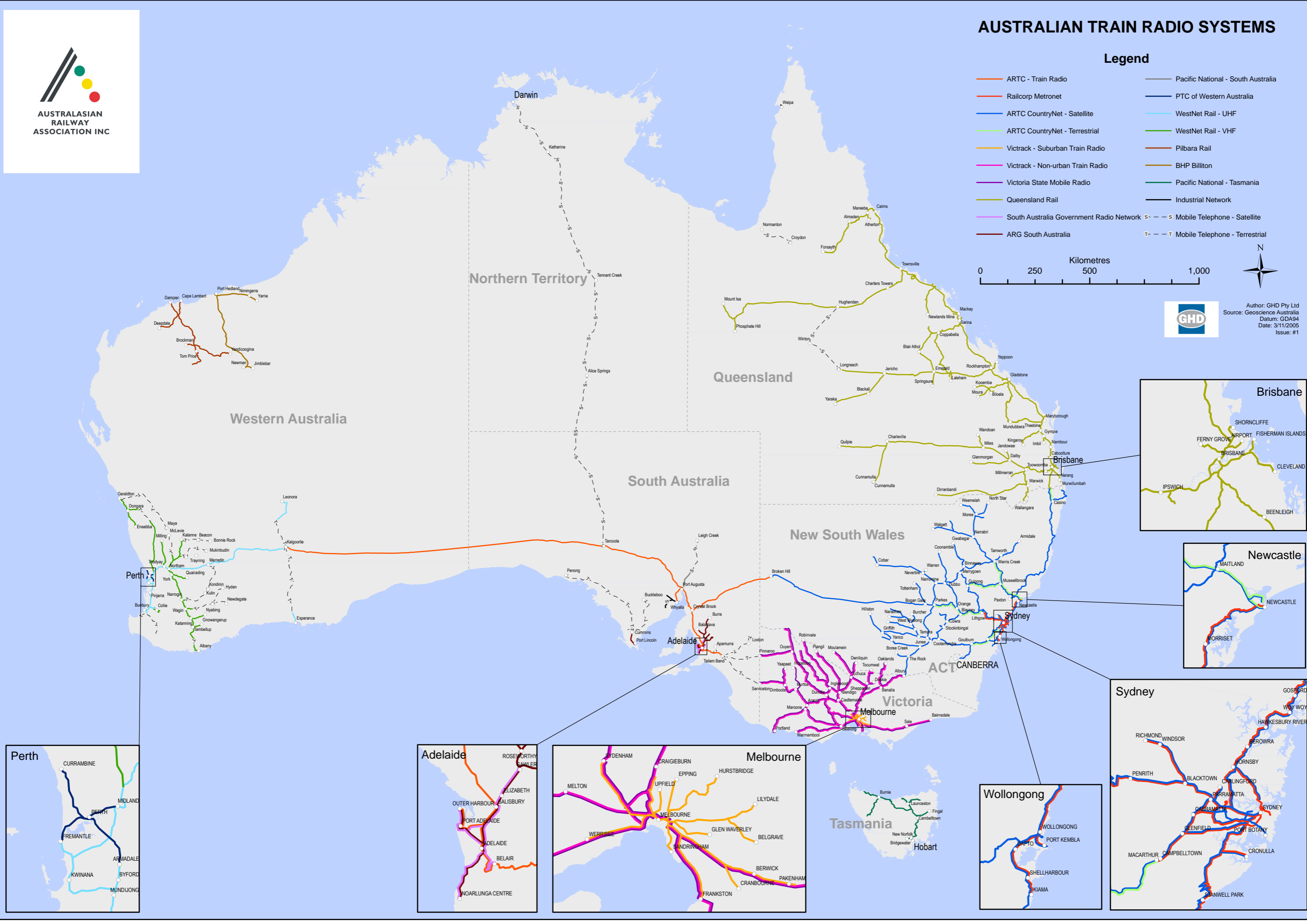
# AUSTRALIAN TRAIN RADIO SYSTEMS

## Legend

- ARTC - Train Radio
- Railcorp Metronet
- ARTC CountryNet - Satellite
- ARTC CountryNet - Terrestrial
- Victrack - Suburban Train Radio
- Victrack - Non-urban Train Radio
- Victoria State Mobile Radio
- Queensland Rail
- South Australia Government Radio Network
- Pacific National - South Australia
- PTC of Western Australia
- WestNet Rail - UHF
- WestNet Rail - VHF
- Pilbara Rail
- BHP Billiton
- Pacific National - Tasmania
- Industrial Network
- Mobile Telephone - Satellite
- Mobile Telephone - Terrestrial



Author: GHD Pty Ltd  
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


















### 3. System Summary

The following tables summarise the train radio systems in service on respective sections of Australian railway network. The tables should be read in conjunction with the map.














**Table 1 Train Radio Communications –Summary**

Rail Network	Lines	Train Radio System	Data Sheet	Identification Colour Code
Queensland Rail	The majority of the network, except for the following	QR -UHF Private Mobile Radio	1	
	<ul style="list-style-type: none"> <li>▶ Normanton to Croydon</li> <li>▶ Longreach - Winton - Hughenden</li> </ul>	Satellite Telephone	18	
Defined Interstate Network	<u>Queensland</u>			
	Fishermen Islands to Glenapp	QR- UHF Private Mobile Radio	1	
	<u>New South Wales</u>			
	Glenapp (QLD) to Albury and Broken Hill (NSW)	CountryNet – UHF Private Mobile Radio (Terrestrial) and / or satellite	2	
	Sydney to Broken Hill		2	
Cootamundra to Parkes				
<u>Victoria</u>				
Albury (NSW) to Serviceton (VIC) (via Melbourne)	Victrack- Non urban train radio, UHF Private Mobile System	4		



Rail Network	Lines	Train Radio System	Data Sheet	Identification Colour Code
	<u>South Australia &amp; Northern Territory</u>			
	Serviceton (VIC) to Tailem Bend (SA)	Mobile Telephone (GSM)	17	
	Tailem Bend to Kalgoorlie (WA) Crystal Brook to Broken Hill (NSW) and Port Augusta to Whyalla	ARTC UHF Private Mobile System	7	
	Tarcoola (SA) to Darwin (NT)	Satellite Telephone	18	
	<u>Western Australia</u>			
	Kalgoorlie to Perth	WestNet UHF Private Mobile Radio	11	
RailCorp NSW	City Rail electrified network (Bounded by Newcastle, Lithgow, Macarthur, Kiama)	Metronet UHF Private Mobile Radio	3	
ARTC New South Wales	All country lines which are not part of the defined interstate network	CountryNet UHF Private Mobile Radio and / or Satellite	2 2	 
Victoria (Metropolitan)	All electrified suburban lines	Suburban Train Radio -UHF Private Mobile System	5	
Victrack Access (Country lines leased to Pacific National)	All broad gauge country lines in Victoria	<ul style="list-style-type: none"> <li>▶ Victoria Non-urban train radio, UHF Private Mobile Radio; and</li> <li>▶ State Mobile Radio</li> </ul>	4 5	 
Trains Trans Adelaide	Adelaide Suburban broad gauge lines	SA Government Radio Network (UHF system)	8	



Rail Network	Lines	Train Radio System	Data Sheet	Identification Colour Code
South Australia Country Lines	Board and standard Gauge Country Lines and the Eyre Peninsular narrow gauge line	A combination of the following:		
		▶ ARG VHF Private Mobile Radio	9	
		▶ CDMA Mobile Telephone	17	
		▶ Satellite Telephone	18	
	Port Augusta to Leigh Creek	PN UHF Private Mobile System	10	
TransPerth	Perth electrified suburban network	TransPerth –UHF Private Mobile Radio	13	
Western Australia Country Network (leased to WestNet Rail)	The narrow gauge network Perth to Bunbury	West Net -UHF Private Mobile Radio	11	
	Some section of narrow gauge country network.	WestNet -VHF Private Mobile Radio in some areas. CDMA Mobile Telephone elsewhere	12	
			17	
	Some sections of the standard gauge lines to Leonora and Esperance	WestNet -VHF Private Mobile Radio in some areas, CDMA Mobile Telephone elsewhere	12	
			17	
Tasmania	The complete Tasmanian rail network	PN -VHF Private Mobile Radio	16	
Western Australia (Pilbara area)	BHP Billiton iron ore rail network	VHF Private Mobile radio	14	
	Pilbara Rail iron ore rail network	UHF Private Mobile Radio	15	



**Table 2 Mobile Telephone Use-Summary**

Mobile telephone systems are used as the “train radio” on a number of rail systems and specific railway lines. The service coverage is not optimised by the communications carrier for railway applications. Therefore the service may not be available for the complete length of a specific line. The use of mobile telephone systems is indicated in the following table.

Area	Line	System
South Australia	Apamurra	CDMA
	Tailem Bend SA to Serviceton VIC	GSM
	Riverland area	CDMA
	Eyre Peninsular	CDMA
Western Australia	The narrow gauge network where train radio coverage is not provided. (refer to the map).	CDMA

**Table 3 Satellite Telephone Use- Summary**

Satellite mobile telephone systems are used as the “train radio” on a number of rail systems and specific railway lines.

Both geostationary and low earth orbit systems are used. The use of satellite telephone systems is indicated in the following table.

Area	Line	System	Comment
Queensland Rail	Normanton to Croydon	Optus MobileSat	
	Longreach to Winton to Hughenden	Inmarsat	
RailCorp and ARTC (New South Wales)	All lines in New South Wales	Optus MobileSat	Only implemented for CountryNet equipped locomotives and rail cars.
“Northern Australia Railway”	Tarcoola to Darwin	<ul style="list-style-type: none"> <li>▶ Optus MobileSat</li> <li>▶ Iridium</li> <li>▶ Globalstar</li> </ul>	Safeworking requires locomotives to be equipped with two different satellite systems



## 4. System Data Sheets

### 4.1 General

Data sheets are provided for the following train radio and related systems.

<b>Data Sheet</b>	<b>System</b>
1	Queensland Rail
2	ARTC – CountryNet
3	RailCorp – MetroNet
4	Victrack – Non-urban Train Radio
5	Victrack – Suburban Train Radio
6	State Mobile Radio – Victoria
7	ARTC – Train Radio
8	Government Radio Network – South Australia
9	Australia Railroad Group -South Australia
10	Pacific National Operations -South Australia
11	WestNet Rail – UHF Network
12	WestNet Rail – VHF Network
13	Public Transport Commission of Western Australia
14	Pilbara area – BHP Billiton Network
15	Pilbara area – Pilbara Rail Network
16	Pacific National Operations -Tasmania
17	Mobile Telephone – Terrestrial
18	Mobile Telephone - Satellite



## 4.2 Queensland Train Radio

Train Radio System – Data Sheet		1
Data Item	Details	
<b>General</b>		
Owner	Queensland Rail	
System Name	Train Radio	
Application	State-wide train radio system	
Comments	Some lightly trafficked lines use satellite telephone. A separate system is provided on many lines for rail maintenance purposes.	
<b>Functionality</b>		
General	Used for train-to-train control communications, and direct train control safeworking where this method is used.	
Mode of Operation	Open channel (all informed)	
<b>Technical</b>		
System Type	Private Mobile Radio	
Frequency Band	UHF (ROA Channels)	
Technology	Analog	
Manufacture	Tait	
Date in Service	1998	
Age of Equipment	8 Years	
Notes	<ul style="list-style-type: none"><li>Commercially available land mobile radio transceivers are used on this system.</li><li>The QR mobile equipment uses GPS controlled channel selection and frequency selection manual operation is also possible.</li></ul>	
<b>Interoperability With Other Systems</b>		
Interoperability Level	3	
Comment	Interoperable with the ARTC and WestNet Rail UHF train radio systems.	



### 4.3 ARTC – CountryNet

Train Radio System – Data Sheet		2
Data Item	Details	
<b>General</b>		
Owner	ARTC	
System Name	CountryNet	
Application	Train radio system for all lines in New South Wales.	
Comments	The system was originally implemented for use on all NSW country lines. Coverage is generally provided by satellite, Terrestrial coverage is provided on some sections of the country lines. Coverage has now been extended to metropolitan lines, with the exception of tunnels.	
<b>Functionality</b>		
General	Used for train to train control communications including train order working where this safeworking method is used.	
Mode of Operation	One to one (private call), with open channel (all informed) train control to all trains if required.	
<b>Technical</b>	Terrestrial	Satellite
System Type	Private mobile radio	Satellite (Optus MobileNet)
Frequency Band	UHF (ROA Channels)	-
Technology	Analog	Digital
Manufacture	Simoco/TMC	NEC
Date in Service	1995 – 1996	1995 – 1996
Age of Equipment	1 to 10 years	1 to 10 years
Notes	<ul style="list-style-type: none"> <li>▶ Uses a unique data protocol for radio control and GPS location data;</li> <li>▶ Custom manufactured radio package.</li> </ul>	
<b>Interoperability With Other Systems</b>		
Interoperability Level	0	
Comment	The system is not interoperable with other train radio systems. It is only available on locomotives and rail cars equipped with CountryNet equipment, terrestrial or satellite.	



#### 4.4 RailCorp – MetroNet

Train Radio System – Data Sheet		3
Data Item	Details	
<b>General</b>		
Owner	RailCorp	
System Name	MetroNet	
Application	Train radio system for the suburban and interurban electric passenger fleet.	
Comments	Radio coverage is provided in the RailCorp electrified network. Bounded by Newcastle, Kiama and Lithgow.	
<b>Functionality</b>		
General	Used for communications between trains, signal boxes, train control and maintenance depots.	
Mode of Operation	Generally one to one (private call) with open channel (all informed) to all trains if required.	
<b>Technical</b>		
System Type	Trunked radio system, (quasi version of the MPT 1327 system)	
Frequency Band	UHF (ROA Channels)	
Technology	Analog	
Manufacture	Siemens (Tait radio transceivers are used)	
Date in Service	1996	
Age of Equipment	11 to 12 years	
Notes	Uses custom manufactured radio network control equipment.	
<b>Interoperability With Other Systems</b>		
Interoperability Level	0	
Comment	Not interoperable with other train radio systems. It is only available on passenger trains equipped with MetroNet radio equipment.	





## 4.5 Victrack – Non-urban Train Radio

Train Radio System – Data Sheet		4
Data Item	Details	
<b>General</b>		
Owner	Victrack	
System Name	Non-urban Train Radio	
Application	Statewide train radio system	
Comments	The system is used on both the standard gauge and broad gauge networks including suburban lines traversed by freight locomotives.	
<b>Functionality</b>		
General	Used for train to train control communications. Standard gauge trains communicate with the ARTC control centre in Adelaide. Broad gauge trains communicate with train control in Melbourne. The system supports “alternative safeworking” on sections on the Melbourne to Adelaide standard gauge line.	
Mode of Operation	Train to train control one to one (private call). Train control to train open channel (all informed). AWS uses mobile radio data terminals.	
<b>Technical</b>		
System Type	Private mobile radio	
Frequency Band	UHF (ROA Channels)	
Technology	Analog	
Manufacture	Motorola (originally) other makes are also used	
Date in Service	1987	
Age of Equipment	1 to 22 years	
Notes	<ul style="list-style-type: none"><li>▶ The system uses a modified form of Motorola data messaging (MDC).</li><li>▶ Commercially available land mobile transceivers are used for this system with proprietary data signalling functions added.</li></ul>	
<b>Interoperability With Other Systems</b>		
Interoperability Level	2	
Comment	The land mobile transceivers can also be used on the ARTC QR and Westnet Rail systems.	



#### 4.6 Victrack – Suburban Train Radio

Train Radio System – Data Sheet		5
Data Item	Details	
<b>General</b>		
Owner	Victrack	
System Name	Suburban Train Radio	
Application	Train radio system for the suburban passenger train fleet.	
Comments	Radio coverage is provided for the electrified suburban rail network.	
<b>Functionality</b>		
General	Used for train to train control communications.	
Mode of Operation	One to one (private call)	
<b>Technical</b>		
System Type	Trunked radio system	
Frequency Band	UHF not ROA Channels	
Technology	Analog	
Manufacture	Originally Storno, now Motorola who acquired Storno	
Date in Service	1991	
Age of Equipment	14 years	
Notes	The radio equipment is no longer manufactured .	
<b>Interoperability With Other Systems</b>		
Interoperability Level	0	
Comment	Not interoperable with other train radio communications systems or the ROA frequency assignments.	



## 4.7 State Mobile Radio Network - (Victoria)

Train Radio System – Data Sheet		6
Data Item	Details	
<b>General</b>		
Owner	Victorian Government	
System Name	State Mobile Radio Network (SMR)	
Application	<p>The SMR is a statewide radio communications system principally used by State Government agencies and other organisations such as utilities.</p> <p>The SMR is used as a back up to the Victrack non-urban train radio system.</p>	
Comments		
<b>Functionality</b>		
General	Used for train to train control communications, also for “administration” purposes between trains and the train operators control room.	
Mode of Operation	Open channel (all informed) or one to one (private call)	
<b>Technical</b>		
System Type	Trunked radio system (MPT 1327)	
Frequency Band	VHF	
Technology	Analog	
Manufacture	Base stations and network controllers– Nokia Mobile radios – Nokia, Simoco/TMC, Tait, and Motorola	
Date in Service	1994	
Age of Equipment	1 to 11 years	
Notes		
<b>Interoperability With Other Systems</b>		
Interoperability Level	0	
Comment	Not interoperable with other train radio systems or other government radio networks.	



## 4.8 ARTC Train Radio System

Train Radio System – Data Sheet		7
Data Item	Details	
<b>General</b>		
Owner	Australian Rail Track Corporation	
System Name	Train Radio	
Application	Train Radio for the standard gauge network <ul style="list-style-type: none"> <li>▶ Tailem Bend SA to Kalgoorlie WA</li> <li>▶ Crystal Brook SA to Broken Hill NSW</li> <li>▶ Port Augusta to Whyalla</li> </ul>	
Comments		
<b>Functionality</b>		
General	Used for train-to-train control communications including train order safeworking where this method is used.	
Mode of Operation	Open channel (all informed)	
<b>Technical</b>		
System Type	Private Mobile Radio	
Frequency Band	UHF (ROA Channels)	
Technology	Analog	
Manufacture	Various	
Date in Service	1985	
Age of Equipment	Varies 1 to 20 years	
Notes	Commercial available land mobile radio transceivers are used on this system	
<b>Interoperability With Other Systems</b>		
Interoperability Level	3	
Comment	Mobile radios for the system interoperable with the following systems: <ul style="list-style-type: none"> <li>▶ The WestNet UHF system</li> <li>▶ The QR system and</li> <li>▶ The Victrack non-urban train radio (if MDC data messaging functionally is provided)</li> </ul>	



## 4.9 Government Radio Network - South Australia

Train Radio System – Data Sheet		8
Data Item	Details	
<b>General</b>		
Owner	South Australian Government	
System Name	Government Radio Network	
Application	<ul style="list-style-type: none"><li>▶ The SA GRN is the radio communication system to be used by all SA government agencies.</li><li>▶ The GRN is used as the train radio for at suburban train and light rail services operated by TransAdelaide.</li></ul>	
Comments		
<b>Functionality</b>		
General	Used for train to train control communication. Data transmission of train run numbers is also supported.	
Mode of Operation	Open channel (all informed) or one to one (private call) if required.	
<b>Technical</b>		
System Type	Trunked mobile radio (Motorola Smartzone )	
Frequency Band	UHF	
Technology	Analog and Digital	
Manufacture	Motorola	
Date Placed in Service	1999	
Age of Equipment	1 to 6 years	
Notes	<ul style="list-style-type: none"><li>▶ Commercial available land mobile radio transceivers are used on this system.</li><li>▶ The system can be upgraded to digital transmission (APCO 25 compliant)</li></ul>	
<b>Interoperability With Other Systems</b>		
Interoperability Level	3	
Comment	The mobile radio transceivers can be configured to communicate on the ROA channels in addition to the GRN .	



#### 4.10 Australia Railroad Group System(s)-South Australia

Train Radio System – Data Sheet		9
Data Item	Details	
<b>General</b>		
Owner	Australia Southern Railroad	
System Name	Train Radio	
Application	Train radio for the following lines operated by ASR in South Australia. <ul style="list-style-type: none"><li>▶ Adelaide to the Barossa Valley and Burra.</li><li>▶ Eyre Peninsular – Port Lincoln to Cummings</li></ul>	
Comments		
<b>Functionality</b>		
General	Used for train-to-train control communication.	
Mode of Operation	Open channel.	
<b>Technical</b>		
System Type	Private Mobile	
Frequency Band	VHF	
Technology	Analog	
Manufacture	Motorola	
Date in Service	1994	
Age of Equipment	1 to 10 years	
Notes	Commercial available land mobile radio transceivers are used on this system.	
<b>Interoperability With Other Systems</b>		
Interoperability Level	0	
Comment	Not interoperable because of the frequency band (VHF).	



#### 4.11 Pacific National Operations System- South Australia

Train Radio System – Data Sheet		10
Data Item	Details	
<b>General</b>		
Owner	Pacific National	
System Name	Train Radio	
Application	Train radio for the Leigh Creek line.	
Comments		
<b>Functionality</b>		
General	Used for train-to-train control communication.	
Mode of Operation	Open channel (all informed).	
<b>Technical</b>		
System Type	Private Mobile Radio	
Frequency Band	UHF (Non ROA Channels)	
Technology	Analog	
Manufacture	Various	
Date Placed in Service	1990	
Age of Equipment	Various 1 to 10 years	
Notes	Commercial “off the shelf” mobile radio equipment is used.	
<b>Interoperability With Other Systems</b>		
Interoperability Level	2	
Comment	The frequencies used are not ROA frequencies (channels).	



## 4.12 WestNet Rail – UHF System

Train Radio System – Data Sheet		11
Data Item	Details	
<b>General</b>		
Owner	WestNet Rail	
System Name	UHF Train Radio	
Application	Train Radio for the standard gauge network Kalgoorlie to Perth and the Perth to Bunbury section of the narrow gauge network.	
Comments		
<b>Functionality</b>		
General	Used for trains to train control communication.	
Mode of Operation	Open channel (all informed)	
<b>Technical</b>		
System Type	Private Mobile Radio	
Frequency Band	UHF (ROA Channels)	
Technology	Analog	
Manufacture	Various	
Date in Service	1980s	
Age of Equipment	1 to 10 Years	
Notes	<ul style="list-style-type: none"> <li>▶ Commercially available land mobile radio transceivers are used on this system.</li> <li>▶ The base station equipment has been progressively renewed</li> </ul>	
<b>Interoperability With Other Systems</b>		
Interoperability Level	3	
Comment	The system is interoperable with the TransPreth, ARTC and QRS systems.	





#### 4.13 WestNet Rail – VHF System

Train Radio System – Data Sheet		12
Data Item	Details	
<b>General</b>		
Owner	WestNet Rail	
System Name	VHF Train Radio	
Application	Train radio for some sections standard and narrow gauge sections of the Western Australian rail network. (Refer to the map).	
Comments		
<b>Functionality</b>		
General	Used for trains and train control communication.	
Mode of Operation	Open channel (all informed)	
<b>Technical</b>		
System Type	Private Mobile Radio	
Frequency Band	VHF	
Technology	Analog	
Manufacture	Various	
Date in Service	1970s	
Age of Equipment	1 to 10 Years	
Notes	<ul style="list-style-type: none"><li>▶ Commercially available land mobile radio transceivers are used on this system</li><li>▶ The base station equipment has been progressively renewed</li></ul>	
<b>Interoperability With Other Systems</b>		
Interoperability Level	0	
Comment	Not interoperable because of the frequency band used (VHF).	



#### 4.14 TransPerth Train Radio System

Train Radio System – Data Sheet		13
Data Item	Details	
<b>General</b>		
Owner	Public Transport Commission of Western Australia	
System Name	Train Radio	
Application	Train Radio system for the Perth suburban electrified train network.	
Comments		
<b>Functionality</b>		
General	Used for communications between train and train control.	
Mode of Operation	Open channel (all informed)	
<b>Technical</b>		
System Type	Private Mobile Radio	
Frequency Band	UHF (ROA Channels)	
Technology	Analog	
Manufacture	Motorola	
Date in Service	1993	
Age of Equipment	2 years	
Notes	<ul style="list-style-type: none"> <li>▶ Commercially available land mobile radio transceivers are used on this system</li> <li>▶ The system has recently been renewed</li> </ul>	
<b>Interoperability With Other Systems</b>		
Interoperability Level	3	
Comment	Interoperable with the ARTC, QR and WestNet UHF train radio systems	



#### 4.15 BHP Billiton Train Radio System- Pilbara Area WA

Train Radio System – Data Sheet		14
Data Item	Details	
<b>General</b>		
Owner	BHP Billiton	
System Name	Train Radio	
Application	Train Radio for the Newman and Yarrie iron ore rail network.	
Comments		
<b>Functionality</b>		
General	Used for communication between trains and train control. Also includes channels for maintenance purposes.	
Mode of Operation	Open channel (all informed)	
<b>Technical</b>		
System Type	Private Mobile Radio	
Frequency Band	VHF	
Technology	Analog	
Manufacture	Motorola	
Date in Service	1966	
Age of Equipment	8 years	
Notes	<ul style="list-style-type: none"><li>Commercial available land mobile radio transceivers are used on this system</li><li>The equipment has been progressively renewed in during the operating life of the railway; the last renewal was in 1997.</li></ul>	
<b>Interoperability With Other Systems</b>		
Interoperability Level	See comment	
Comment	Not interoperable with the Pilbara Rail System	



#### 4.16 Pilbara Rail Train Radio System-Pilbara Area WA

Train Radio System – Data Sheet		15
Data Item	Details	
<b>General</b>		
Owner	Pilbara Rail	
System Name	Train Radio	
Application	Train Radio for the Hammersley and Robe River Rail network.	
Comments		
<b>Functionality</b>		
General	Used for communications between trains and train control. Also includes channels for maintenance purposes.	
Mode of Operation	Open channel (all informed)	
<b>Technical</b>		
System Type	Private Mobile Radio	
Frequency Band	UHF	
Technology	Analog	
Manufacture	Simoco/TMC	
Date in Service	1960's	
Age of Equipment	Various 2 to 6 years	
Notes	Commercially available land mobile radio transceivers are used on this system.	
<b>Interoperability With Other Systems</b>		
Interoperability Level	See comment	
Comment	Not interoperable with the BHP Billiton System	



#### 4.17 Pacific national Operations System -Tasmania

Train Radio System – Data Sheet		16
Data Item	Details	
<b>General</b>		
Owner	Pacific National Operations Tasmania	
System Name	Train Radio	
Application	The complete Tasmania Rail Network	
Comments		
<b>Functionality</b>		
General	Used for train control purposes including driver only operation of trains. Incorporates “cross band” operation to enable the locomotive radio to be used as a local repeater for hand portable radios.	
Mode of Operation	Open channel (all informed)	
<b>Technical</b>		
System Type	Private Mobile Radio	
Frequency Band	VHF with UHF local repeaters in locomotives.	
Technology	Analog	
Manufacture	Tait	
Date in Service	1995	
Age of Equipment	Varies 1 to 10 years	
Notes	Commercial available land mobile radio transceivers are used on this system	
<b>Interoperability With Other Systems</b>		
Interoperability Level	See comment	
Comment	Not required to be interoperable with other train radio system.	



## 4.18 Mobile Telephone Systems – Terrestrial

Train Radio System – Data Sheet		17
Data Item	Details	
<b>General</b>		
Owner	There are an number of network operators. The major service providers are Telstra, Optus and Vodafone.	
System Name	The Telstra system is called MobileNet the other systems are not named.	
Application	Used as the train radio on some sections of the rail network where train radio systems are not provided	
Comments	MobileNet comprises both GSM and CDMA networks .The networks of the other operators are GSM.	
<b>Functionality</b>		
General	Used of train to train control communication. Also used for administrative purposes by the rail operators.	
Mode of Operation	One-to-one (private call). Group call similar to open channel is becoming available	
<b>Technical</b>		
System Type	GSM	CDMA
Frequency Band	UHF	UHF
Technology	Digital	Digital
Manufacture	Various	Various
Date in Service	1980's	1990's
Age of Equipment	Typically 1 to 10 years	Typically 1 to 10 years
Notes	The GSM coverage is predominately in areas of high population and along some major highway transport routes. The CDMA network generally has the same coverage as the GSM network with additional coverage in county areas.	
<b>Interoperability With Other Systems</b>		
Interoperability Level	0	
Comment	The GSM and CDMA networks are not interoperable. Interoperation with the satellite networks is available using dual mode telephones.	



#### 4.19 Mobile Telephone System – Satellite

Train Radio System – Data Sheet		18
Data Item	Details	
<b>General</b>		
Owner	There are a number of systems used owned by different organisations.	
System Name	Refer to system type below	
Application	Used as the train radio on some sections of the rail network where other radio communications systems are not provided Also used for administrative purposes by the rail operators.	
Comments		
<b>Functionality</b>		
General	Used of train-to-train control communication as follows: <ul style="list-style-type: none"> <li>▶ The primary system where other services are not available</li> <li>▶ A backup to terrestrial services</li> </ul>	
Mode of Operation	One-to-one (private call, limited group call is available on MobileSat.	
<b>Technical</b>		
System Type	Geostationary- Optus MobileSat, Inmarsat Low earth orbiting -Globalstar, Iridium	
Frequency Band	UHF	
Technology	Digital	
Manufacture	Various	
Date in Service	Generally 1990's	
Age of Equipment	1 to 10 years	
Notes		
<b>Interoperability With Other Systems</b>		
Interoperability Level	0	
Comment	The satellite systems are not interoperable with each other. Interoperation with the mobile telephone networks is available using dual mode telephones.,	



## 5. Interoperability

### 5.1 Levels of Interoperability

The interoperability levels noted on the system data sheets are based on the following classifications. These classifications compare the capability of the respective train radio system to support the use of commercially available land mobile radio transceivers, configured for use on the ROA channels.

The levels of interoperability are ranked from 0 to 3 with 0 being the non-interoperable and 3 being fully interoperability.

Level	Status	Details
0	Not Interoperable	The radio system is unique and not interoperable with the train radio systems.
1	Limited	The radio equipment has limited interoperability. For example the mobile radio transceivers require proprietary signalling functions to be incorporated.
2	Restricted	The radio equipment is generally interoperable with some minor differences. For example mobile radio transceivers require GPS controlled channel /frequency switching functions to be seamlessly interoperable.
3	Comprehensive	The radio equipment is fully interoperable.

### 5.2 Interoperability (Between Systems)

To achieve a level of interoperability between disparate or non-interoperable systems the following techniques are used.

#### 5.2.1 Interconnection

Some train radio systems are interconnected to provide voice communications between trains using different radio systems covering the same section of the railway network. The interconnection is generally a manually controlled process, actioned by the train controller. This function is distinct from interoperability.

#### 5.2.2 Multiple Mobile Transceiver Installations and/or Functionality

Locomotives operating on the standard gauge network currently require a number of different radio transceivers of use on the respective sections of the network. This may require a number of mobile transceivers to be installed or a custom developed radio communications package.





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