KiwiRail

Radio Systems Manual

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1. Introduction

1.1 Use of Radios

VHF and UHF radios are used extensively across the rail industry. The correct operation and care of equipment is important to ensure the quality of communications.

Communications must be undertaken in accordance with rule **GR02 Network Communications**.

1.2 Speech Quality

Most radios are fitted with noise-cancelling microphones. These will only work when the user speaks directly to them. Failure to do this will result in poor speech quality being received.

1.3 Security of Radios

Managers must ensure that:

- proper security is provided for all radios
- Rail Personnel take proper care in using the equipment and use the correct operating procedures
- records are kept of each portable identification number and the location where it is held
- records of any radio sent for repairs and when it is returned are kept
- radio or battery charging equipment defects are promptly advised to KiwiRail Operations Support (155).

1.4 Care of Radio Equipment

Radios should be treated with care, including the microphone. Locomotive, mobile and base radio microphones must always be pressed firmly into the clip when not being used and the coiled cord on the microphone must be kept free of knots and must not be stretched.

Handheld radios with remote speaker / microphones should be clipped to the user when not being used (PPE items have a ‘radio loop’ that is to be used).

When working on top of locomotives and rail vehicles, Rail Personnel must ensure that the fixed antenna is not bent or damaged.

Any damage or malfunction should be recorded on a Loco 54 repair form, Mis.346 or reported to KiwiRail Operations Support (155).

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2. Radio Functions

2.1 Basic Operating Functions

The following operating functions are used on radios:

2.1.1 Receive (Listen)

- turn on the volume control
- set the desired channel
- messages will be heard through the speaker / speaker microphone

2.1.2 Transmit (Talk)

- press the microphone PTT switch (or PTT button on the side of portable radios)
- pause briefly to allow the radio to settle, then speak closely (50 - 80 mm from your mouth) to the microphone in a clear voice. Where safe and possible, shelter your microphone from the wind when talking on portable radios
- make each transmission as brief as possible, and release the PTT switch to listen
- transmissions greater than 60 seconds in duration will automatically time out. A low-pitch beep will sound from the speaker, followed by a continuous low-pitch tone.

2.2 Operating Functions – Train Control Network

The Train Control Radio System is designed primarily for motive power units and vehicle mobile radios. A handheld radio will not provide the same level of coverage as a properly installed motive power unit or vehicle mobile radio.

2.2.1 Base Calling Train Control

To initiate a call to the Train Controller, use the Base Call function:

- select the required channel with the channel switch, check that the radio is not on Scan
- lift the microphone and listen to check that there is no other traffic on the channel, then press the Base Call (or Call) button
- once the call has registered in Train Control, you will hear a short burst of tones through the radio. The rail vehicle, radio or train number, and the calling repeater / area will be displayed automatically on the Train Controller's screen
- after the Train Controller answers, speak into the microphone while pressing the press-to-talk switch
- the call may be cancelled before the Train Controller has replied by operating the press-to-talk switch on the microphone
- to remain on the channel the call was made on, do not replace the microphone into the clip until there is no further need to keep the channel held. Return the radio to Scan if required
- If there is no response from the Train Controller for 10 minutes after initiating a call, use the microphone to voice call the Train Controller.

2.2.2 Voice Calling Train Control

To voice call the Train Controller:

- select the required channel with the channel switch, check that the radio is not on Scan
- lift the microphone, press the press-to-talk switch and speak into the microphone
- after the Train Controller answers, speak into the microphone while pressing the press-to-talk switch
- when the call is finished, replace the microphone
- remain on the channel the call was made on, and do not replace the microphone until there is no further need to keep the channel held. Return the radio to Scan if required

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2.2.3 Scanner Instructions

The VHF radio can scan the VHF radio channels. The normal condition is for the radio to scan channels 1-16.

Standard mobile and portable radios have a button programmed to turn the scanner on / off.

Several factors alter the operation of the scanner. The scanner will be stopped under the following conditions:

- a signal is being received, or
- the microphone is out of (or not properly in) its clip

2.2.4 Scanner Alarm

On locomotive radios, a scan alarm (warning tone) indicates that the scanner has been stopped for more than 12 minutes.

The scan alarm can be reset by placing the microphone back onto the metal clip and then removing again.

2.3 Incoming Calls Indication via Selcall

When the radio receives an incoming Selcall:

- an alert sounds, and an indication is given on the radio screen (if fitted)
- the indication continues until you operate the press-to-talk switch on the microphone. If the radio is scanning, it may resume scanning
- to answer, lift the microphone and ensure that your radio is on the correct channel for the area (check that the radio is not on Scan)
- to remain on the channel the call was received on, do not replace the microphone until there is no further need to keep the channel open
- after the call, replace the microphone and return the radio to Scan if required

NOTE

When a voice call is received (not initiated by Selcall), ensure the channel selector is on the correct channel before responding to the call (including channel 1). Then follow the procedure in this instruction.

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3. Portable Radios

3.1 General Portable and Base Radios

NOTE
See separate Locomotive Engineer instructions for Lyttelton Tunnel and Midland Line in the **Local Network Instructions**.

3.1.1 Normally Used

The portable radio is normally used:

- in yards for non-ASP communication
- in container transfer sites
- passenger operations
- for train examination purposes
- by Infrastructure Maintenance Representatives

3.1.2 Initial Check

To undertake an initial check:

- operate the on / off volume control clockwise until the switch clicks on
- wait for the radio's self-test to complete (indicated by a 'beep, beep' from the radio)
- set the radio to the desired channel
- adjust the noise level using the volume control

3.1.3 Transmitting

When transmitting:

- press the press-to-talk switch on the microphone and hold it down while speaking into it, and
- release the press-to-talk switch when finished speaking, and the radio is ready to receive a reply

IMPORTANT
If the press-to-talk switch is not released, receiving a reply will not be possible.

3.1.4 Receiving

Incoming calls will be heard from the speaker. The volume control may adjust the loudness of incoming speech. On portable radios fitted with an external microphone, the microphone make also function as the speaker.

3.1.5 Hazards

Hazards when using portable radios:

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- Rail operations may be suspended when it is suspected that there is a risk of fire or explosion because of spillages of petroleum fuels, CNG, LPG or solvents, or dust (explosive concentrations). Do not operate the radio in this hazardous area; move to a safe location before transmitting on a portable radio
- Do not replace or charge batteries in a hazardous atmosphere. Contact sparking may occur while installing or removing batteries and cause an explosion
- While transmitting, do not hold the radio with the antenna very close to or touching exposed body parts, especially the face or eyes
- Radios have a noise-cancelling microphone, and you need to speak directly into the extension speaker / microphone (if fitted) or the speaker grill area at approximately 50 - 80 mm
- Do not hold the transmit switch (PTT) on when not intending to transmit
- Operating the radio near unshielded explosive blasting caps may trigger a blasting cap and cause an explosion

NOTE
This also applies when cellular phones and pagers are being used.

- Do not dispose of batteries in a fire. Batteries may explode when subjected to extremely high temperatures
- Do not short-circuit the radios battery contacts
- Turn the radio off when removing or installing a battery
- When working in wet conditions, check the speaker / microphone opening for water droplets; if in doubt, check with other members of the shunting crew and locomotive how clear your transmissions are. To clear water from the speaker / microphone, tap the microphone in the palm of your hand

3.2 Radio Alarms

Table 1: Radio Alarms and Cause

Alarm	Cause
Two short beeps after switching on	Self-test passed, and the radio is operational
Long low pitch beep after switching on	Failed self-test, return for repair
Low pitch beep when transmitting	You have been transmitting too long (60 seconds) and the radio is about to stop transmitting
High-pitch chirp-chirp / red flashing LED	Battery charge is low. Although there may be 15 minutes of transmission power remaining, the battery should be changed immediately

3.2.1 Timer Alert Alarm

When the portable radio is removed from the holder, the timer alert alarm is activated on the Train Control radio screen. After seven minutes the Train Control timer alarm operates.

The timer is reset to 7 minutes each time the press to talk switch on the portable is used.

If necessary, continue to reset the timer alert alarm at intervals of less than seven minutes until the task is completed and you have returned the portable radio to the holder, deactivating the timer function in Train Control.

3.3 Remote Speaker / Microphone

Remote speaker / microphones include a speaker, a microphone, a push-to-talk (PTT) switch, and associated circuitry.

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When the remote speaker / microphone is attached to the radio, the accessory speaker, microphone, and PTT switch on the remote speaker / microphone are active.

The PTT switches on both the radio body and the speaker / microphone can be used to operate the radio.

Similarly, both microphones can be used. The speaker in the radio body is disabled by attaching the speaker / microphone.

3.3.1 Care of Speaker / Microphone Cord and Antenna

To protect the remote speaker / microphone cord and antenna, do not:

- unnecessarily stretch the cord
- drop the speaker / microphone or allow it to swing from the radio, clip it to your lapel
- swing the speaker / microphone by its cord
- lift the radio by the speaker / microphone cord or pull on the speaker / microphone
- lift the radio by the antenna.

When in use portable radios equipped with an extension speaker / microphone unit (attached to the radio or by a flexible cord) and flexible antenna must be carried in a pouch and worn on a proper belt or carrying strap or, when wearing PPE, in the purpose built pouch where provided.

Personnel using a portable radio that is not equipped with an extension speaker / microphone unit may carry these in the hand, provided that they are not being used to control designated Audio Shunt Procedure operations.

Aerial, knobs and where provided, extension speaker / microphone units are not to be removed from the set.

3.4 Battery Care for Portable Radios

The rechargeable batteries in portable radios need care for safe and dependable radio operation over each shift.

3.4.1 Self-Discharge

Immediately after charging is completed, self-discharge reduces the battery capacity. A fully charged battery may lose charge at 10 to 15% per month.

Where radios are not used regularly, they should be charged on a planned cycle.

3.4.2 Charging

The following user requirement is to be followed when charging batteries:

- ensure the radio is turned off when the radio and battery combination are placed in a charger for recharging
- to fully charge the batteries, 2 hours of charging time is required. Never continue charging or using the battery when it becomes noticeably hot
- do not attempt to recharge hot or overheated batteries (left in the sun)
- avoid charging batteries when cold (below 10^{o}C) or very hot (above 35^{o}C)
- keep battery and charger contacts clean. Wipe dry any moisture from the battery before placing it in the charger
- chargers revert to a trickle charge at the end of normal or fast charging. Continued indefinite charging is recommended for radios in regular use
- the charger must be specifically designed for the type of battery in use.
- do not attempt to charge or use batteries with swollen, broken, or cracked cases.

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3.4.3 Cycling

Batteries should be cycled (charging and discharging) monthly to keep batteries in good condition.

3.4.4 Battery Storage

Batteries may be stored in any condition - charged or uncharged. A battery will have an expected shelf life of several years at room temperature. However, a battery stored for this time could not be expected to have the maximum capacity and must be fully charged before use.

3.4.5 New Batteries

Cycle new batteries 2 to 3 times to build up the capacity. Leave the battery in the charger to collect a top-up after the charger has indicated charge complete.

3.4.6 Disposal of Batteries

Batteries must be disposed of safely. Return all unserviceable batteries to a Radio Technician for safe disposal / recycling.

3.4.7 Hazards

Do not short-circuit battery terminals. Be careful that tools, keys, and coins are not placed near or across the battery connections. A short-circuited battery will quickly get very hot and may become permanently damaged.

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4. Locomotive Radio Equipment

4.1 Main Equipment Items

There are 3 main items of locomotive radio equipment:

1. Fixed VHF radio
2. Fixed UHF radio
3. Portable UHF radio

4.2 Fixed VHF Radio

There are 5 main variants of VHF locomotive radios in use:

1. Tait TM8260 and TM9360 is used in freight and shunt locomotives
2. Tait TM8255 and TM9355 is used in Auckland EMUs
3. Tait TM8115 is used in Wellington Matangi EMUs

NOTE
Not all radios are equipped with all the features.

4.3 Fixed UHF Radio

This radio normally interfaces between the VHF radio and the portable UHF radio. It may also be used for piloting and shunting. The channel switch should always be on channel 41 except when Shunt Mode (crossband disconnect) is used.

4.4 Portable UHF Radio

The portable UHF radio communicates with the Train Controller through the fixed UHF and VHF radios when the crossband is activated. It may also be used for shunting and piloting. The user requirements are as follows:

- the portable radio must be in the holder for normal locomotive radio operation
- when not in use, select shunt mode on the portable radio charger
- when the UHF portable is required in crossband mode, select ATC on the charger before removing the portable radio
- when the UHF portable is required for shunting purposes, ensure shunt is selected on the charger before removing the portable radio

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5. Operating Instructions

- Locomotive Radios
- Auckland EMU Radios
- Hi-Rail Vehicle Radios

These radio have enhanced features as below:

5.1 Base Call to Train Control

- When the CALL button is pressed, a white light will flash. When it goes solid the call has been acknowledged by the Train Control radio computer
- The radio will send a call every 30 seconds until a response is received (times out after 30 attempts)

5.2 Scan

- On locomotives and Auckland EMUs, when the microphone is placed into the metal clip – the VHF radio will start to scan
- To keep the radio on a specific channel, place the microphone into the plastic clip (where provided) or keep it out of the metal clip
- Hi-Rail vehicles have a SCAN button, press this to start / stop the scan cycle (an orange light will illuminate when scanning)

5.3 Emergency Call

Locomotives have a separate Emergency button, Auckland EMUs and Hi-Rail Vehicles have a red emergency button on the radio.

Press and hold the emergency button for approximately two seconds. Do not set the channel switch. The radio will send the call on the selected Train Control channel, and if no response is received, it will transmit the call-in sequence on channels 2 - 4 and 6 - 14. The CALL light will flash and go solid once the call has been acknowledged.

Once the call has been registered in Train Control, the emergency indication will stop flashing and show steadily. If the call does not register in Train Control immediately, the indication continues flashing to show that the call has been delayed. A further call will be transmitted after 30 seconds, and this is repeated 30 times and will stop when the call registers.

The call may be cancelled after the first sequence is completed before the call registers at Train Control by operating the press-to-talk switch on the microphone.

After receiving the emergency call, the Train Controller will wait approximately 15 seconds before the first attempt at verbally responding to the Operator. Time is required for the locomotive radio equipment to complete the emergency cycle. Sometimes, this reply may not be received for up to 30 seconds. This will depend on the scanner's status when the call was sent, the type of scanner, and the channel used in the area.

Should the Train Controller not respond to the emergency call within one minute of the indication becoming steady, the microphone may be lifted, and a voice call placed (saying "Emergency, Emergency, Emergency"). Ensure the radio is on the correct channel for the area.

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IMPORTANT
After pushing the emergency call button, if the call has not locked on, transmitting on the microphone will stop the transmission of an emergency Selcall.

5.4 Radio Vigilance Alarm

(This instruction does not apply to Hi-Rail Vehicles)

This alarm is activated automatically when the vigilance alarm applies the train penalty brake or if an event recorder / vigilance system is installed on the locomotive when the emergency brake is applied. It works like an emergency alarm, requiring no manual operation.

The radio will send the call to the selected Train Control channel when the alarm is activated. If no response is received, it will transmit the call in sequence on channels 2 - 4 and 6 - 14. The CALL light will flash and go solid once the call has been acknowledged. A further call will be transmitted after 30 seconds, repeated 30 times until the call registers.

The call may be cancelled after the first sequence is completed before the call registers at Train Control by operating the press-to-talk switch on the microphone.

When the penalty brake applies during tests of the vigilance alarm, do not reset the vigilance alarm until the Train Controller has acknowledged the alarm signal displayed on the screen and thus confirmed that the test is correct.

This alarm will also be activated on ATC locomotives when the Locomotive Engineer makes an emergency brake application on locomotives fitted with a vigilance and event recorder system. The way the alarm functions and the requirements once the alarm has been activated will be the same as the vigilance alarm.

5.5 Crossband Radio System

(This instruction only applies to locomotives)

Using the crossband radio allows the portable radio to communicate through the VHF radio to the Train Controller. It is activated when the portable radio is removed from its holder. The range of the portable varies with the topography of the area. It will typically be 1 to 2 km (in hilly areas). It may sometimes extend to 10 km in a flat open country.

The user requirements are as follows:

- Before removing the portable from the charger / holder, set the channel of the VHF radio to the Train Control channel for the area the train is in. Base call the Train Controller and ask permission to remove the portable radio, place switch to ATC, and then remove the portable radio from the charger
- the screen at Train Control will show that the portable timer feature has been activated. It will also display the locomotive (or train) number and the calling area
- switch on the portable radio, and a short tone confirms that the self-test is correct. This burst of tone can be used to indicate the volume setting
- if the tone sounds continuous or the light on top of the radio glows, the radio is faulty
- ensure that the fixed UHF radio is set to channel 41
- for normal operation, set the portable to channel 2
- within tunnels equipped with leaky feeder radio systems - (e.g., all tunnels over 100m long), set the portable radio to channel 4
- before leaving the cab, call the Train Controller on the portable and give the precise location of the train and come to a clear understanding about the frequency of calls.

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5.5.1 To Call Train Control with Portable Radio

Switch to channel 2 (normal operation) or 4 (in tunnels with a radio system) and speak into the microphone grille on the front of the radio while operating the press-to-talk switch.

5.5.2 Use of Portable Radio Completed

On returning to the locomotive:

- switch off the portable radio
- turn its channel selector to channel 1
- replace it in the charger
- put the switch on the charger to shunt.

The charging light turns on and request permission from the Train Controller to move the train (the scanner restarts).

5.5.3 Use of Portable less than 7 minutes

When the Locomotive Engineer wishes to leave the cab at an unattended station or location where other Rail Personnel are not nearby, the UHF portable radio is used.

Procedures that take less than 7 minutes involving operating main line points or points indicator controls as well as checking the train consist where personal safety is not at risk would be as follows:

- the Locomotive Engineer sends a radio base call from the locomotive and requests permission from the Train Controller to remove the portable from its holder

NOTE

Battery Test. Select channel 1 or 41 on the portable and hold the press-to-talk switch down for approximately 30 seconds; if the red lamp blinks, the battery is flat.

- the initial base call from the locomotive will be displayed on the call window screen as a locomotive call on the Train Control radio screen.
- then when the portable has been removed, the portable out indication will appear in the alarms window. At the same time, the 7-minute timer indication will appear on the locomotive call indication
- when the Locomotive Engineer leaves the locomotive cab with the portable. The alert timer is automatically activated
- should a portable alert alarm occur while the portable is out of the locomotive holder. This will be displayed in the alarms window. Normal alarm response procedures will apply
- once the Locomotive Engineer has returned to the locomotive cab, and the portable radio will be returned to its holder. When the portable indication is received on the Train Control screen, this will be good advice to the Train Controller that the Locomotive Engineer has returned to the locomotive and the crossband link has been deactivated. The train may continue proceeding unless otherwise advised by the Locomotive Engineer.

5.5.4 Additional Precautions

Additional procedures will be applied when:

- the Locomotive Engineer is to be out of the cab with the portable for more than 7 minutes, or
- carrying out tasks involving more risk (e.g., walking back over rough ground or working on a locomotive running board)
  in these situations, the usual voice transmissions with the Train Controller to advise that it is necessary to leave the locomotive cab with the portable for a specific reason must be followed

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- before removing the portable radio from a locomotive at a depot (including transferring the portable radio to the locomotives / cabs), ensure the switch on the charger is set to shunt. This prevents the crossband link and indication on the Train Control screen from being activated unnecessarily
- before returning the portable to the charger, ensure the switch on the charger is set to shunt. After returning the portable to the charger, leave the switch in shunt

5.6 Locomotive Portable for Piloting

The Locomotive Engineer:

- operates a switch (selecting the shunt mode on the charger) fitted on the portable charger. This will illuminate when switched on
- removes the UHF portable from the charger and hands it to the Rail Operator / Pilot
- sets the channel switch on the fixed UHF radio to channel 45 or 46 using the locomotive portable by agreement with the Rail Operator / Pilot. They use this radio to communicate with the Rail Operator / Pilot. Adjust the volume of the fixed UHF radio to suit

NOTE

The VHF radio will still operate, but the audio will be muted (you will not be able to hear VHF traffic when a UHF shunting channel has been selected in the foreground). A 'Loco Call' from the Train Controller will cause the radio to beep once, and 'CALL' will be displayed on the screen).

- when ready to restore the UHF portable to the charger, reset the portable to channel 1, switch it off, and place it back in the charger
- leave the charger switch in shunt mode

5.7 Radio Alarm Activated

Once any radio alarm to the Train Controller has been activated, the train must not be moved until authorised by the Train Controller, as assistance may be arriving from either end of the train. Do not move the train without authorisation from the Train Controller.

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6. Radio Communication in Tunnels

When rail personnel are required to assist Locomotive Engineers in a ‘train failure in tunnels’ situation

6.1 UHF Radios in Tunnels

Where a UHF radio is available, typically, this radio would be either:

- an ASP portable radio used by Yard Personnel (where the tunnel channel has been specifically programmed)
- a UHF portable (either from the disabled train or the relief loco)
- the fixed UHF radio in the disabled / relief loco
- UHF portable radios in tunnels with a tunnel radio system.

The most reliable method is using the locomotive UHF portable radio with the crossband activated. It uses the tunnel system to give coverage within the tunnel and up to 1 km outside each portal.

ASP portables on the tunnel channel:

- are the preferred method for other users
- use the same channel as the locomotive UHF portable
- are linked to Train Control if the locomotive has activated its crossband link
- will provide local coverage over the same distance if the crossband is not activated.

Simplex communication is unreliable in tunnels; a coverage distance of as little as 20 metres can be obtained on UHF radios on simplex channels (e.g. channel 45).

6.2 VHF (E Band) Radios in Tunnels

Typically, this radio would be either:

- portable radios used by Train Managers, Rolling Stock Maintenance Representatives, and channel 1 shunting
- track vehicle fixed radio
- the disabled / relief loco radio.

6.2.1 Disabled / Relief Locomotive Communication VHF Channel 1

Coverage distance may be as little as 20 metres where they are in a tunnel with a train. The Train Controller will not be involved in the communications.

In some tunnels, the radio users may communicate directly on the Train Control channel(s). In some cases, the Train Controller may be required to relay messages.

6.3 Understand the Radio Procedures to be Used

With different methods of contacting the locomotive or while working in or near a tunnel with radio communication available, it is important when planning the necessary procedures to be followed that the Train Controller, the Locomotive Engineer and assisting Rail Personnel understand the procedures to be followed.

NOTE

Tunnel systems provide coverage in the tunnel and up to 1 km beyond the portals.

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Only one locomotive at a time should have its portable radio crossband activated; otherwise, they will interfere with another.

Tunnels of less than 100 metres may not have radio tunnel systems. Radio coverage from hilltop repeaters may include just inside some of these tunnel portals.

The tunnel radio system could be inoperative if the cable through the tunnel is damaged (i.e., by derailed wagons).

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7. Radio Tests

7.1 Radio Test Requirements

The radio in main line locomotives will generally be tested at least once every 24 hours. A test is required:

- if a radio test is due or will fall due before arrival at its destination
- for the driving end of locomotives and consists
- when the power to the radio has been removed (except as described below).

When locomotives are shut down between radio tests, the shutdown procedures for diesel locomotives are modified to ensure:

- the knife switch and radio circuit breakers are left in
- all other circuit breakers are left off following the radio test
- the auxiliary generator circuit breaker on DX class locomotives is left in.

Locomotive Engineers may also carry out tests if they consider it necessary.

7.2 Radio Test Procedure

Contact the Train Controller to arrange permission for a radio test by applying the following process:

- Base Call on the correct channel
- wait until the Train Controller responds
- request a radio test
- acknowledge the reply from the Train Controller with a microphone call.

7.2.1 Portable Radio Test

When undertaking a radio test, the following process must be followed:

- turn the main radio volume to the minimum
- place switch on the charger to ATC and remove the portable
- select channel 1 on the portable and hold the press to talk switch down for approximately 30 seconds. Monitor the red transmit lamp for 30 seconds; if the lamp blinks, the battery is flat
- select channel 2 on the portable
- call the Train Controller on the portable (this will refresh the Train Control timer)
- receive confirmation from the Train Controller that the portable is transmitting satisfactorily
- receive a loco call from the Train Controller (no voice transmission necessary)
- select portable channel 1, switch off, replace in charger, and place switch to shunt
- without voice transmission to the Train Controller, check that the scanner is working, and then carry out the vigilance and emergency tests.

7.2.2 Vigilance and Emergency Tests

- activate the vigilance device system
- press the emergency button and wait until the emergency has locked on (CALL lamp glowing steadily)
- the Train Controller will call the locomotive to confirm that the test is complete.

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IMPORTANT
Do not make any calls when the channel is busy.

IMPORTANT
If the radio test fails, the locomotive radio is to be switched off / on, and the test repeated.

7.3 Test Record

The radio test must be endorsed on the card in the locomotive cab with the time, date, and signature.

Communications Personnel repairing a locomotive's radio system must tell the Terminal Supervisor / Team Leader when the repairs are completed. The radio must be tested to ensure it is operating correctly before the locomotive re-enters traffic.

The portable radio must be left in the holder when the test is completed, and the cab door must be locked.

If locomotives other than the lead locomotive are required to assist on a train or run for balancing purposes, they may run between depots with a defective radio. It is envisaged that this situation would apply only when a spare locomotive is not readily available and/or replacing the locomotive would result in a train delay.

Arrangements must be made for personnel at the destination depot to be informed so the radio fault in the locomotive concerned can be repaired on arrival.

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8. Maintenance Radio Systems

8.1 Fleetlink Radio System

Maintenance Representatives in several areas have mobile and handheld Fleetlink radios. These radios are on a commercial trunked radio network. With the use of an attached keypad, various Rail Personnel can be contacted:

- by selecting the phone number (press 7, then the extension number), or
- by selecting the 3-figure radio number if contacting another mobile / handheld.

In both instances, once the number has been selected, the momentary operation of the press-to-talk switch will contact the Rail Personnel being called. Some of these radios may also incorporate pre-selected numbers.

In an emergency, contact can be made with the emergency services operator by selecting 1,1,1,1,1,1,1 and then operating the press-to-talk switch.

8.2 Digital Mobile Radio (DMR) Overview

KiwiRail have several VHF maintenance radio systems which are separate to the train control system and allow users to communicate between each other across a wide area, including tunnels.

DMR radios use additional repeaters and hardware added to the railway corridor and work in selected areas.

DMR features are activated on selected Hi-Rail, vehicle and portable radios and include the existing VHF E-Band radios channels as well as the maintenance channels in use for the area.

The channels are open and anyone with a DMR radio listening in the area will be able to hear the conversation.

At locations specified in the Local Network Instructions, Track Maintenance Representatives may communicate between their worksites using DMR radios.

8.3 Digital Mobile Radio (DMR) Instructions

1. Persons in charge of any work under track protection may carry a Train Control / DMR-capable radio.
2. Where workers are in separate locations, at least one person at each location should have a DMR radio to enable communications.
3. When not communicating with others, radios must scan the allocated maintenance channel and all other channels.

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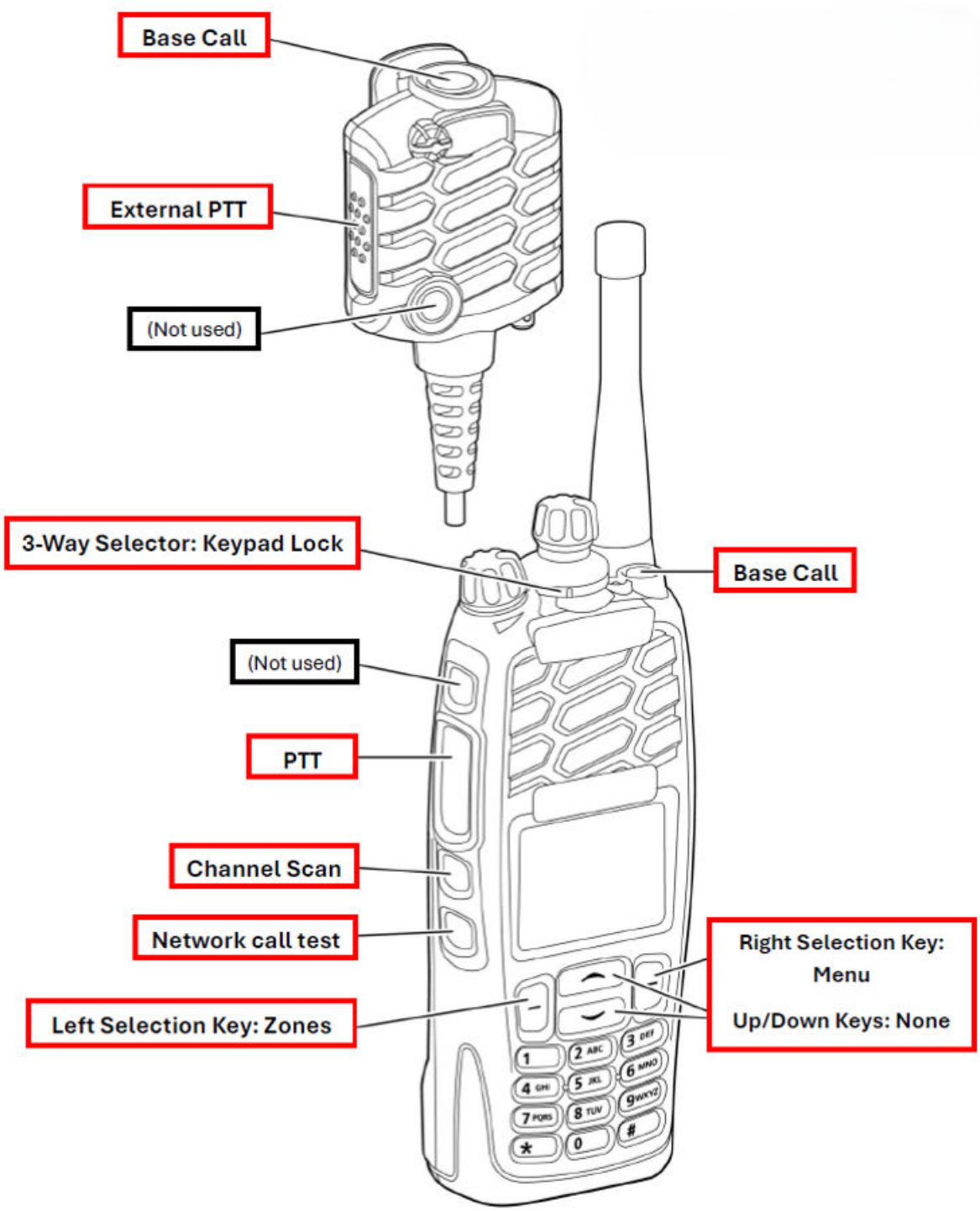
8.4 TP9500 Portable Radio Controls



TP9500 Portable Radio Controls

To scan the DMR channel and other channels:

1. Select the DMR channel relevant to your work team.
2. Then press the radio's scan button.

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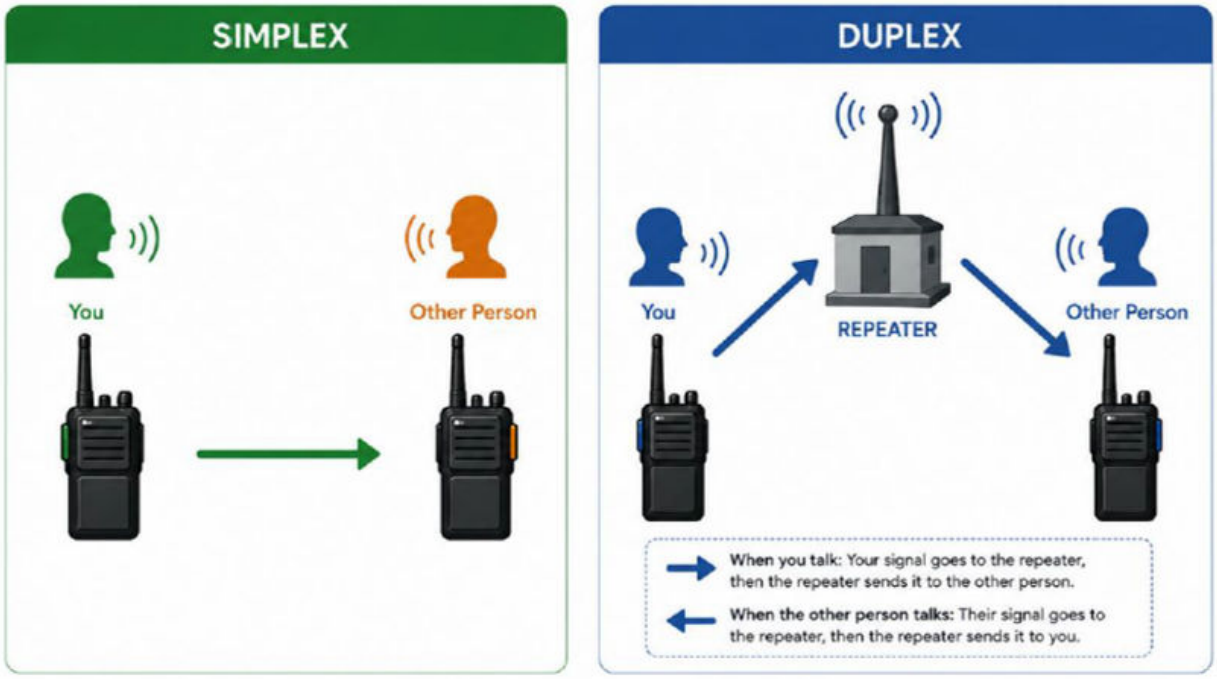
8.5 Simplex vs Duplex Transmissions



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9. Audio Shunting Procedures (ASP)

In addition, several types of portable radios are used at some terminals for ASP shunting. The radio operation is similar to each other.

9.1 Testing of ASP Radios

9.1.1 Portable Radio

Visual Checks

Check that the microphone, antenna, and radio shell are not damaged and are in good working condition.

Audio Checks

Regarding the controls on the top of the radio:

- turn the radio on
- extend the speaker / microphone cord and check for continuous operation

9.1.2 Portable to the Office Base Radio

- turn the volume control on
- inform other members of the shunt gang of the intended transmission
- set the channel switch to channel ASP 0
- confirm good voice communication between the portable and Terminal Supervisor / Team Leader.

9.1.3 Test to the Shunt Team

- set the correct channel for your shunt, and
- confirm good voice communication between portable and locomotive radios.

9.2 Call Facility

A rapid sequence of tones heard over the radio will be a call from the Terminal Supervisor / Team Leader. When the shunting movement is stopped, the Rail Operator in Charge will call the Terminal Supervisor / Team Leader on the working channel.

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10. Yard Operating Instructions

These are posted locally, and you must remain familiar with them. For clarification, ask your Terminal Supervisor or Team Leader.

10.1 UHF Radios for Shunting / Piloting

The fixed UHF radio and the UHF portable may be used to communicate between the Locomotive Engineer and the Rail Operator or Pilot of the locomotive and carry out work train requirements.

The radio system is designed to provide a reliable communication standard. Each shunting service will be provided with a dedicated channel.

Portable radios with multi-channels will be provided where more than one shunting service operates. Rail Personnel must take particular care to ensure the correct channel is selected.

10.2 Piloting Using an ASP Radio

Where the Rail Operator / Pilot has their portable radio with suitable channels (this includes portable ASP radios):

Set the channel switch on the fixed UHF radio to the correct channel by agreement with the Rail Operator / Pilot and use this radio to communicate with the Rail Operator / Pilot. Adjust the volume of the fixed UHF radio to suit.

The VHF radio will still operate, but the audio will be muted (you will not be able to hear VHF traffic when a UHF shunting channel has been selected in the foreground). A 'Loco Call' from the Train Controller will cause the radio to beep once, and 'CALL' will be displayed on the screen).

The radio will automatically stop transmitting after 60 seconds of continuous transmission. You will be warned of this condition by a loud beeping from the radio that will continue until you release the push-to-talk button.

Immediately that you hear the beeping sound:

- release the PTT button, and
- depress the PTT button and re-establish communication.

10.3 Fault Reporting ASP Radio

Radio faults are reported to telephone KiwiRail Operations Support (155). Outside normal working hours, any faults which require urgent attention are to be advised to KiwiRail Operations Support, who will arrange for the On-Call Personnel to be advised.

Faults of an urgent nature must be notified at the time. A work request number will be given to the caller from KiwiRail Operations Support as a fault reference number for any follow-up action should it be necessary.

These faults will be recorded in the Register for Radio Failures by the Person in Charge or the Assistant when advised by the Operator concerned.

10.4 Register for Radio Failures

Details of any ASP radio failure (portable or locomotive) are summarised into a register with particulars of when the radio was repaired. The information to be shown in the codes column of the register is to be transcribed from the report form.

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Reporting the faults to the KiwiRail Operations Support and entering particulars in the register will be the responsibility of the Person in Charge.

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11. Train Control Instructions

The following alarms display on the screen:

- timer alert alarm (for locomotive portable removal), and
- vigilance alarm when the vigilance system has applied the train penalty brake

> **NOTE**
> The vigilance alarm will also be activated when an emergency brake application is made in a locomotive with fitted vigilance and event recorder system. The specific procedures to be followed when a vigilance alarm is received in Train Control will also apply in these situations.

- Emergency alarms (from locomotives and other equipment such as overgauge, dragging equipment or rail temperature detectors).

11.1 Screen Shows Alarms

When a screen shows an alarm:

- attempt to contact the Locomotive Engineer immediately
- if the first attempt is unsuccessful, continue to call frequently for the next two minutes
- if a reply is not received within two minutes, send Rail Personnel to the train to find out what has caused the alarm and advise you. The Rail Personnel should be near the train and have access to a radio-equipped vehicle
- When the train is to be approached from the front, wait for the normal train time through the section to lapse before permitting the Rail Personnel to proceed.

Immediately once help has been arranged:

- advise the nearest Terminal Supervisor / Team Leader
- the Network Control Manager
- record the incident.

11.2 Radio Portable Timer Link Activated

Before a Locomotive Engineer leaves the cab, they must tell the Train Controller of the train's precise location and make a clear arrangement about further communication and the timing of calls.

After a portable radio has been removed from its holder in the locomotive, the portable timer link activated indicator on the screen will light up.

If the Locomotive Engineer does not make contact at the prearranged time, the Train Controller must call immediately and continue to call frequently for the next two minutes (even though the timer alert alarm may not appear on the screen).

If no response is received within two minutes, follow the procedures in **Train Control and Signal Box Manual 24.6 Portable Timer Alert.**

11.3 Emergency / Vigilance Alarm

If the emergency / vigilance alarm is activated when the train is within 100 km of a Train Controller's boundary, this alarm may show on another Train Controller's radio screen and the Train Controller under whose jurisdiction the train is running.

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When this happens, the other Train Controller must tell the Train Controller concerned and ensure they are aware of the emergency.

11.4 Repeater Time Out Function

When transmitting takes more than 60 seconds, it will be necessary to release the press-to-talk switch for about 3 seconds so that the repeater timing circuit can restart when issuing:

- track warrants
- operation instructions
- safe working authorities
- other instructions.

If the press-to-talk switch is not released, then the person receiving it will not hear the portion of the message transmitted after 60 seconds.

The Train Controller is to ensure that each transmission between overs is less than 60 seconds.

11.5 After Repairs Completed

When the radio link has been repaired following a failure, the procedures listed below must be followed before 2 Person Crews can stand down and Single Person Crew can be reinstated.

- the Communications Personnel must check the radio system to ensure it is working
- once the tests are completed, Communications Personnel and the Train Controller must confirm that radio communication in the affected area has been re-established
- the Train Controller must then arrange for alternative train crewing to be reinstated.

11.6 Delayed between Crossing Stations

When Locomotive Engineer cannot be contacted, and a train has not reached the next crossing station at the expected time, the Train Controller will arrange for a Rail Personnel to proceed to the train and advise the Train Controller of the circumstances.

Should the Rail Personnel travel by rail (e.g., trolley or hi-rail vehicle) into the section where the train is, it must be approached from the rear.

11.7 Emergency Police Assistance

If Rail Personnel have been sent to a train to find out why the Locomotive Engineer cannot be contacted, and the Locomotive Engineer cannot be found, the Train Controller must contact the Police nearest to the train and ask for help to find the missing person.

Give the Police full details of the circumstances and the action taken so far, then assist with arranging whatever help they need. Tell the Network Control Manager immediately and inform the local Terminal Manager.

11.8 Additional Train Control Radio Alarms

11.8.1 Lineside Alarms

At various locations throughout the network dragging equipment detection units are installed.

Dragging equipment detection unit

When activated, these units will send a radio transmission through the radio system to the Train Controller. The transmission is repeated 30 seconds later. When the alarm is received, the Train Controller must:

- advise the Locomotive Engineer concerned to stop the train immediately and check the train for the reason the alarm was activated, and

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- advise the Rolling Stock Representative if a mechanical problem is found.

On channel 1 of the locomotive radio within 3 kilometres of these units, an alarm tone followed by a verbal warning 'Dragging Equipment at .....' will be heard twice; on receiving the transmission, the Locomotive Engineer must call the Train Controller.

11.8.2 Signalling Panel Alarms

When activated, these units will illuminate a visual display on the relevant signalling panel screens in Train Control. The alarm wording displayed on the panel describes the nature of the alarm and the location (i.e., either a heat or dragging equipment indication).

IMPORTANT

The signalling panel screen alarms do not provide an audible warning to passing trains.

The Train Controller will follow the same arrangements when heat and dragging equipment alarms are activated.

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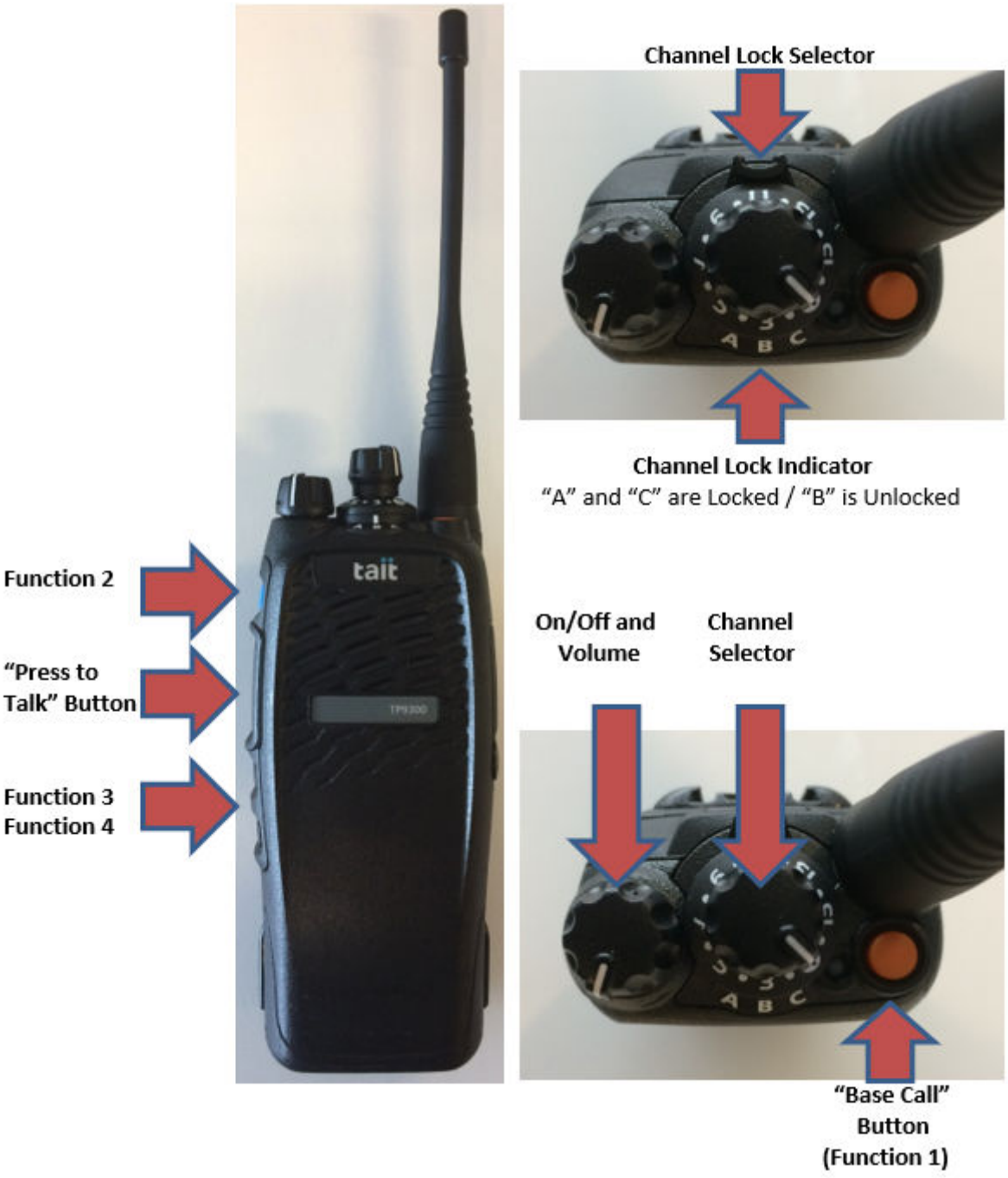
12. Radio User Guides

12.1 Tait TP9300 ASP Shunting Radios



On / Off and Volume Use this to turn the radio on and set the volume to a suitable level. Note when the radio is switched on, a "Radio Off" announcement is played.

Channel Lock To lock the channel (to avoid inadvertent channel changes), move the selector to A or C. To change channel, the radio must be in the B position.

Channel Selector Use this to select the required channel. The radio will read out the channel name once selected.

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Base Call Orange button on the top of the radio. Ensure the correct channel is selected before use.

Press to Talk This is the long button on the side of the radio and the speaker / microphone.

12.2 Tait TM8260 / 9360 Locomotive Radios

DISPLAY The channel without brackets in the Foreground channel. This is the one the radio will transmit on when the PTT or CALL button is pressed. The channel in brackets is the background channel, this may be muted, or can be heard at reduced volume.

CALL Base Call to Train Control

SKIP Short Press: Momentarily skip channel from Scan. Long Press: Skip channel from Scan for 2 minutes.

CH1 Channel 1 shortcut (press again, or return microphone to metal clip to restore previously selected channel)

MODE Select between VHF or UHF radio in foreground.

2C 2 channel mode, radio will scan channel 1 and the selected channel for 20-minutes.

MENU Press to select Test Mode or Network Status Check

12.3 Tait TM8200 / 9300 Auckland EMU Radios

CALL Base Call to Train Control

SKIP Short Press: Momentarily skip channel from Scan. Long Press: Skip channel from Scan for 2 minutes.

CH1 Channel 1 shortcut (press again, or return microphone to metal clip to restore previously selected channel)

RED KEY Emergency Call

2C 2 channel mode, radio will scan channel 1 and the selected channel for 20-minutes.

MENU Press to select Test Mode or Network Status Check

12.4 Tait TM9300 Hi-Rail Vehicle Radios

Also fitted to some Track Maintenance Machines:

CALL Base Call to Train Control

SCAN Toggle Scan on / off. The radio will scan the selected channel and channels 1-16

POLL This sends a POLL call to Train Control. This verifies the operation of the repeater link to Train Control without appearing on the Controllers screen.

E Emergency Call

MENU Press to select Test Mode or Network Status Check

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