



# MOTOTRBO™

## R1.8 Training Overview

MOTOTRBO™ System Training – Release 1.8  
MOTOROLA, MOTO, MOTOROLA SOLUTIONS and the Stylized M Logo are trademarks or registered trademarks of Motorola Trademark Holdings, LLC and are used under license.  
All other trademarks are the property of their respective owners. © 2010, 2011 Motorola Solutions, Inc. All rights reserved.

# R1.8 FEATURES

**Digital Telephone Patch** – Enables MOTOTRBO digital system users to place and receive telephone calls which are routed via a gateway between a landline telephone network and MOTOTRBO radio system. This feature utilizes a Commercial Off The Shelf (COTS) Analogue Phone Patch (APP) box and a Plain Old Telephone Service (POTS) line. Telephone users can call individual MOTOTRBO radios and MOTOTRBO talkgroups, while MOTOTRBO radios can call individual telephones. This feature is supported both by the DR 3000 and the MTR3000 repeater.

**One Touch Telemetry** – Enables telemetry commands to be initiated on digital revert channels by means of up to 3 CPS configured One Touch Telemetry buttons. These digital revert channels can either be repeater or direct mode channels and it is recommended that they are taken from the channel pool in order to separate voice and command transmissions.

**Enhanced Channel Access** – A call procedure in which an initiating radio transmits a channel access request and waits for access to be granted before transmitting. This improves call success rates by minimising (data / voice) collisions. This procedure is always used on Capacity Plus systems and during telephone calls, and is optional for polite (data / voice) transmissions on Single Site Repeater and IP Site Connect systems.

**Text Message Alert** – Enables the received Text Message Alert Tone to be configured for “Momentary” or “Repetitive” via the CPS and / or radio menu. For the “Momentary” setting, the incoming text message alert tone is played once and the alert screen is automatically cleared after 60s. For the “Repetitive” setting, the incoming text message alert tone is played repeatedly and the alert screen is not cleared until either the user reads the message, the preset timer expires or the radio is turned off.

**Power Up Tone Disable** – Allows the Self Test Alert and Accessory Alert tones to be enabled / disabled via the CPS and / or radio menu.

**Alarm Output from GPIO** – Enables the mobile radio to generate an external alarm output via GPIO upon receiving an emergency alarm / call.

**Test & Tune Enablement for 3rd Party Developers of Analyzer Equipment** – Subscriber / repeater interfaces to support 3rd party developed auto-tune applications (note: details provided as part of the ADK).

**Receiver Range Enhancement** – Improved receiver sensitivity which results in a better user experience under weak signal conditions. This feature is implemented for MOTOTRBO subscribers and repeaters (both the DR 3000 and MTR3000).

**RDAC Updates** – Resolved the following issues:

- Error #4410 when programming the IP address with leading zero's in RDAC.
- When VC++2005 Redistributable is uninstalled, it does not get reinstalled via repair.

# ***DIGITAL TELEPHONE PATCH***

# DEFINITIONS

**4W** – Repeater to Accessory 4-wire Interface

**APP** – Analog Phone Patch

**CPS** – Customer Programming Software

**DTP** – Digital Telephone Patch

**IP** – Internet Protocol (IPv4 in our case)

**LAC** – Local Area Channel/Slot

**TELCO** – Telephone Company Interface

**Phone Channel** – Phone Capable Channel

**Phone Gateway** – The Repeater that connects the Phone Channel to an APP Box

**PSTN** – Public Switched Telephone Network

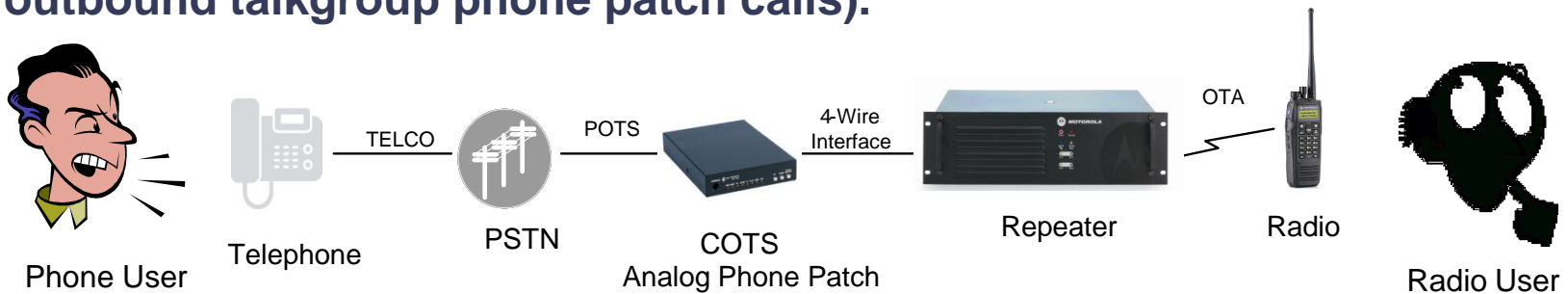
**POTS** – Plain Old Telephone Service (typically analog)

**OTA** – Over The Air (Reference to the RF Channel)

**WAC** – Wide Area Channel/Slot

# DIGITAL TELEPHONE PATCH (DTP) FEATURE SUMMARY

- DTP enables MOTOTRBO™ digital system users to place and receive telephone calls which are routed via a gateway between a landline telephone network and MOTOTRBO™ radio system.
- The gateway between the landline telephone network and MOTOTRBO™ radio system comprises a Commercial Off The Shelf (COTS) Analog Phone Patch (APP) box connected to a MOTOTRBO™ repeater known as a phone gateway repeater.
- DTP is supported by the following system configurations: Conventional Single Site Repeater, IP Site Connect (LACs & WACs) and Capacity Plus.
- DTP supports inbound individual & talkgroup phone patch calls and outbound individual phone patch calls (note: it does not support outbound talkgroup phone patch calls).



# 4-WIRE INTERFACE

The interface between the APP box and phone gateway repeater comprises an analogue 4-wire interface.

- **Tx Audio**
  - audio line from landline to repeater,
  - single-ended.
- **Rx Audio**
  - audio line from repeater to landline,
  - single-ended.
- **PTT**
  - indicating APP is active,
  - 5v tolerance input GPIO.
- **COR**
  - indicating radio is transmitting,
  - 5v tolerance output GPIO.

Since the repeater has just one 4-wire interface, this means the phone gateway repeater can support only a single phone call at a time.

# ***DTP SYSTEM TYPES***

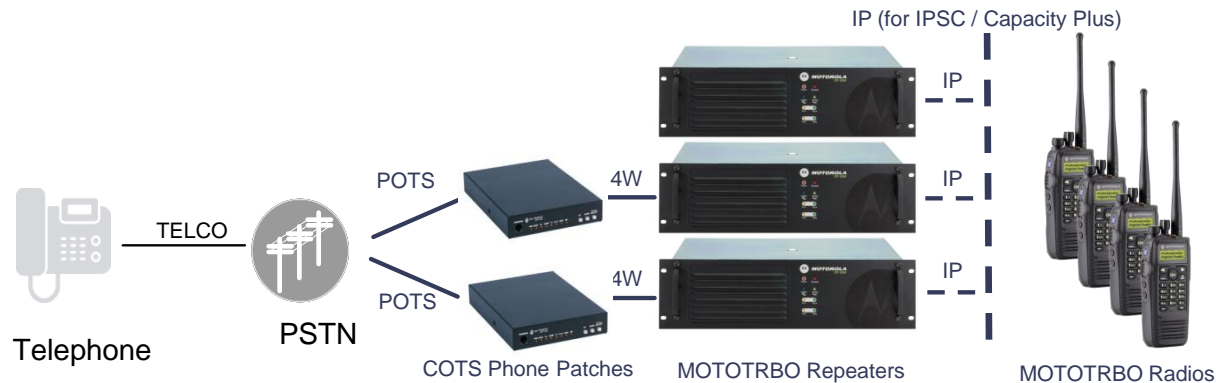
## **System Types Supported:**

- Signal Site Repeater
- IP Site Connect
- Capacity Plus

## **System Types NOT Supported:**

- Connect Plus
- Direct Mode
- Analogue mode
  - This means no pre-programmed phone numbers or access/de-access codes

# DTP SYSTEM ARCHITECTURE - OVERVIEW



Configurations supported: Single Site Repeater, IPSC, Capacity Plus.

Digital Phone Patch utilises 'COTS' Analogue Phone Patch devices.

Radios can initiate and receive phone calls on any repeater channel that is linked to a Phone Patch device.

Phone calls supported: Telephone to Talkgroup, Telephone to Radio and Radio to Telephone.

Each repeater can directly interface to a maximum of one Phone Patch device.

Each IPSC channel (Local or Wide) can interface to a maximum of one Phone Patch device.

Each Phone Patch device can interface to one or both repeater channels (depending on the system configuration).

Capacity Plus systems automatically move radios to channels linked to Phone Patch devices for phone calls.

Digital Phone Patch is a "Chargeable Feature" which must be activated in the repeater.



# DTP – SUPPORTED FEATURES

## Radio System Features:

- Phone User to Radio User Call (Phone to Radio)
- Radio User to Phone User Call (Radio to Phone)
- Phone User to Talkgroup Call (Phone to Talkgroup (Group & All Call))
- Radio Over-Dial Capability (for use with automated response systems)
- Phone User Target Selection (Talkgroup, Individual, Identifier, Slot Number)
- Radio system reservation during Phone Call

## Typical Analog Phone Patch Features:

- Connection to PSTN or PBX
- Restrict Outbound Radio User Access
- Block/Allow Radio from Performing Call Type (International, Long Distance, Toll, Local, 911, etc...) per Access Code
- Inbound Restrictions (Restrict Phone User Access)
- Phone Usage Time Out Timer
- Type Approvals for Supported Countries (Depends on Phone Patch Vendor of Product Used)

# DTP – SUPPORTED FEATURES CONT.

- **Most APP boxes in the market support the following telephony services:**
  - Access and Deaccess Codes:
    - The access code is used to wake up the APP box and prevent the radio / phone user from making unauthorized phone patch calls.
    - The deaccess code is used to terminate the phone patch call if an access code is required when setting up the call.
    - Different access and deaccess codes may be configured to have different privileges, so that the codes can be used to block / allow radio from performing a call type.
  - A phone usage time-out timer (TOT) which ends the call once the timer expires.
  - A go-ahead tone which is emitted to the phone user when the radio user de-keys. This provides an indication to the phone user to begin talking.
  - Direct connection to PBX or PSTN lines.
- **Since DTP utilizes an APP box connected to the repeater, this feature is not supported in direct mode.**

# ***DTP – FEATURES NOT SUPPORTED***

- **Talkgroup to Phone User Call (Talkgroup to Phone)**
- **Phone User Caller ID or Phone Number displayed to Radio User**
- **Phone Call Log in Radio (Missed, Answered, Outgoing)**
- **Radio System Logging of Dialed or Source Phone Number**
- **Voice Prompts** (Some APP Boxes can support)
- **Custom Ringing Tones**
- **PBX Custom feature** (i.e. Voice Mail indications, extension calls, etc.)
- **VoIP interconnect** (i.e. Skype calls)
- **Feature Interaction Limitations**
  - No Transmitter Interrupt of a Phone Call
  - No Enhanced or Basic Privacy Phone Calls
  - No Priority Sampling while in a Phone Call
  - No Concept of Emergency Phone Call, but may Emergency Revert out of a Phone Call.

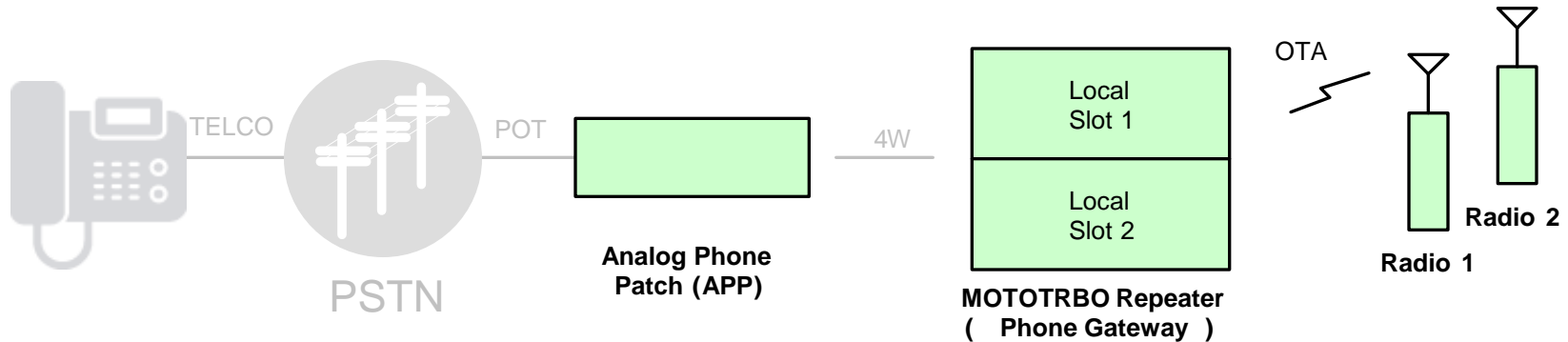
# ***DTP HARDWARE CONSIDERATIONS***

- **An APP box is required – some recommendations as follows (note: this is not an exhaustive list):**
  - Design 2000 TACT
  - Zetron M735
  - Zetron M30
  - MRTI2000
- **Assess required to a PSTN POTS line or a company's PBX system.**
- **Digital Telephone Patch feature does not require any new MOTOTRBO hardware.**
- **Customers can easily upgrade their current system software and activate\* the feature!**  
**(\* requires a license for the phone gateway repeater)**

# DTP - PHONE CALLS

- **Radios CPS configured to initiate and receive phone calls on a per digital personality basis**
- **Only phone-enabled radios can initiate and receive a phone call**
- **Communication between telephone user and radio user(s) half duplex**
  - The Phone Gateway repeater always transmits phone audio over the air if no radio transmitting over the air.
  - A radios always transmits impolitely over phone audio when a radio user wants to talk.
  - The Phone Gateway repeater automatically controls the Radio to Phone and Phone to Radio switches.
- **Radios always follow Enhanced Channel Access rules during phone calls**
  - A radio sends one voice header to request the channel.
  - The repeater grants the channel by repeating the voice header from the requesting radio.
  - After receiving its echoed back voice header, the radio continues sending its voice header and voice bursts.

# SINGLE SITE REPEATER CONFIGURATION



- The diagram above shows the APP box connected to the PSTN via a plain old telephone (POT) line, alternatively it may be connected to a company's PBX.
- Actual communication with the PSTN (or PBX) is implemented by the APP box's feature set.
- Both repeater channels can be used as phone channels.
- To make and receive phone calls on a given channel, a radio user must switch to that channel.
- The telephone user specifies which channel to use when making a call.

# IP SITE CONNECT CONFIGURATION

- **Local Area Channel (LAC)**

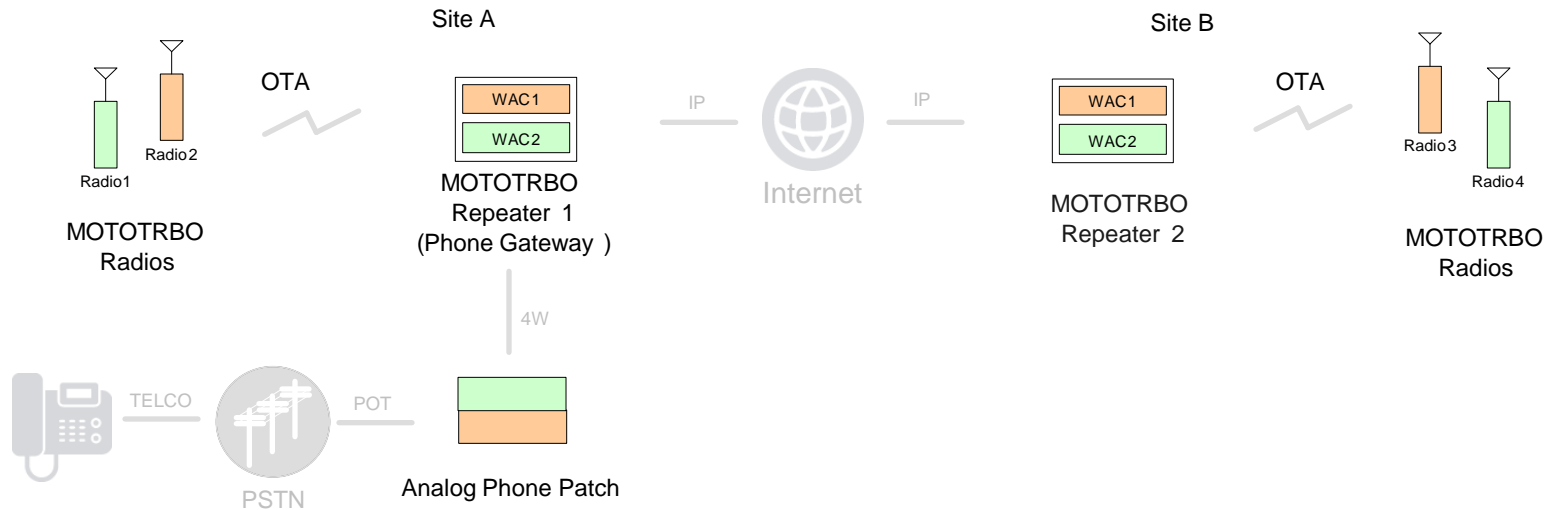
- DTP is supported on IP Site Connect (IPSC) local area channels.
- To make and receive phone calls on a given LAC, a radio user must switch to that LAC.
- The telephone user specifies which channel to use when making a call.
- The phone feature on a local area channel behaves as per the Single Site repeater configuration.

- **Wide Area Channel (WAC)**

- DTP is supported on IPSC wide area channels.
- One and only one APP box must connect to a given WAC via one of the repeaters (known as the **phone gateway repeater**) on that WAC.
- The phone gateway repeater for this WAC must be CPS configured to act as the phone gateway (i.e. via the CPS parameter “**Phone Gateway**”).
- The telephone user specifies which channel to use when making a call.
- To make and receive phone calls on a given WAC, a radio user must switch to that WAC.

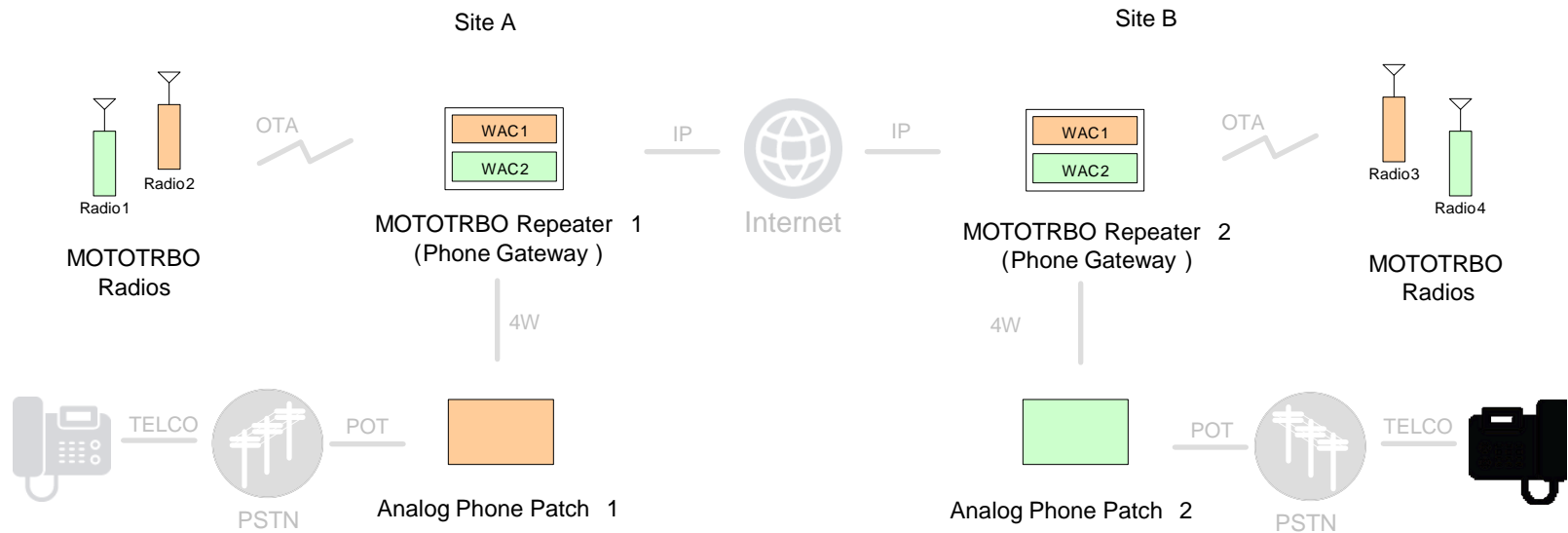


# IP SITE CONNECT CONFIGURATION CONT.



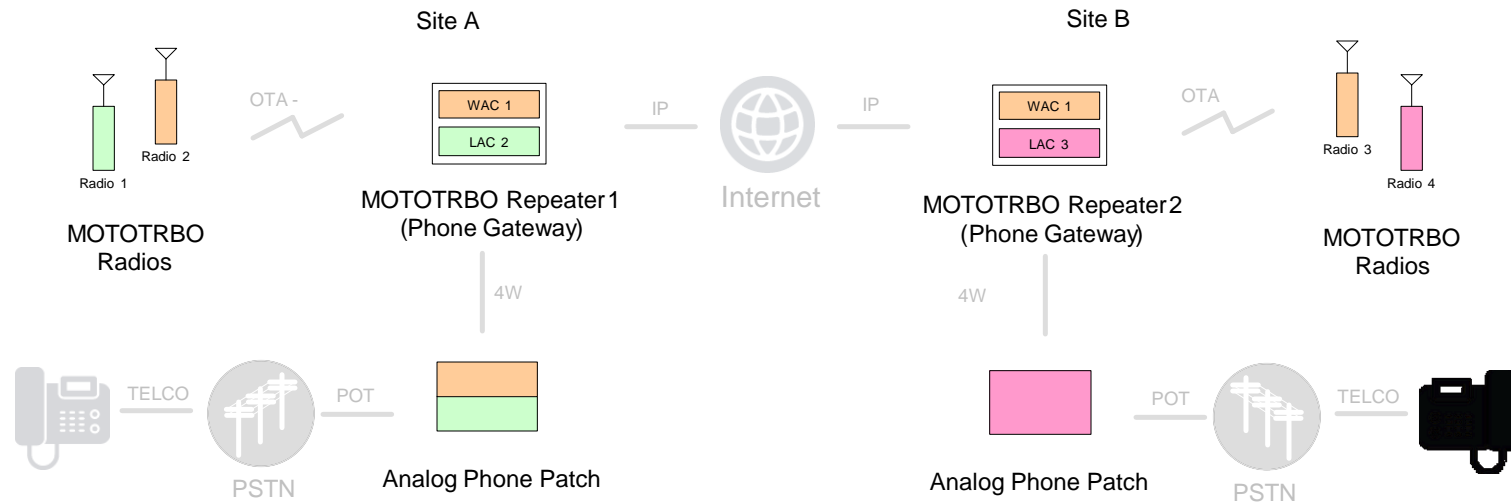
- The diagram above shows the case where both WACs share the same APP box at Site A.
- The “[Phone Gateway](#)” parameter must be enabled for both repeater slots at site A, and disabled for both repeater slots at site B.
- Since only one APP box is used, then only one phone call (either WAC1 or WAC2) can be supported at any given time.

# IP SITE CONNECT CONFIGURATION CONT.



- The diagram above shows the case where the APP box at site A supports phone calls on WAC1 and the APP box at site B supports phone calls on WAC2.
- Since there is one APP box per WAC, then the system can support two concurrent phone calls.
- The “[Phone Gateway](#)” parameter must be enabled for repeater WAC1 at site A and repeater WAC2 at site B.
- The “[Phone Gateway](#)” parameter must be disabled for repeater WAC2 at site A and repeater WAC1 only at site B.

# IP SITE CONNECT CONFIGURATION CONT.



- The diagram above shows a system that supports phone calls on both LACs and both WACs.
- The APP box at site A supports phone calls on WAC1 and LAC2 (but not concurrently) and the APP box at site B supports phone calls on LAC3.
- The “**Phone Gateway**” parameter must be enabled for both repeater slots at site A and LAC3 at site B.
- The “**Phone Gateway**” parameter must be disabled for repeater WAC1 at site B.

# PHONE GATEWAY - SINGLE SITE AND IPSC

- When “**Phone Gateway**” is enabled on a given (Single Site / IPSC LAC / IPSC WAC) slot and an APP box is attached to the repeater, the repeater will act as the phone gateway for that enabled slot.
- When “**Phone Gateway**” is disabled on a given (Single Site / IPSC LAC / IPSC WAC) slot, the repeater can not act as a phone gateway for that slot even if an APP box is attached to the repeater (note: the repeater may act as the phone gateway for the other slot if configured as such).
- In order to support phone calls on a Single Site / IPSC LAC slot, the “**Phone Gateway**” repeater needs to be upgraded to **R01.08.00** or later.
- In order to support phone calls on a WAC, all repeaters on the WAC (i.e. not just the Phone Gateway repeater) need to be upgraded to **R01.08.00** or later.

# CAPACITY PLUS CONFIGURATION

- **DTP is supported for Capacity Plus trunked voice channels, but not Capacity Plus data revert channels.**
- **Each trunked voice repeater may be connected to an APP box via its 4-wire interface whereupon it becomes a phone gateway for the system.**
- **Since a Capacity Plus system may support up to 6 trunked voice repeaters, then a Capacity Plus system may support up to 6 phone gateways and hence 6 concurrent phone calls.**

# CAPACITY PLUS CONFIGURATION CONT.

- Where a Capacity Plus trunked voice repeater is connected to an APP box, both the repeater's slots can support phone calls via that APP box, but not concurrently.
- In order to support phone calls on a Capacity Plus system, all trunked voice repeaters for the system need to be upgraded to **R01.08.00** or later.

# **CAPACITY PLUS CONFIGURATION** CONT.

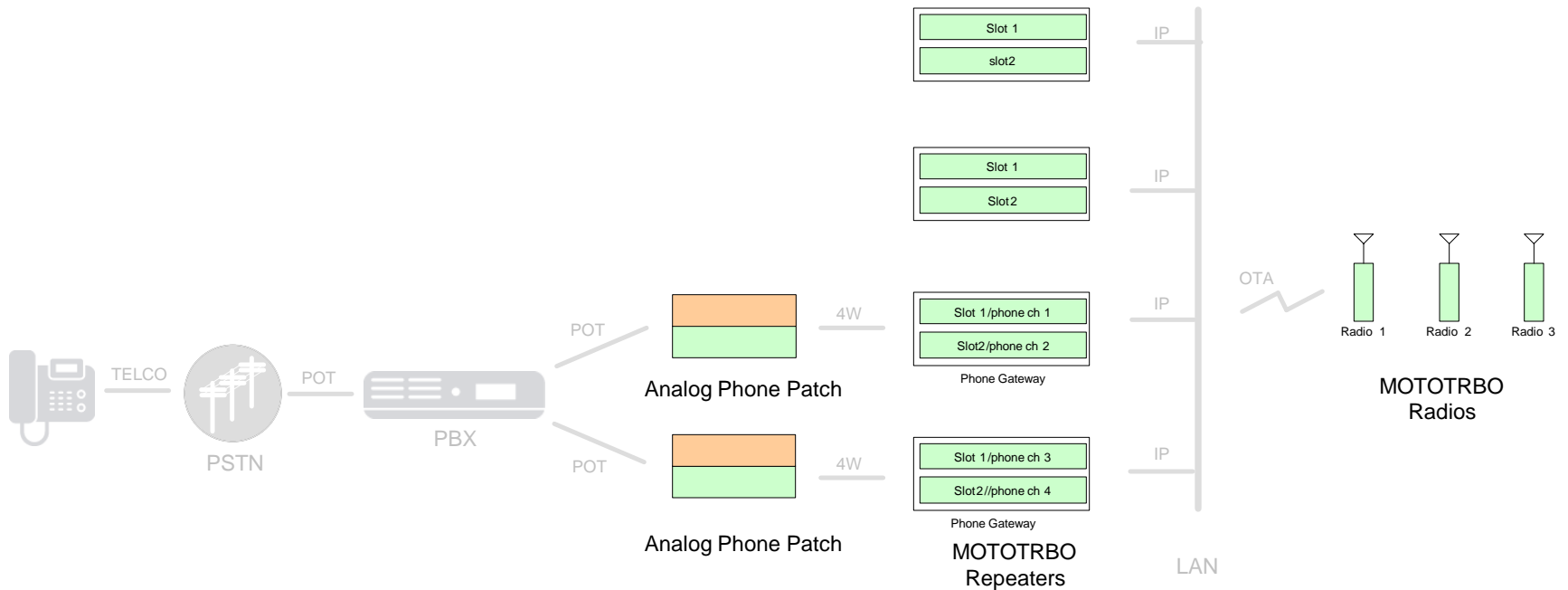
- **When a radio user initiates a phone call he does not select which phone channel to use because Capacity Plus is a trunked system.**
  - Instead, the system selects an available phone channel automatically for the call (which may not be the current Rest Channel).
- **When a phone user initiates a call, he calls the phone number of the APP box or PBX, but (unlike for Single Site and IPSC) he does not specify which repeater slot to use.**
  - Instead, the system selects an available repeater slot (which may not correspond to the current Rest Channel).

# **CAPACITY PLUS CONFIGURATION** CONT.

- **When a phone user initiates a call, the associated phone gateway repeater will automatically assign one of its slots to the new phone call.**
  - It could be either slot 1 or slot 2. If both phone gateway repeater slots are already busy, the telephone user will hear the busy indication (Busy tone).
- **An incoming telephone call will not be able to pull radio(s) out of an on-going radio call, except in the case where the telephone call is a Phone All Call.**
  - If the incoming telephone call is not Phone All Call, and the target radio or radios are already active in a call, the telephone user will hear the busy indication (Busy tone).



# CAPACITY PLUS CONFIGURATION CONT.



# PHONE SYSTEM CONFIGURATION

- Radios and repeaters have different roles in a phone call, hence the configurations are different.
- For a **phone gateway repeater**, there is only 1 phone system that needs to be created and configured.
- For a **radio**, multiple phone systems can be created and configured.
  - **Single Site Repeater and IPSC LAC** – If a phone system is connected to the selected channel, the radio can initiate/receive phone calls otherwise the phone capability is disabled.
  - **IPSC WAC** – If a phone system is connected to the selected channel (i.e. not the channel to which a radio roams), the radio can initiate/receive phone calls from any site on the WAC otherwise phone capability is disabled.
  - **Capacity Plus** – If a phone system is connected to any channel in the channel list for the selected digital personality, the radio can initiate/receive phone calls on that channel otherwise phone capability is disabled.

# ACCESS/DE-ACCESS CODE CONFIGURATION

- **Single Site Repeater and IP Site Connect**

- The radio user selects the channel on which to make the phone call.
- The radio user must know on which channel and APP box the phone call occurs, hence which code to use.
- Multiple pairs of codes can be used and the codes may differ with the APP boxes in the system.

- **Capacity Plus**

- The system selects the phone channel automatically.
- The radio user does not know the channel details when entering the codes.
- Multiple pairs of codes can be used, but they must be the same in all APP boxes if they have to be manually entered by the radio user.

# **CALL INITIATION BY A RADIO USER**

- **When a radio user initiates a phone call, the channel access is always polite, regardless of the radio's programmed admit criteria. This is analogous to sending CSBK or data signaling, which is sent politely.**
- **While a radio participates in a phone call, a phone call text string and icon show up on the display screen to inform the radio user.**
- **Buffer dial is supported for access / deaccess code, phone number, and over dial digits. "Buffer Dial" means that the radio user needs to press the "OK" button to send out the digits as in-band audio.**

# CALL INITIATION BY A RADIO USER

- **The phone number can be up to 22-digits in length.**

NOTE 1: An international number is typically 15 digits maximum, and so there are 7 additional digits a user can utilize to input routing codes and “pauses” etc.

NOTE 2: A “pause” is either pre-configured as a “P” within a CPS configured phone number or entered via the radio keypad as “\*#”.

NOTE 3: A “pause” has the same CPS configured duration as any other DTMF digit transmitted by the radio using “Buffer Dial”.

- **Before calling a phone user, the radio user must switch to a DTP capable channel (if Single Site or IPSC).**
- **The phone call itself may be initiated using one of the following methods:**
  - **Manual Dial** – Enter the phone number from the radio keypad manually. This option can be CPS enabled / disabled.
  - **Phone Address Book** – Select a phone number from the radio’s Phone Address Book.
  - **One Touch Button** – Press a radio programmable button. The one touch button is associated with a phone number contained in the radio’s Phone Address Book.

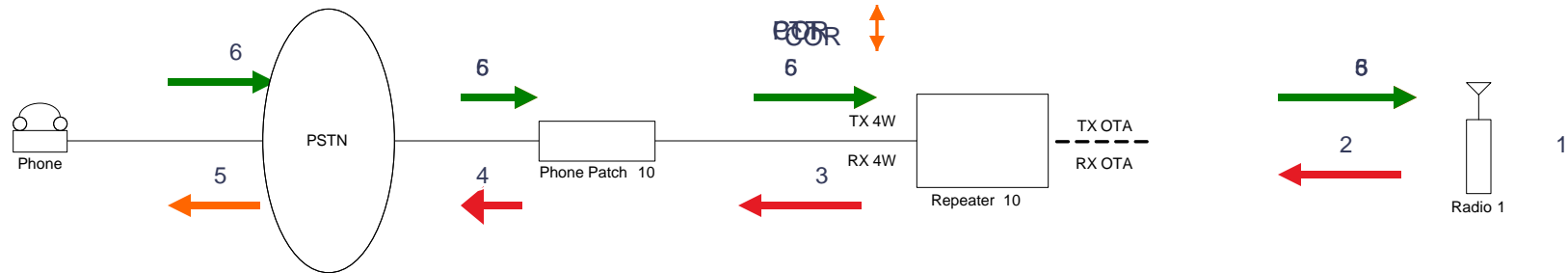
# **CALL INITIATION BY A RADIO USER** CONT.

- **If an access code is required to initiate phone calls, this can either be CPS configured in the radio or entered by the radio user manually.**
- **Where the access code is not configured in the radio, the radio user is prompted to manually enter the access code after dialing the phone number.**
- **If an access code is not required, the radio user can skip this step by not keying anything. After the radio transmits the phone number and access code, the call is placed over the phone network.**

# CALL INITIATION BY A RADIO USER CONT.

- If there is an Interactive Voice Response (IVR) device at the phone user's end and over dial is required, the radio user can enter the over dial DTMF digits via the radio keypad or a programmable button.
  - Example: The IVR device at a bank may prompt the user to enter the account number to access account information.
- **NOTE: For non-display models - phone numbers, over dial digits and access / deaccess codes need to be (CPS) assigned to programmable buttons because these radios do not have keypads.**

# RADIO TO LANDLINE TELEPHONE CALL SETUP



- 1. A radio user selects a phone channel and starts dialing the telephone number.**
  - The Phone Gateway ID (i.e. ID of the phone gateway repeater) should be pre-assigned for the phone channel.
  - The Access code is required as part of the dialing digits to activate the APP.
  - There are three dialing methods; one touch call, manual dialing and phone address book dialing.
- 2. The radio sends DTMF digits as in-band audio OTA. The OTA bursts are DMR voice call bursts targeted towards the Phone Gateway repeater.**
- 3. The repeater repeats the OTA bursts on its outbound channel and also sends the DTMF digits to the APP via its Rx audio line after AMBE voice decoding.**
- 4. The APP keys up and passes the telephone number to the telephone network.**
- 5. The telephone network starts ringing the telephone and the ringing is also heard by radio user.**
  - The ringing tone is passed to the repeater Tx audio line first.
  - The repeater sends the ringing tone as in-band audio OTA after AMBE voice encoding. The OTA bursts are sourced from the Phone Gateway repeater.
- 6. The telephone user answers the call.**
  - The telephone user voice is sent to the repeater Tx audio line.
  - The repeater sends the voice OTA after AMBE voice encoding. The OTA bursts are sourced from the Phone Gateway repeater.

Animated  
Slide



# **CALL INITIATION BY A PHONE USER**

- **When a phone user initiates the call, the phone user dials the phone number of the APP box or PBX.**
  - If a PBX is used it connects the call to the APP box.
- **If an access code is required, the phone user enters the access code following an audible prompt from the APP box.**

# CALL INITIATION BY A PHONE USER CONT.

- After the APP box validates the access code, the APP box connects the call to the repeater. The repeater sounds a tone and prompts the phone user for the target ID.
- The phone user then enters the target ID to reach the radio user/group.  
**NOTE:** If a Go-Ahead tone is configured in the APP box, the phone user hears the tone for the Target ID, followed by the Go-Ahead tone.
- The length of the target ID is CPS configurable and the format varies according to different system configurations.
  - Single Site and IPSC: The target ID specifies the call type, channel slot number, and radio / talkgroup identifier.
  - Capacity Plus: The target ID specifies the call type and radio / talkgroup identifier (the channel slot number is not required).

# CALL INITIATION BY A PHONE USER CONT.

- The phone user may try up to three times to dial a valid target ID and if the target ID is still invalid on the third attempt then the system automatically terminates the call setup.
- After the repeater validates the target ID, if the channel is busy then the repeater sounds a **busy-waiting tone** for the phone user and waits for the channel to become idle before continuing with the call setup.
- While waiting for the channel to become idle, the phone user hears the busy-waiting tone and can choose to continue waiting or end the call setup at any time.

# **CALL INITIATION BY A PHONE USER** CONT.

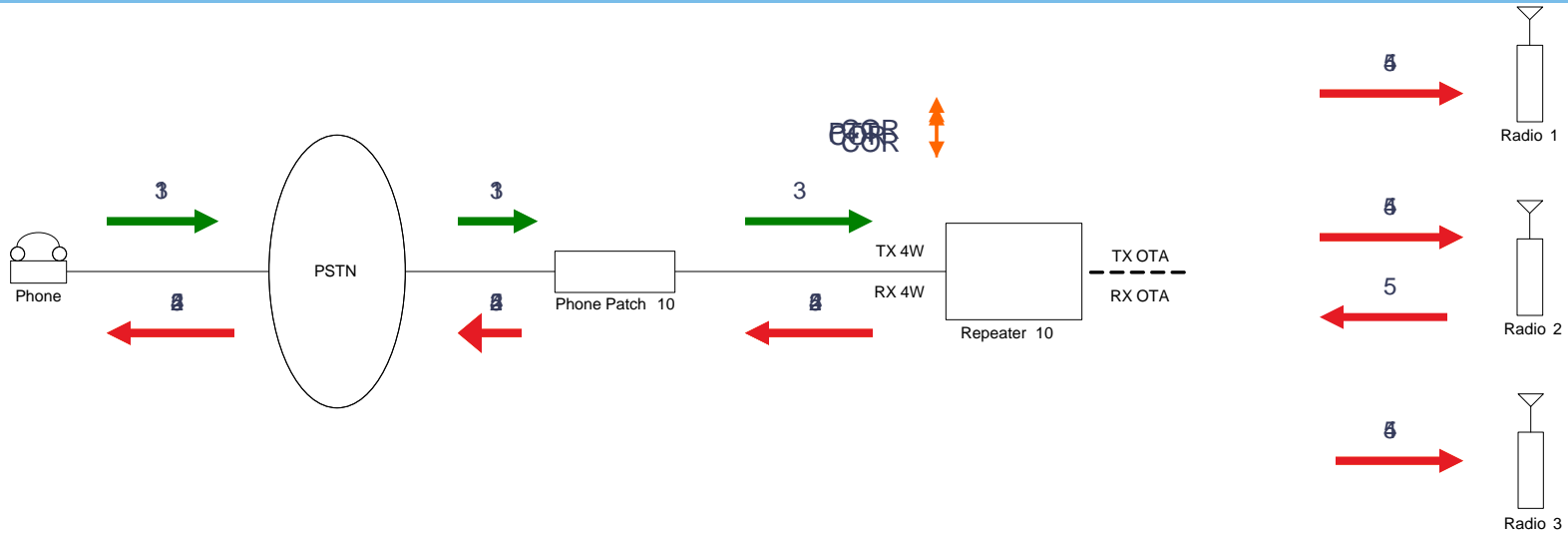
- **If the channel does not become idle for a configurable period of time, the repeater will end the call setup. For this scenario, the phone user will stop hearing the busy-waiting tone and the repeater will hang up the call.**
- **If the channel is already idle or becomes idle before the above mentioned timer expires then the repeater will alert the called radio user / group by sending ringing tones to the radio(s).**
- **For Single Site and IPSC systems a radio user can join an incoming phone call from a phone user as a result of scanning a phone channel (note: channel scanning is not supported by Capacity Plus).**

# CALL INITIATION BY A PHONE USER CONT.

- **Phone All Call**

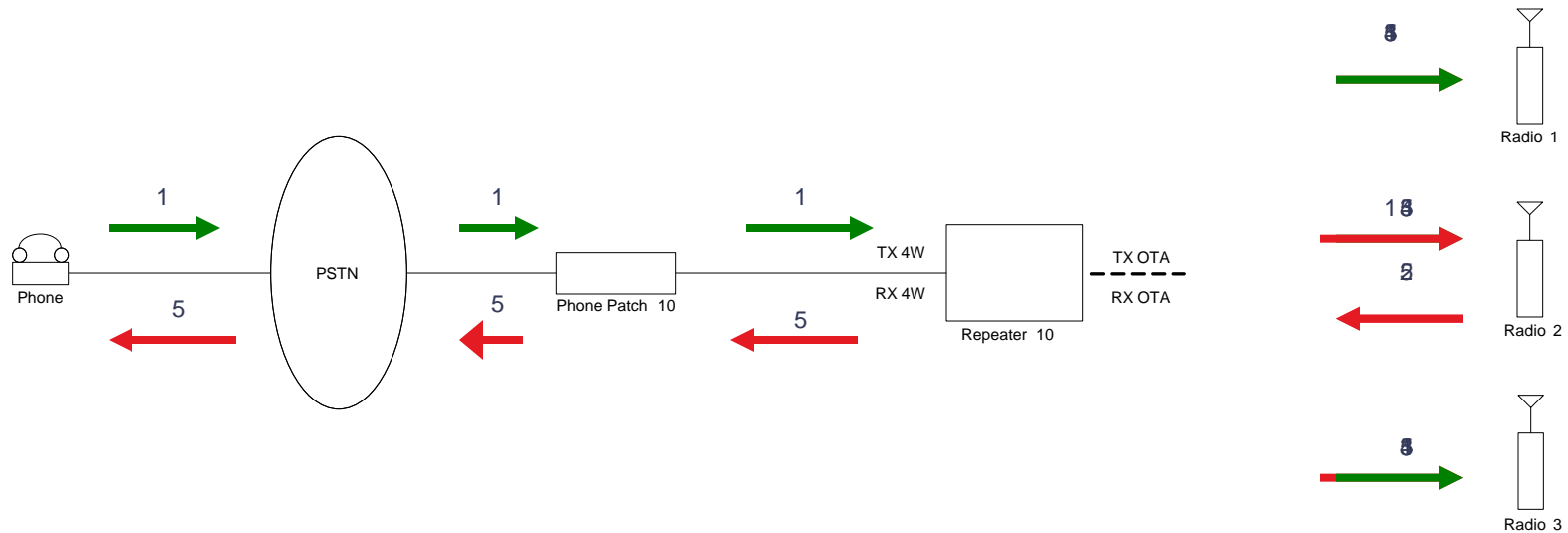
- The phone user follows the phone talkgroup call setup procedure to set up a Phone All Call by specifying the All Call ID (i.e. 0) within the Target ID.
- For a Phone All Call, the phone user can start to talk after the first ring (i.e. before any radio user answers the call).
- During a Phone All Call, not all radio users are able to respond to the phone user. Only radios configured for All Call announcement capability are able to respond to the landline phone user and be heard by all the other radio users.
- These users are also able to end the Phone All Call by sending the deaccess code.
- Phone All Call can be enabled / disabled in the repeater via the CPS.

# LANDLINE TELEPHONE TO RADIO CALL SETUP



- 1. A telephone user dials the telephone number of the APP and enters the access code. The APP is keyed up.**
  - The repeater connected to the APP should be pre-configured to be the Phone Gateway repeater.
- 2. The telephone user hears an audible prompt to enter the target ID of the radio(s) to be called.**
- 3. The telephone user enters the target ID from the telephone keypad.**
  - For Single Site and IPSC: Target ID = Call Type + Time Slot + Radio ID.
  - For Capacity Plus: Target ID = Call Type + Radio ID.
  - The target ID is sent to the Phone Gateway repeater Tx Audio line as DTMF tones.
- 4. The repeater verifies the target ID and starts ringing the radio(s). The ringing tone is also heard by the telephone user.**
  - The repeater sends the ringing tone to the APP via its Rx audio line.
  - The repeater sends the ringing tone to the radios as in-band audio OTA after AMBE voice encoding. The OTA bursts are sourced from the Phone gateway repeater.
- 5. The radio user answers the call.**
  - The OTA bursts from radio are targeted towards Phone Gateway repeater.
  - The repeater repeats the OTA bursts on its outbound channel and also sends the voice to the APP via its Rx audio line after AMBE voice decoding.

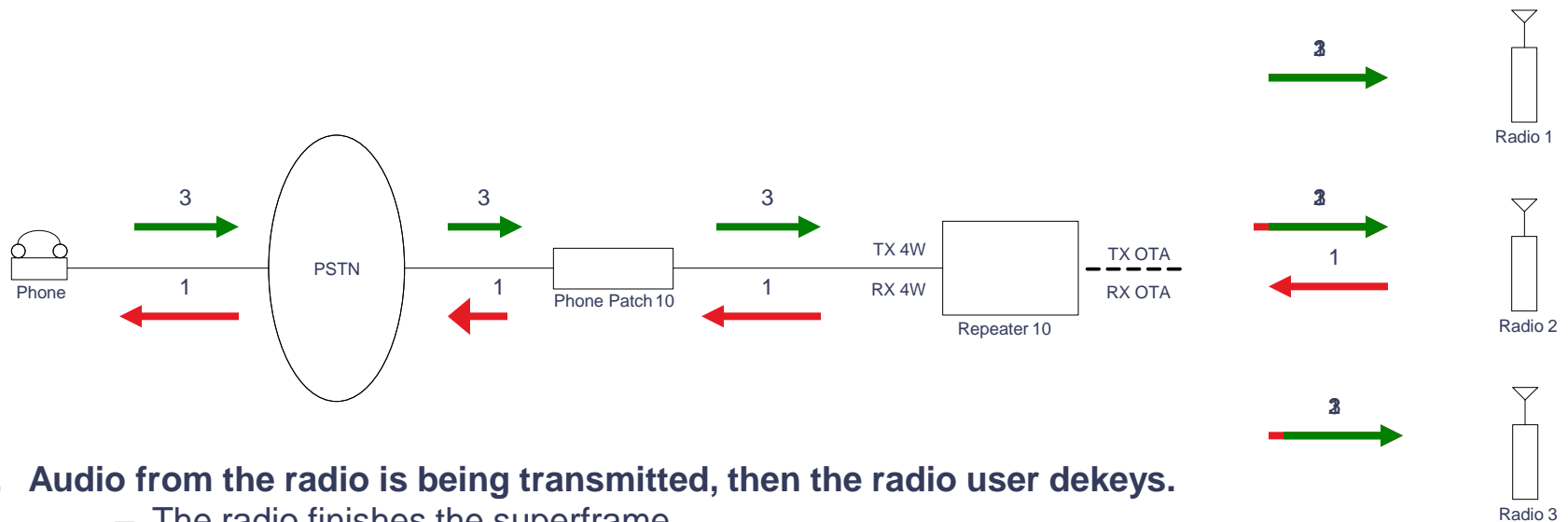
# PHONE TO RADIO SWITCH



1. Audio from the telephone user is being transmitted.
2. A radio partied to the call keys up, sending one voice header (channel request).
3. The Phone Gateway repeater gracefully terminates the phone to radio transmission.
  - Concludes the current phone audio superframe by sending Eraser Frames OTA (drops the radio bursts for the time being),
  - Synthesizes one voice terminator for the phone audio and sends it OTA.
4. The Phone Gateway repeater synthesizes voice headers for the radio and sends them OTA (channel grant).
5. The radio starts sending voice headers and voice bursts

Animated  
Slide

# RADIO TO PHONE SWITCH



- 1. Audio from the radio is being transmitted, then the radio user dekeys.**
  - The radio finishes the superframe,
  - The radio sends a voice terminator.
- 2. The Phone Gateway repeater synthesizes six voice terminators for the radio and sends them OTA.**
- 3. The Phone Gateway repeater starts transmitting landline telephone audio.**
  - The repeater synthesizes two voice headers for the phone and sends them OTA,
  - The repeater AMBE voice encodes landline audio and sends the voice bursts OTA.

Animated  
Slide



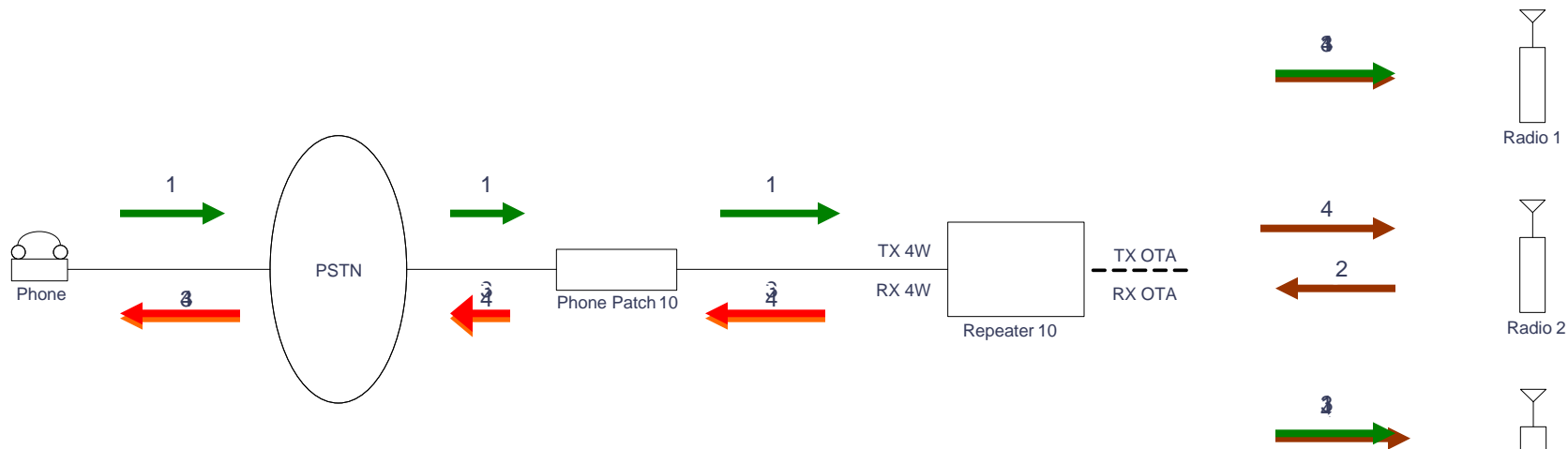
# CALL TERMINATION

- **The radio user terminates the call:**
  - The radio user may push the “Back” button or a programmable “Phone Exit” button to end / reject the call.
  - Alternatively, the deaccess code may be sent manually using the radio keypad.
- **The telephone user terminates the call:**
  - The phone user ends the call simply by hanging up or sending the deaccess code from the telephone keypad.
  - Sending the deaccess code is recommended because this allows the radio system to end the call immediately, thus letting the radio users know that the call has ended in the correct manner.
  - If the phone user ends by hanging up, call termination depends on the APP box responding to the PSTN disconnect signaling. Some APP boxes may not be able to detect PSTN signals in which case they will wait for their TOT to expire (hence, ending the call in this manner normally takes longer).

# CALL TERMINATION CONT.

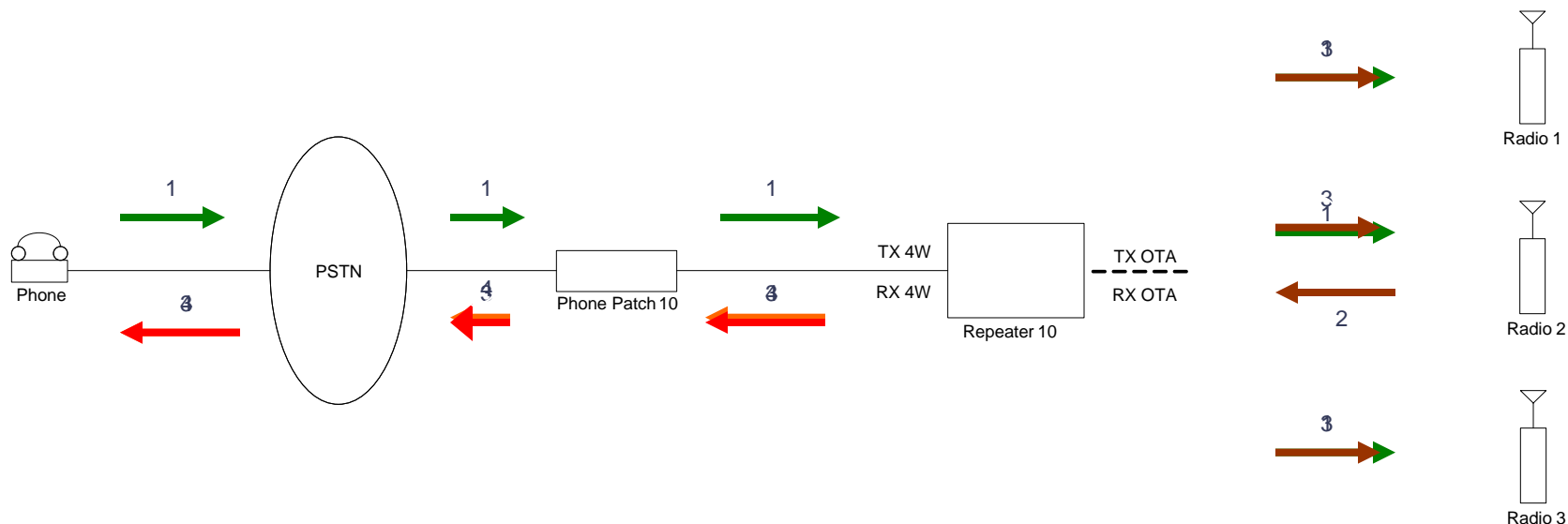
- **The APP box terminates the call:**
  - If a phone TOT is configured in the APP box, the call is ended automatically by the APP box when the call duration exceeds the timer.
  - Some APP boxes provide configurable 30-second warning / alert tones before timer expires.
- **When the call terminates:**
  - The APP box de-keys,
  - The Phone Gateway repeater and radio(s) exit the phone call.

# NON-EMERGENCY IMPOLITE TAKEOVER



1. Audio from the telephone user is being transmitted.
2. A radio not partied to the phone call keys up impolitely.
3. The Phone Gateway repeater gracefully terminates the phone transmission OTA and sends the deaccess code to the APP via its Rx audio line.
  - Concludes the current phone voice superframe by sending Eraser Frames OTA.
  - Synthesizes one voice terminator for the phone and sends it OTA.
  - Sends the pre-configured deaccess code to the APP via its Rx audio line to request that the phone call is disconnected.
4. The APP is de-activated after having received the deaccess code. The Phone Gateway repeater exits phone mode. The Phone Gateway repeater aligns its outbound OTA bursts with inbound OTA bursts.
  - The repeater synthesizes at least two voice headers for the radio and sends them OTA.
  - The repeater starts to repeat OTA radio bursts after receiving the next voice burst A.
  - The phone call will not be resumed after the impolite transmission ends.

# EMERGENCY TAKEOVER



1. Audio from the telephone user is being transmitted.
2. A radio sends an Emergency Alarm CSBK.
3. The Phone Gateway repeater immediately repeats the EM CSBK on its outbound channel and sends the deaccess code to the APP via its Rx audio line.
  - Repeats EM CSBK without concluding the current superframe (to keep the same OTA behavior as the R1.7 release).
  - Sends the pre-configured deaccess code to the APP via its Rx audio line to request the phone call to be disconnected.
4. The APP is de-activated after having received the deaccess code. The Phone Gateway repeater exits phone mode and so do the radios.
  - The phone call will not be resumed after the EM CSBK ends.

# VOICE ACCESS TIME

- To ensure a smooth switch and avoid voice truncation, the Enhanced Channel Access feature is introduced to minimize the switching impact and to achieve the best overall user experience in all system configurations.
- As a result, a slight additional Voice Access Time is introduced for the switches.
- The performance parameters are summarized in the table below.

Additional Voice Access Time (ms)	Single Site			IP Site Connect			Capacity Plus		
	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Radio-to-Radio / Phone	60	210	360	60	210	360	60	210	360
<i>* All time figures are increases to existing Voice Access Time</i>									

# **TRANSMIT INTERRUPT**

- **The Transmit Interrupt feature is automatically disabled (i.e. it's blocked in the subscriber radio) while a phone call is in progress.**
- **Hence, an on-going phone patch call is uninterruptable.**

# CPS CONFIGURATION FOR PHONE GATEWAY REPEATER - PHONE SYSTEM

**MOTOTRBO Customer Programming Software - [training\_repeater.ctb]**

File Edit View Device Features Window Help

Open Save Delete Cut Copy Paste Search Read Write Clone Reports About

**Phone System**

Top Target ID

Deaccess Code #963

Busy TOT (sec) 15

Response TOT (sec) 18

TX Tone Duration (ms) 100

TX Tone Interval (ms) 60

Enable All Call

Response Required

**Target ID**

Length 6

Entry Time (sec) 30

Validation Attempts 3

Phone System Expert View

**Callouts:**

- Repeater generated deaccess code for APP when hang up required (e.g. during emergency takeover).
- Duration repeater waits (after phone call initiated) for busy channel to become available before ending call setup.
- Duration of DTMF digits (for repeater generated deaccess code).
- Duration repeater waits for a radio to answer a phone call before ending call setup. Applies to both private and talkgroup phone calls (where ringing response required).
- Interval between DTMF digits (for repeater generated deaccess code).
- Duration repeater waits for Target ID entry during phone to radio call setup before repeater generates deaccess code to end call setup.
- Target ID length including call type (private, talkgroup or all call), timeslot (Slot Number) and radio / talkgroup ID entered by Phone User when initiating a phone call.
- Number of Target ID validation attempts during phone to radio call initiation.

# CPS CONFIGURATION FOR PHONE GATEWAY REPEATER - PHONE CHANNEL

**MOTOTRBO Customer Programming Software - [training\_repeater.ctb]**

File Edit View Device Features Window Help

Open Save Delete Cut Copy Paste Search Read Write Clone Reports About

XPR 8300

- General Settings
- Accessories
- Privacy
- Network
- Phone System
- Channels
  - Zone1
    - DTP\_Ch1
    - Channel2

## DTP\_Ch1

Top RX TX

Color Code 1

**Phone Gateway Slot 1 & Slot 2**

IP Site Connect Slot 1

Messaging Delay Normal

RSSI Threshold (dBm) -100

**Defines whether repeater used as phone gateway for configured channel. For conventional channels, choices are None, Slot 1, Slot 2, and Slot 1 & Slot 2. For Capacity Plus Voice channels, choices are None and Slot 1 & Slot 2.**

### RX

Frequency (MHz) 470.025000

Ref Frequency (MHz) Default

### TX

Frequency (MHz) 465.025000

Ref Frequency (MHz) Default

Power Level High

Offset (MHz) 0.000000

Copy

DTP\_Ch1 Expert View



# CPS CONFIGURATION FOR RADIO - PHONE SYSTEM

**MOTOTRBO Customer Programming Software - [training\_SU.ctb]**

File Edit View Device Features Window Help

Open Save Delete Cut Copy Paste Search Read Write Clone Reports About

**pSys1**

Top DTMF

Gateway ID: 10

Access Code: 147\*

Deaccess Code: #963

**DTMF**

Preamble (ms): 500

TX Tone Duration (ms): 100

TX Tone Interval (ms): 60

Pause Duration (ms): 3000

Expert View 2.74% Used

**Callout Texts:**

- ID of phone gateway repeater (i.e. repeater to which the APP connected). To radio, this represents phone's ID and must be unique to other repeaters / radios in system.
- Phone system access code which grants radio access to initiate certain types of phone call.
- Radio generated deaccess code for APP when hang up required at end of phone call.
- Duration of silence prior to sending first DTMF digit in access code.
- Duration of DTMF tones and "pauses" in access code, deaccess code, phone number and over-dial digits generated by radio.
- Duration of intervals between DTMF tones in access code, deaccess code, phone number and over-dial digits generated by radio.
- Duration of silence between access code and dialling digits.

# CPS CONFIGURATION FOR RADIO - PHONE CONTACTS

MOTOTRBO Customer Programming Software - [training\_SU.ctb]

File Edit View Device Features Window Help

Open Save Delete Cut Copy Paste Search Read Write Clone Reports About

Buttons  
Text Messages  
Telemetry  
Menu  
Privacy  
Network  
Signaling Systems  
MDC  
Quik-Call II  
Digital Emergency  
Capacity Plus Emergency  
Phone  
pSys1  
pSys2  
Contacts  
MDC  
Quik-Call II  
Digital  
Capacity Plus  
Phone  
pCall1  
pCall2  
RX Group Lists  
Channels

## Phone

	Name	Number
▶	pCall1	918475383772
▶	pCall2	63513

Phone contacts serve as address book to make radio phone calls.

Phone Expert View 2.74% Used

# CPS CONFIGURATION FOR RADIO - PHONE CHANNELS

MOTOTRBO Customer Programming Software - [training\_SU.ctb]

File Edit View Device Features Window Help

Open Save Delete Cut Copy Paste Search Read Write Clone Reports About

MDC  
Quik-Call II  
Digital Emergency  
Capacity Plus Emergency  
Phone  
pSys1  
pSys2  
Contacts  
MDC  
Quik-Call II  
Digital  
Capacity Plus  
Phone  
pCall1  
pCall2  
RX Group Lists  
Channels  
Channel Pool  
DTP\_Site\_A  
DTP\_Ch1  
DTP\_Ch2  
DTP\_Ch3  
DTP\_Ch4  
Scan

## DTP\_Ch1

Top RX TX

Scan/Roam List: None

Auto Scan:

Color Code: 1

Repeater Slot: 1

Phone System: pSys1

ARS:

Enhanced GPS:

Window Size: 6

Privacy:

Privacy Alias: Privacy Key1

Option Board:

Option Board Trunking:

Lone Worker:

DTP\_Ch1 Expert View 2.74% Used

Specifies configured phone system which radio uses for initiating and receiving phone calls on this channel. Selecting 'None' disables radio from initiating and receiving phone calls on this channel.

# CPS CONFIGURATION FOR RADIO - RADIO BUTTONS

**Phone Exit:** Allows radio button to be configured to terminate phone calls (applies to non and numeric display radios only).

**Buttons**

Top Radio Buttons Accessory Buttons One Touch Access Number Key Quick Contact Access

**Radio Buttons**

	Short Press	Long Press
Orange Button	Emergency On	Emergency Off
Side Button 1	Phone Call	Phone Manual Dial
Side Button 2	One Touch Access 1	One Touch Access 2
Side Button 3	High/Low Power	Repeater/Talkaround
Front Button 1 (P1)	Zone Selection	Unassigned
Front Button 2 (P2)	Contacts	Unassigned

**Accessory Buttons**

	Short Press	Long Press
Orange Button	Emergency On	Emergency Off

Allows user to access phone address book (contacts list) to make a phone call.

Provides user with flexibility to dial any phone number.

Buttons Expert View 2.74% Used

# CPS CONFIGURATION FOR RADIO - ONE TOUCH ACCESS

The screenshot displays the MOTOTRBO Customer Programming Software interface. The main window is titled 'Buttons' and contains several navigation tabs: 'Top', 'Radio Buttons', 'Accessory Buttons', 'One Touch Access', and 'Number Key Quick Contact Access'. The 'One Touch Access' section features a table with the following data:

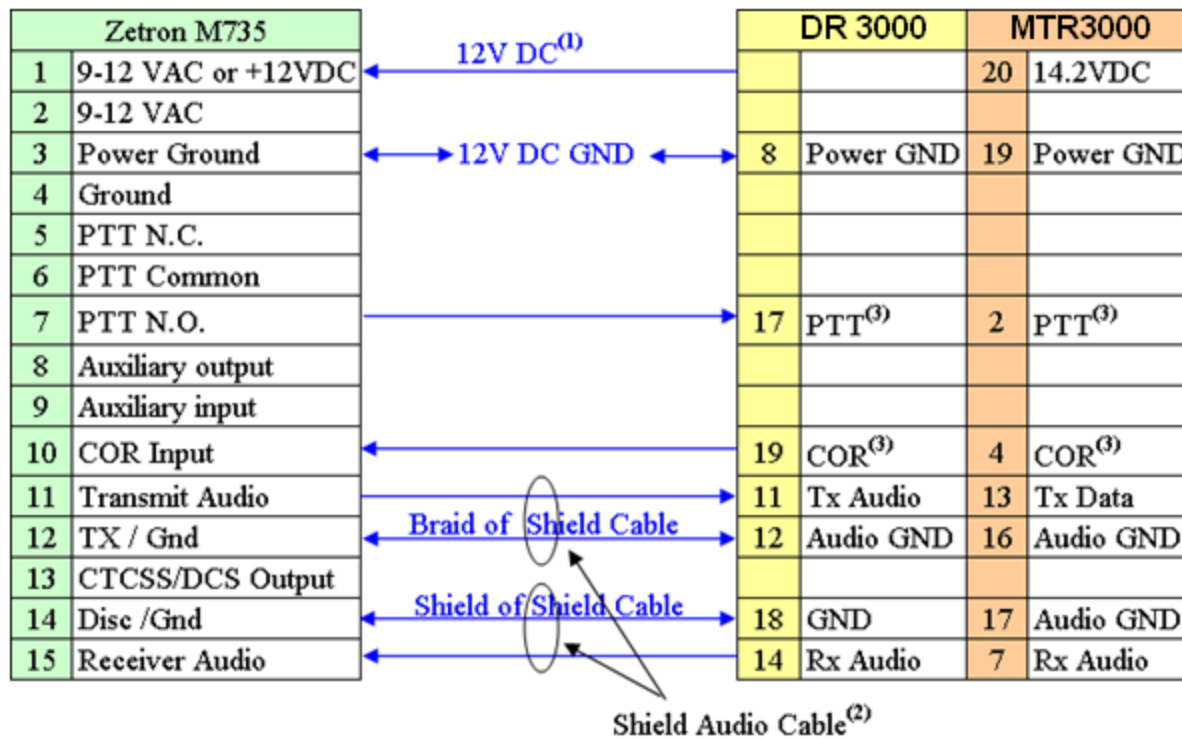
One Touch Access	Mode	Call	Call Type	Text Message
1	Phone Call	pCall1	Group Call	
2	Phone Call	pCall2	Group Call	None
3	Digital	TGA	Group Call	None
4	Digital	TGA	Group Call	None
5	Digital	TGA	Group Call	None
6	Digital	TGA	Group Call	None

A red box highlights the first two rows of this table, with a callout text: 'Allows user to select phone number from phone address book (contacts list)'. Below this, the 'Number Key Quick Contact Access' section contains a smaller table:

Number Key	Mode	Call
0	None	None
1	None	None

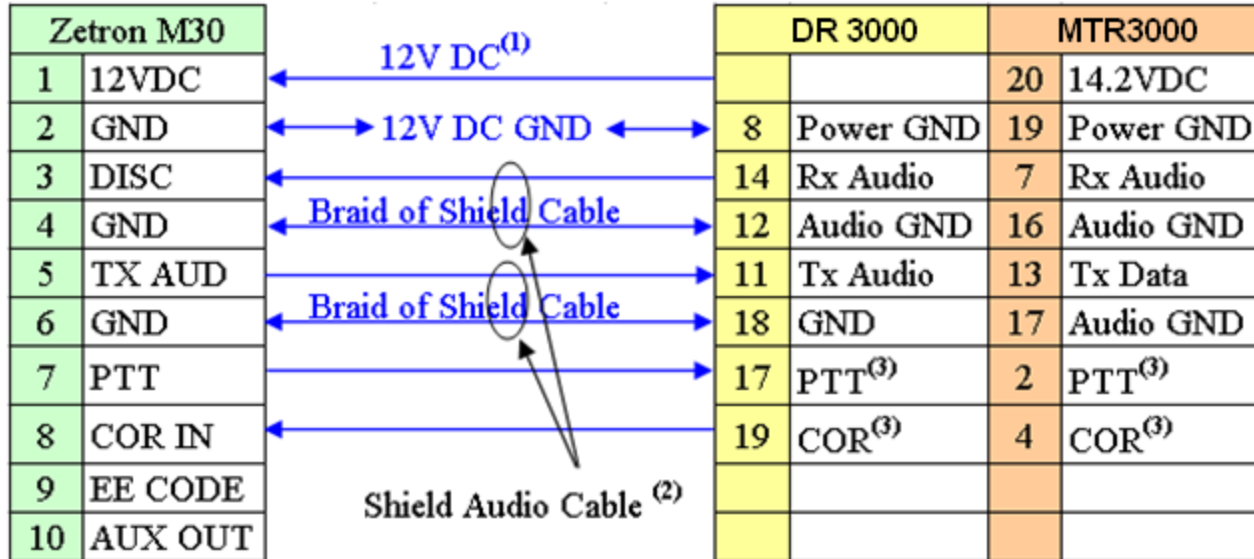
The software interface also shows a left-hand navigation tree with categories like 'Accessories', 'Buttons', 'Text Messages', 'Telemetry', 'Menu', 'Privacy', 'Network', 'Signaling Systems', 'MDC', 'Quik-Call II', 'Digital Emergency', 'Capacity Plus Emergency', 'Phone', 'pSys1', 'pSys2', 'Contacts', 'MDC', 'Quik-Call II', 'Digital', 'Capacity Plus', 'Phone', 'pCall1', 'pCall2', and 'RX Group Lists'. The status bar at the bottom indicates 'Expert View' and '2.74% Used'.

# ZETRON M735 INSTALLATION - HARDWARE CONNECTION



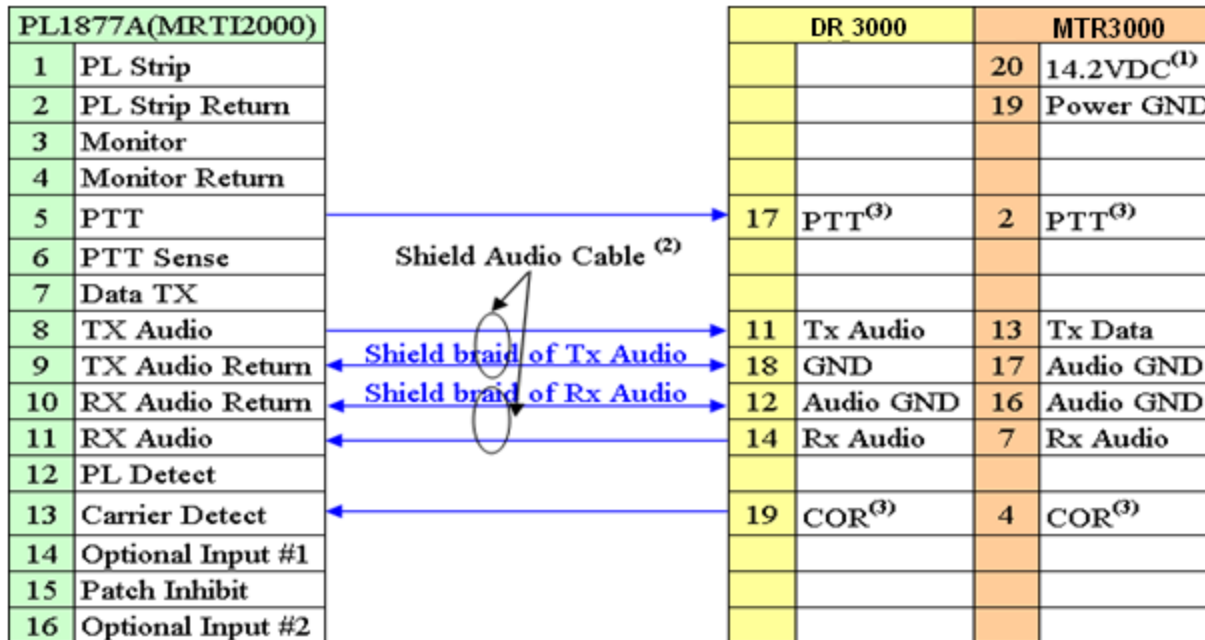
1. Zetron M735 requires a separate DC power supply when used with the DR 3000.
2. Use shielded audio cable for Tx / Rx Audio connections to avoid possible interference to speech signal.
3. Verify CPS configuration for PTT / COR GPIO pins matches hardware connection.
4. Set jumpers on M735 as follows: JP21 – B (External COR), JP31 – A (Negative COR), JP24 – A (Flat Output at Tx Audio).

# ZETRON M30 INSTALLATION - HARDWARE CONNECTION



1. Zetron M30 requires a separate DC power supply when used with the DR 3000.
2. Use shielded audio cable for Tx /Rx Audio connections to avoid possible interference to speech signal.
3. Verify CPS configuration for PTT / COR GPIO pins matches hardware connection.
4. Set jumpers on M30 as follows: JP8 – C (COR polarity low active), JP7– B (external COR).

# MRTI2000 INSTALLATION - HARDWARE CONNECTIONS



1. MRT12000 requires a separate DC power supply when used with the DR 3000..
2. Use shielded audio cable for Tx /Rx Audio connections to avoid possible interference to speech signal.
3. Verify CPS configuration for PTT / COR GPIO pins matches hardware connection.
4. Set jumpers on MTR12000 as follows: JU202 – out (default, to support low Rx Audio input level).



# ZETRON M735 / ZETRON M30 / MRT12000 INSTALLATION - SET TX / RX AUDIO LEVELS

- The Input and Output Signal Levels on the Analogue Phone Patch box must be set to the correct values.
- Procedures for setting the correct Input and Output Signal Levels on the Zetron M735, Zetron M30 and MRT12000 Analogue Phone Patch boxes are described in DR 3000 Basic Service Manual.

# **DTP USER GUIDE – TELEPHONE USER INITIATE PHONE CALL**

- 1. Dial telephone number for APP box.**
- 2. Enter access code after hearing prompt tone.**
- 3. Enter target ID after hearing Target ID Prompt tone.**
  - For Single Site and IPSC: Target ID = Call Type + Slot # + Radio ID.
  - For Capacity Plus: Target ID = Call Type + Radio ID.
  - Target ID length is CPS configurable.
  - Call Type = 7 (individual) or 8 (talkgroup).
  - Slot # = 1 or 2.
- 4. Wait while ringing tone sounded if radio response required, otherwise start talking immediately if no radio response required.**

# **DTP USER GUIDE – RADIO USER INITIATE PHONE CALL**

## **Manual Dial:**

- Press “menu” to access radio menu.
- Press “<” or “>” to navigate to Contacts then press “OK” to select
- Press “<” or “>” to navigate to Manual Dial then press “OK” to select.
- Enter telephone number from radio keypad
- Press “OK” to initiate call

## **Address Book:**

- Press “menu” to access radio menu
- Press “<” or “>” to navigate to Contacts then press “OK” to select
- Press “<” or “>” to navigate to targeted phone contact
- Press “OK” to initiate call

## **One Touch Access:**

- Press One Touch Access button to navigate to targeted phone contact and initiate call

# ***DTP USER GUIDE – RADIO USER RESPONSE***

## **To answer a phone user initiated phone call**

- Press “PTT” and start talking

## **To participate in a phone call**

- Press “PTT” to start transmitting voice
- Release “PTT” stop transmitting voice and to listen to the phone user (or other radio users)

## **To terminate a phone call**

- Press “back” or CPS configured “Phone Exit” button

# ***CHARGE FOR SOFTWARE***

**RPTR LIC KEY- Digital Telephone Patch (DTP);**

**DR3000**

HKVN4056\_

**MTR3000**

HKVN4057\_

# ***OTHER FEATURES***

# ONE TOUCH TELEMETRY

- **Description**

- Provides end user with up to 3 digital revert channels slaved to 3 One Touch Telemetry buttons.
- End user can initiate transmission of a telemetry message over a revert channel by pressing a CPS configured One Touch Telemetry button.

# ONE TOUCH TELEMETRY CONT.

- **The One Touch Telemetry Revert channel is CPS configurable on a per personality basis.**
- **One Touch Telemetry Revert details:**
  - Provides user with up to 3 One Touch Telemetry buttons configured for revert capability.
  - Pressing a One Touch Telemetry button initiates the transmission of a telemetry message via a digital revert channel.
  - Radio returns to normal selected channel automatically after telemetry message transmission on digital revert channel.
- **One Touch Telemetry message revert transmit / receive feature supported for Single Site Conventional, IP Site Connect and Capacity Plus system configurations.**



# TEXT MESSAGE ALERT

- Text Message Alert Tone can be configured for “momentary” or “repetitive” via CPS configuration and / or radio menu.
- For R1.8 onwards, Text Message Alert Tone option defaults to “repetitive” (default for previous releases is “momentary”).
- Text Message Alert Tone option for all new contacts created and unknown contacts defaults to “repetitive”.
- User can change Alert Tone option via Radio menu item “Contacts ->”Select a Contact” -> Message Alert”.
- For “momentary” setting, incoming text message alert tones shall be played once and alert screen shall be cleared automatically after 60s.
- For “repetitive” setting, incoming text message alerts tones shall be played repeatedly and alert screen shall not be closed until cleared manually by user.

# POWER UP TONE DISABLE

- The Self Test Pass Alert Tone can be enabled or disabled via CPS configuration and / or radio menu.
- If enabled, radio shall sound tones during power up cycle, including Self Test Pass / Error tone and Accessory Attach tone (if an accessory is attached). Radio shall also sound Accessory Attach / Detach tone any time an accessory is subsequently attached or detached.
- If disabled, radio shall not sound any tones during power up cycle or when accessory is subsequently attached or detached.

# ALARM OUTPUT FROM GPIO

- Horns and Lights feature extended to support emergency alarm / call (previously, Horns and Lights only supported private call or call alert / call back).
- Radio shall generate external alarm output via GPIO upon receiving emergency. Output will be stopped upon user any keypad or button press or the pre-defined duration timer expires.

# **ENHANCED CHANNEL ACCESS (ECA)**

The **Enhanced Channel Access** feature is a call procedure in which an initiating radio transmits a channel access request and waits for access to be granted before transmitting.

## **Advantages**

- Improves call success rate by minimizing call collisions
- Improves the GPS data success rate on the GPS revert channel
- Prevents call transmission when the radio is out of inbound range
- Provides correct call status indication to the user

# ENHANCED CHANNEL ACCESS CONSIDERATIONS

- **ECA is built into Capacity Plus trunked channels and cannot be disabled.**
- **ECA is disabled when Enhanced GPS is enabled.**
- **ECA is disabled on Dynamic Mixed Mode channels.**
- **ECA is configurable in the radio (not the repeater) for other repeater channel types.**
  - ECA follows the normal configuration while a phone call is being setup, but ECA is always enabled while the phone call is in progress.
- **ECA is only applicable to polite transmissions including data and CSBK calls.**
- **ECA increases latency for data and CSBK calls.**
- **ECA increases system/voice access time for voice calls.**