



MOTOTRBO DIGITAL PHONE PATCH

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Agenda

- What is DTP briefly
- Availability
- What it does and does not do
- Traditional (analogue) phone patch
- DTP in Single Site; IP Site Connect and Capacity Plus configurations.
- Radio and repeater configuration



What is DTP?

- DTP or Digital Phone Patch is a feature in MOTOTRBO which allows radio users to call telephone numbers and visa versa.



Availability

- Supported in all MOTOTRBO hardware as of release 1.8 (i.e. firmware version R01.08.xx).
- Older hardware can simply be upgraded via the CPS to firmware version R01.08.xx.
- Firmware updates are provided free of charge via Motorola Online.



Availability

- In addition to the firmware upgrade, a phone patch licence (entitlement ID) will need to be purchased from Motorola or a Motorola Channel Partner.
- The Motorola DR3000 or MTR3000 cannot be connected directly into the phone line – a phone patch is also required.



Licence Purchase Process

1. Order the License Keys via Motorola On Line
2. Receive an email with an Entitlement ID (EID)
3. Register serial numbers of equipment with Motorola via CPS
4. Activate the feature on the MOTOTRBO equipment via CPS
5. Program features via CPS



Functionality

- DTP enables MOTOTRBO radio 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 of a Analogue Phone Patch (APP) box connected to a MOTOTRBO repeater configured as a phone gateway repeater.





Telephone Interconnect Products

Model 30 Worldpatch

Model 735 Radio Teleconnect

Model 35 Microconnect



ZETRON®

Model 30 Worldpatch



- **Simplex and half duplex Interconnect**
- **End to End Telco Lines and PBX extensions**
- **Remote programmable from DTMF radio or telephone**
- **Morse ID, Toll restrictions, DTMF regeneration**
- **Courtesy Tones , ANI codes**
- **SELCALL version with DTMF encode and decode**

Model 30 Worldpatch

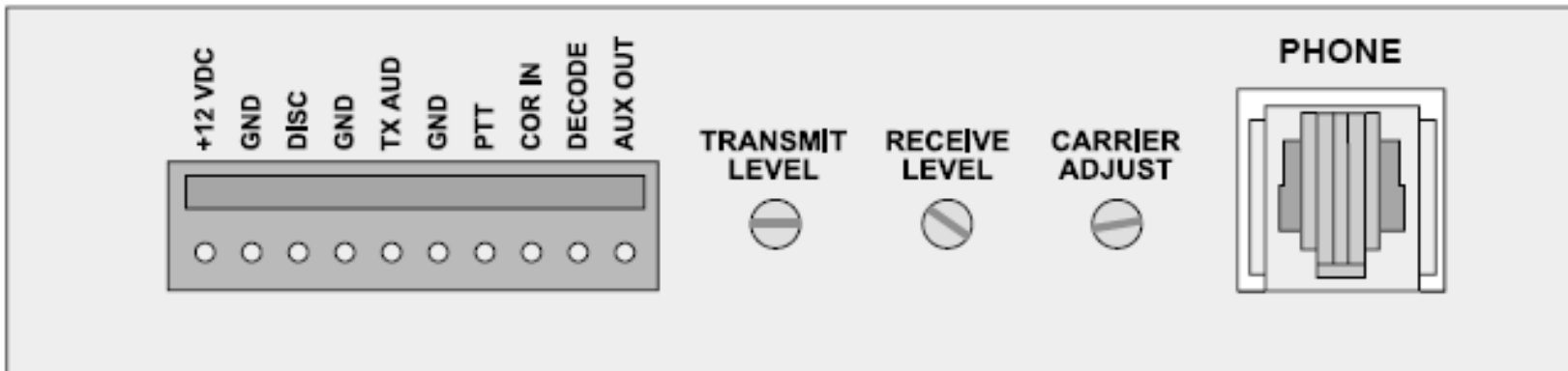


- Low-cost , Fits in small repeaters enclosures.
- Half-duplex operation with privacy mode
- Adjustable VOX threshold to suit users voice level
- Repeater control for radio to radio conversation
- Digital voice delay for enhanced simplex operation
- 50 Autodials
- Hookflash from mobile via *0
- 19 inch rack mount bracket available.

Model 30 Worldpatch



Connections details back panel



Model 30 Worldpatch Operation

Standard Version

Phone to Mobile Calls

- 1.Telephone Line Rings.
- 2.Model 30 waits RINGS TO ANSWER before ringing on the RF Channel.
- 3.If Channel is Free, it Rings on the RF Channel waiting a Connect Code from a Radio.
- 4.If no answer, call is terminated. If radio answers (COR, ANI, or DCA) line goes Off Hook and allows voice call to progress.

1.Disconnect.

Disconnect Code from radio

Dial Tone Disconnect - Busy Disconnect – Mobile Activity Timer

Call Limit Timer – Phone Party Disconnect (hung up or DTMF #0)



Model 30 Worldpatch Operation



Standard Version

Radio to Telephone Calls

1. A radio enters the DTMF access Code and unkeys.
2. M30 will take the phone line off Hook and send Dial Tone to Tx.
3. Radio dials the destination telephone number.
4. M30 checks restricted digits string.
5. M30 dials to the telephone network and establishes the call.
6. Disconnect. As previous slide.

Model 30 Worldpatch Operation

SELLCALL Version

If Selcall is Disabled, M30 will behave as the Std. model .

Phone to Mobile Calls (Selcall Enabled)

1. Telephone Line Rings.
2. Incoming call will be answered after programmed number of rings.
3. The caller will hear two beeps as a prompt to enter radio ID
4. If Channel is Free, the Selcall is transmitted followed by ringing until the mobile answers the call.
5. If no answer, call is terminated. If radio answers (COR, ANI, or DTA) line goes Off Hook and allows voice call to progress. On DTA there could be a caller password.
6. Disconnect.

Disconnect Code from radio

Dial Tone Disconnect - Busy Disconnect – Mobile Activity Timer

Call Limit Timer – Phone Party Disconnect (hung up or DTMF #0)



Model 30 Worldpatch Operation

SELLCALL Version

If Selcall is Disabled, M30 will behave as the Std. model .



Radio to Telephone Calls (Selcall Enabled)

1. The radio user enters the DTMF access Code and unkeys.
2. M30 will take the phone line off Hook and send Dial Tone to Tx.
3. Radio user dials the destination telephone number.
4. M30 checks restricted digits string.
5. M30 dials to the telephone network and establishes the call.
6. Disconnect. As previous slide.

If radio to radio calls are enabled, the radio user must enter a Steering digit and the Access Code.

Model 735 Radio Teleconnect



Model 735 Radio Teleconnect



- Radio to telephone interconnect for PABX or PSTN
- Direct Access to Telephone
- For Simplex or duplex Base stations and repeaters
- Two tone, Five Tone (Selcall) and DTMF selective calling
- PC programmable, remote access through internal modem
- User definable access code
- 2-Tone, (Quickcall II) 5-Tone (ZVEI, CCIR, EEA), and DTMF selective calling
- Works with some trunking radios, Mototrbo, Nexedge

Model 735 Radio Teleconnect



- **Conversation Timers**
- **Optional user recordable voice prompts**
- **Optional dial click decoder**
- **Optional digital voice delay for enhanced simplex operation**
- **Dial out restrictions per user/ system**
- **Optional Call Detail logging**
- **99 autodial telephone numbers**
- **CE conformity**

Model 735 Radio Teleconnect Operation



Telephone to Radio Call Operation

- A caller from a PSTN or PABX extension dials a telephone number and rings model 735 .After x rings M735 answers with a propmt tone or a dial tone or a welcome message.
- Then the caller overdials a user number (eg.001) or Access ANI or a complete ANI number (5 tone code) of the radio he wants to contact.
- If the called radio is an enabled user and M735 has its prompt memory programmed could respond “Thank you” then key up the transmitter and send the selective calling sequence followed by ringing tones to the mobile and the telephone caller.
- To terminate the call the calling party dials #0 or long #
- To terminate the call the called party sends its disconnect ANI.

Model 735 Radio Teleconnect Operation



Mobile Radio to Telephone Calls

- Mobile radio equipped with DTMF can call into the telephone system. The mobile keys up and sends its ANI in DTMF sequence like an access code.
- If the radio is allowed to make more than one type of call he must send the steering digit.
- Steering digits are : Mobile Repeat : 5
Mobile to Telephone Call : 9
Mobile to Mobile or Talkback : 7
- Then DTMF tones of the called party are sent to the line
- To terminate the call the mobile sends Disconnect ANI or long #

Model 35A Microconnect



- For using with Simplex, Half Duplex and Full Duplex radios
- Regenerated DTMF and Pulse dialing
- VOX and sampling combined operation in Simplex mode
- Programmable Telco Access / Disconnect codes
- Programmable by DTMF via a telephone line or radio

Model 35/35A Microconnect



- Digital Voice delay option for improved Simplex operation
- Adjustable hybrid balance
- CE approved
- Toll inhibit
- Hookflash function (35A only)
- Direct Telco Access mode
- M35 European version . M35A USA version .

Model 35A Microconnect Operation



Telephone to Radio Call Operation

1. Phone caller dials M35's telephone number
2. Rings to answer =2 (Default)
 - Answer / Ring-out mode
 - Answer / Access / Ring-out mode
 - No Answer / Ring out mode
3. Radio user answers the Call by keying up (PTT) or sending a radio user code.
4. Radio user disconnects sending a disconnect code or Telephone user sends disconnect code(#) or mobile Activity Time Out, or Call Limit time out, or Busy signal detection or telephone user hungs up.

Model 35A Microconnect Operation



Mobile Radio to Telephone Calls

1. Radio user keys up (PTT) and dials Access Code (*2 default)
2. Radio user dials telephone number, toll restriction and call in progress.
3. Telephone user answers the call or Activity time out.
4. Radio user disconnects sending a disconnect code(#2) or telephone user sends disconnect code(#) or mobile Activity Time Out, or Call Limit time out, or Busy signal detection on line or telephone user hung up.



Functionality

- DTP is supported by the following system configurations: Conventional Single Site Repeater, IP Site Connect (LACs & WACs) and Capacity Plus.
- DTP supports:
 - Inbound individual and talkgroup phone patch calls
 - Outbound individual phone patch calls.



Functionality

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)
- Phone User to All Call (Announcement from Phone)
- 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



Functionality

Typical Analogue 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



Functionality

Unsupported features:

- 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 **
- Custom Ring Tones



* Possibility for AP/LD development.

** Dependant on APP feature set.

Functionality

Unsupported features:

- PBX Custom feature (i.e. Voice Mail indications, extension calls, etc.)
- VoIP interconnect ***
- 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.

*** Can be done via VoIP device with FXO support.



Functionality

- Radios CPS configured for phone access on a per personality basis.
- Only phone-enabled radios can make and receive phone calls.
- Communication between telephone user and radio user is half duplex.
 - The Phone Gateway repeater always transmits phone audio over the air if no radio transmitting over the air.
 - A radio 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.



Functionality

- Radios always follow Enhanced Channel Access rules during phone calls.
- This avoids multiple radios attempting to access the channel (phone call):
 - 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 packets.



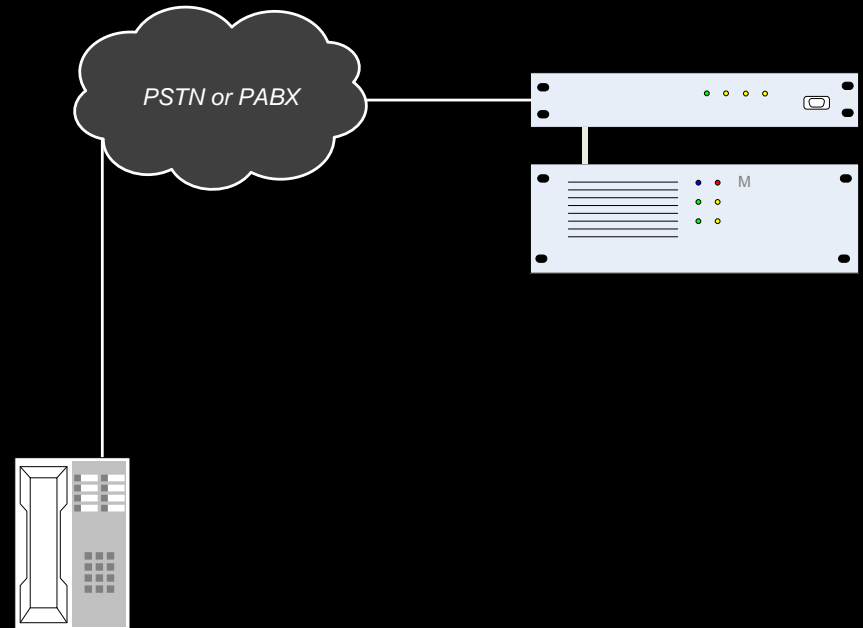
Hardware

- An APP box is required – some recommendations as follows
 1. Zetron M735
 2. Zetron M30
 3. Motorola MRTI2000(note: this is not an exhaustive list)
- Assess required to a PSTN POTS line or a company's PBX system.
- Digital Telephone Patch feature does not require any new MOTOTRBO hardware.



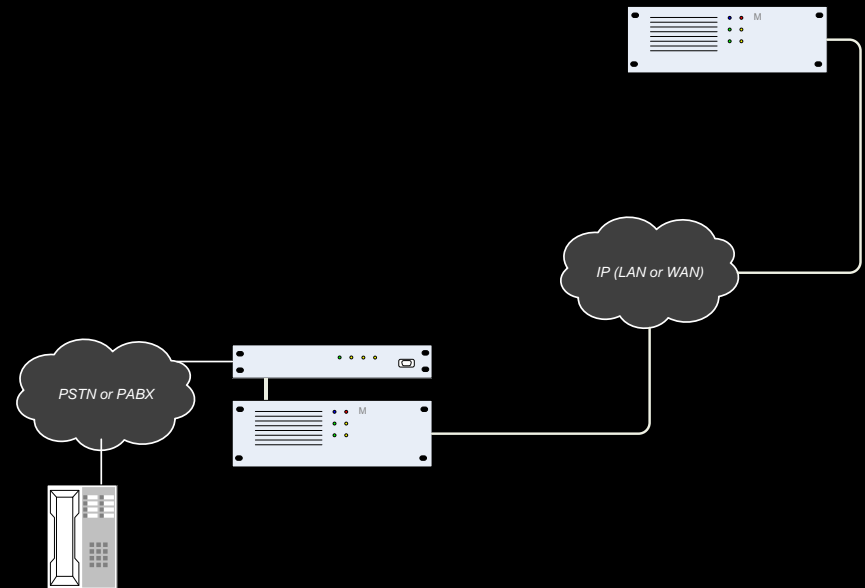
Hardware

- Single repeater in digital mode.
- Phone line can be accessed via slot 1 or 2.



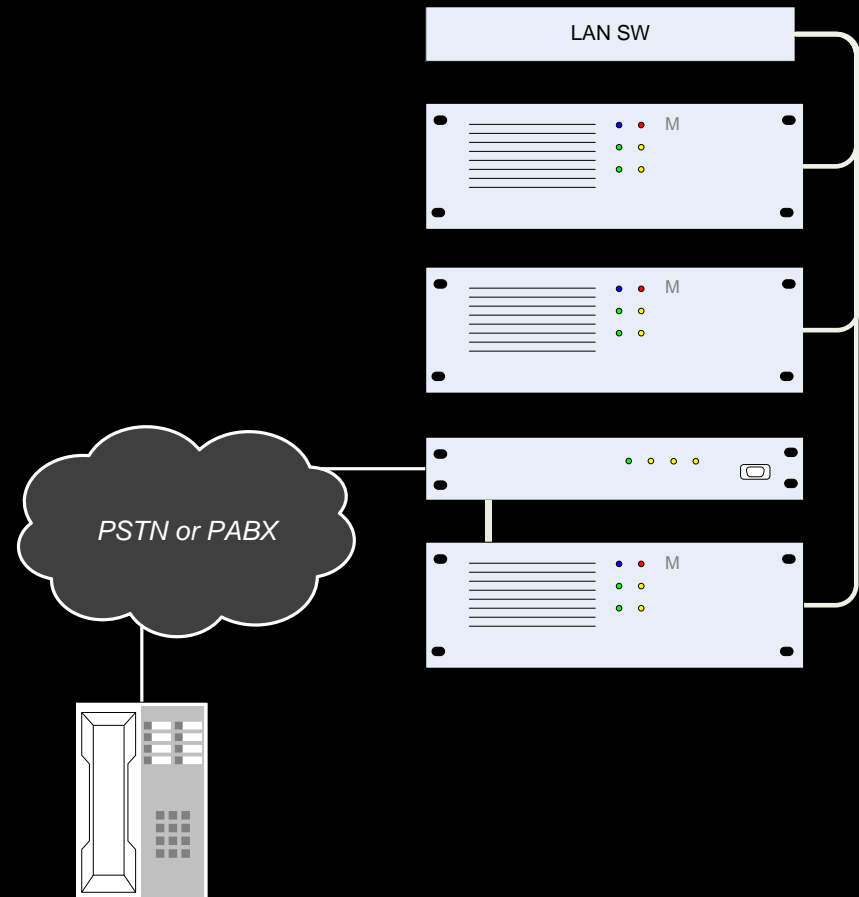
Hardware

- Two repeaters in IP Site Connect mode.
- Slot 1 is linked.
- Possible to make a phone call from both sites on slot 1.
- Only possible to make phone call on slot 2 when roamed to site with APP.



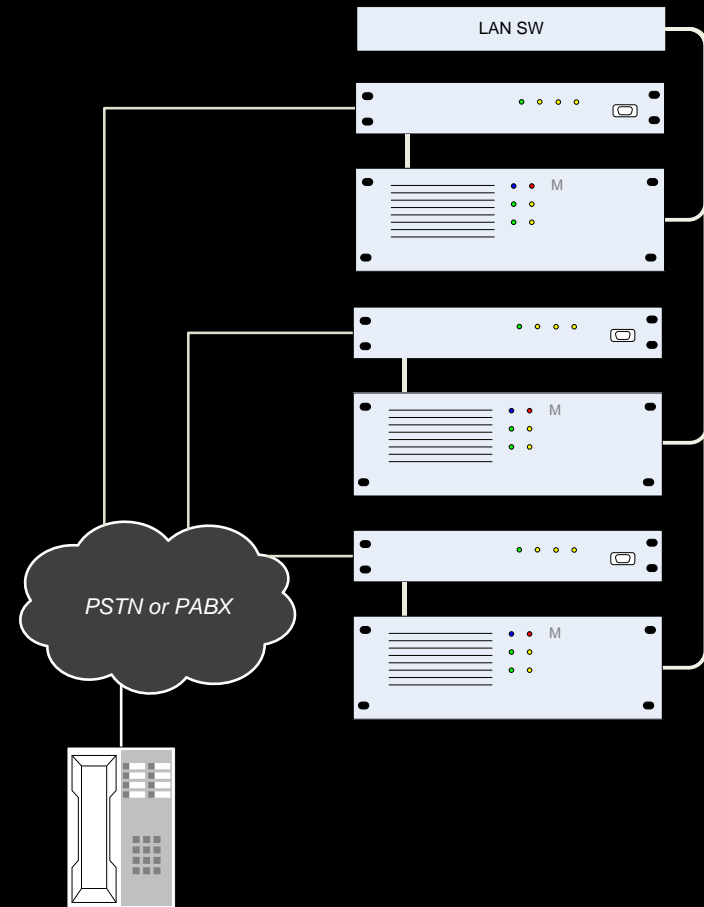
Hardware

- Capacity Plus site with three repeaters.
- APP on RF channel 3 (repeater ID 5 and 6).
- System has 6 virtual channels but only one APP.



Hardware

- Capacity Plus site with three repeaters, each with APP.
- Can support three simultaneous inbound or outbound phone calls.



Hardware

- 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.



Phone to Radio Call

- Individual call to radio 501
 - Single Site / IP Site Connect: 061269576826P18501
 - Capacity Plus: 061269576826P8501
- Group call to group 102
 - Single Site / IP Site Connect: 061269576826P17102
 - Capacity Plus: 061269576826P7102

- *Red: Telephone Patch Number*
- *P: Pause*
- *Green: Slot (IPSC)*
- *Blue: Call type - 7 talkgroup; 8 individual*
- *Yellow: Radio or group number (determined by call type)*



Radio to Phone Call

- Individual call to telephone number 061269576237
 - Single Site / IP Site Connect / Capacity Plus : 1234#P061269576237
- In IPSC and Single Site, the user has to select a channel which is connected / linked to a APP.
- In Capacity Plus, channel selection is not needed as this is handled by the repeaters / radio.
 - *Red: Telephone Patch Number*
 - *P: Pause*
 - *Green: Access code*



Configuration

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

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 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).
- Duration of DTMF digits (for repeater generated deaccess code).
- 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.



Configuration

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

RX

Frequency (MHz) 470.025000

Ref Frequency (MHz) Default

Offset (MHz) 0.000000

Copy

TX

Frequency (MHz) 465.025000

Ref Frequency (MHz) Default

Power Level High

DTP_Ch1 Expert View

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.

Configuration

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

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

Phone system access code which grants radio access to initiate certain types of phone call.

Duration of silence prior to sending first DTMF digit in access code.

Duration of intervals between DTMF tones in access code, deaccess code, phone number and over-dial digits generated by radio.

Duration of DTMF tones and "pauses" in access code, deaccess code, phone number and over-dial digits generated by radio.

Radio generated deaccess code for APP when hang up required at end of phone call.

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.

Configuration

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

Configuration

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.

Configuration

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

Configuration

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

[Top](#) [Radio Buttons](#) [Accessory Buttons](#) [One Touch Access](#) [Number Key Quick Contact Access](#)

One Touch Access

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

Allows user to select phone number from phone address book (contacts list).

Number Key Quick Contact Access

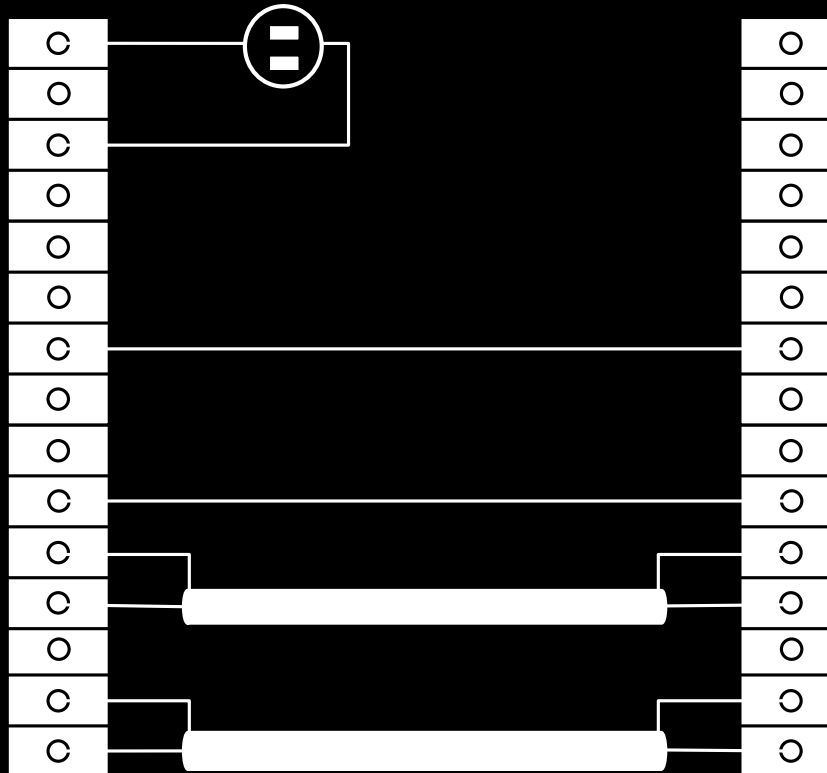
Number Key	Mode	Call
0	None	None
1	None	None

Side Button 1 Short Press

D:\Projects\Cypher R1.8\Digital Phone Patch\Test\Field Test\codeplug\training_SU.ctb Expert View 2.74% Used

Hardware (DR3000)

Zetron M735	
1	9-12 VAC or +12VDC
2	9-12 VAC
3	Power Ground
4	Ground
5	PTT N.C.
6	PTT Common
7	PTT N.O.
8	Auxiliary output
9	Auxiliary input
10	COR Input
11	Transmit Audio
12	TX / Gnd
13	CTCSS / DCS Output
14	Disc / Gnd
15	Receiver Audio

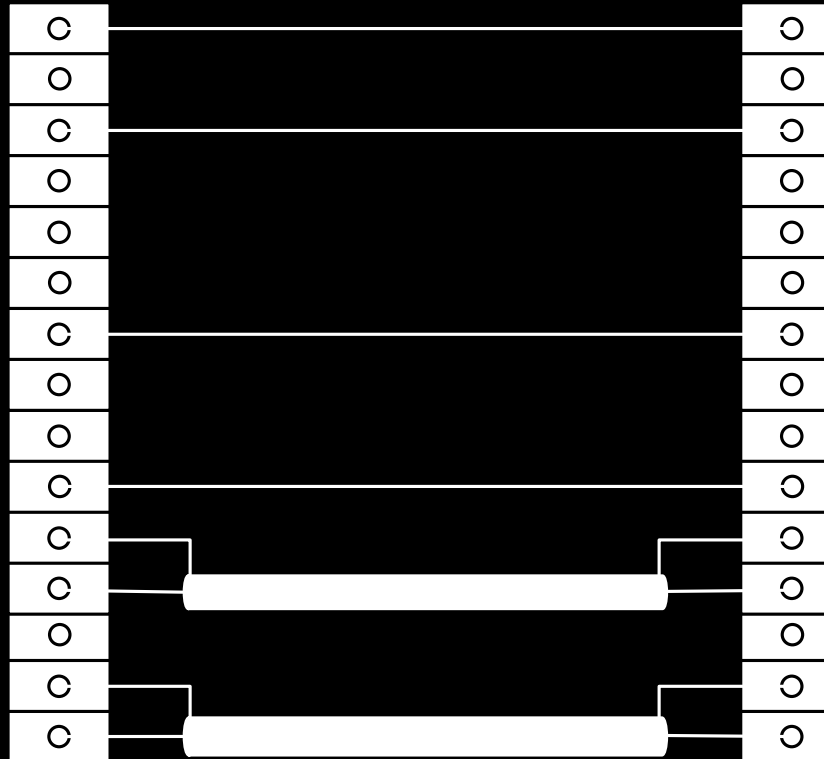


Repeater	
8	Power GND
17	PTT ⁽²⁾
19	COR ⁽²⁾
11	Tx Audio
12	Audio GND
18	Audio GND
14	Rx Audio



Hardware (MTR3000)

Zetron M735	
1	9-12 VAC or +12VDC
2	9-12 VAC
3	Power Ground
4	Ground
5	PTT N.C.
6	PTT Common
7	PTT N.O.
8	Auxiliary output
9	Auxiliary input
10	COR Input
11	Transmit Audio
12	TX / Gnd
13	CTCSS / DCS Output
14	Disc / Gnd
15	Receiver Audio



Repeater	
14	14.2VDC+
8	Power GND
17	PTT ⁽²⁾
19	COR ⁽²⁾
11	Tx Audio
12	Audio GND
18	Audio GND
14	Rx Audio



Configuration

- The inbound and outbound audio to and from the Zetron M30 or M735 needs to be adjusted.
- M735 jumper settings:
 - JP21 B (External COR)
 - JP31 A (Negative COR)
 - JP24 A (Flat Output at TX Audio).
- Details can be found in the latest DR3000 Basic Service Manual.



Further reading

