



➤ DMR: El Futuro en la Comunicación Digital

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Agosto 2014

Digital Mobile Radio

- Standar ESTI publicado en 2005.
- Más de una docena de fabricantes radios DMR.
- Superior calidad de voz sobre radios digitales anteriores.
- Mayor duración de la batería.
- Soporta múltiples grupos en un solo canal.
- Suporta aplicación de datos.

Compatible con diferentes marcas



Radios DMR Portatiles



**Motorola
XPR7550
~\$700US**



**Motorola
XPR6550
~\$450US**



**Vertex
Standard
EVX-539
~\$350US**



**Connect
Systems
CS700
~\$180US**



**Motorola
SL7550
~\$700US**



**Vertex
Standard
VXD-720
~\$450US**



**Hytera
PD-785
~\$800US**

Radios DMR Mobil



Motorola XPR 5550

~\$600US



Hytera MD782

~\$800US



Motorola XPR 4550

~\$450US



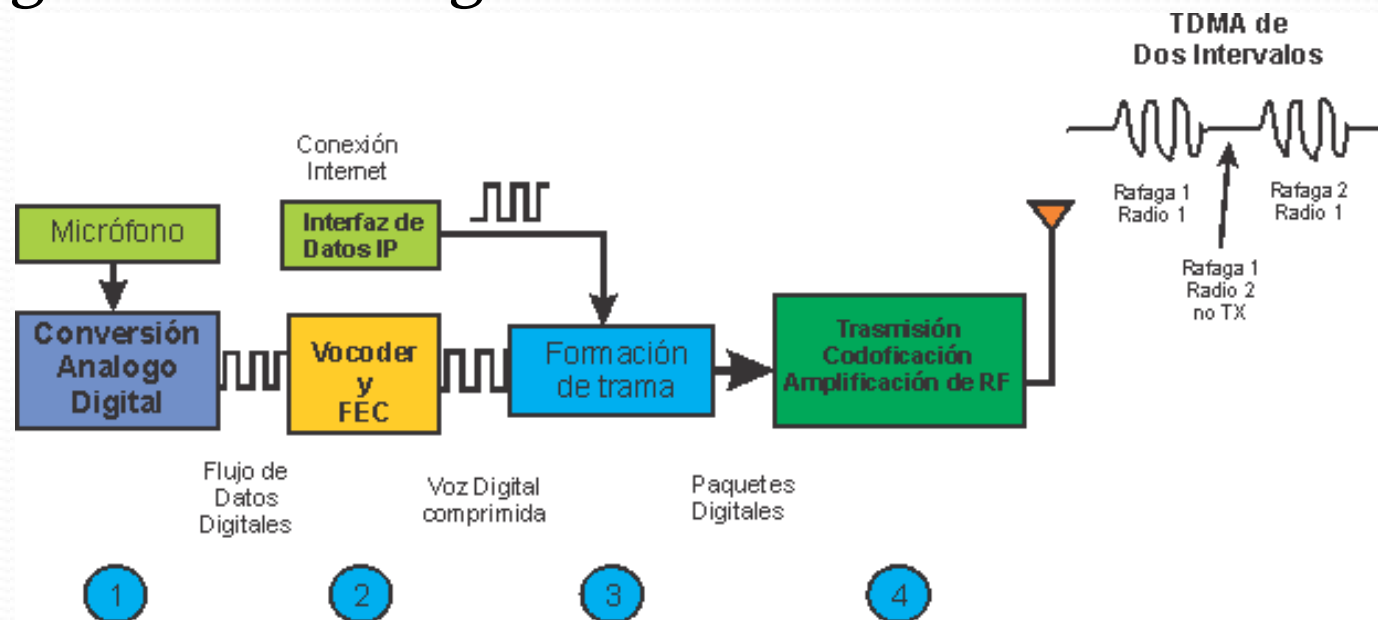
Vertex Standard

VXD-7200

~\$400US

DESCRIPCIÓN GENERAL

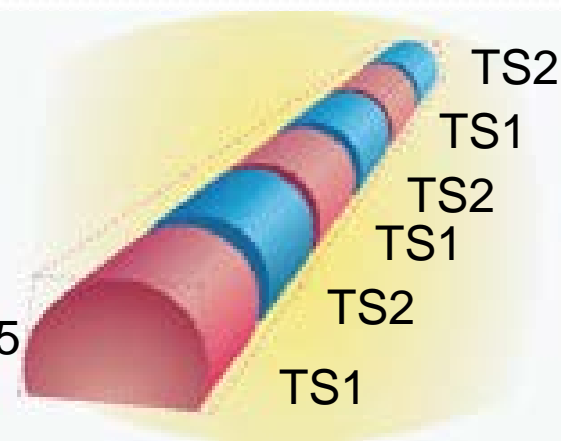
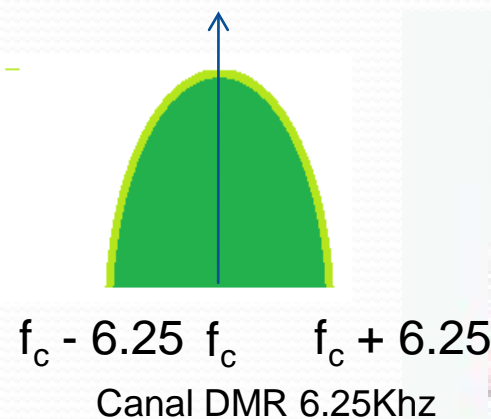
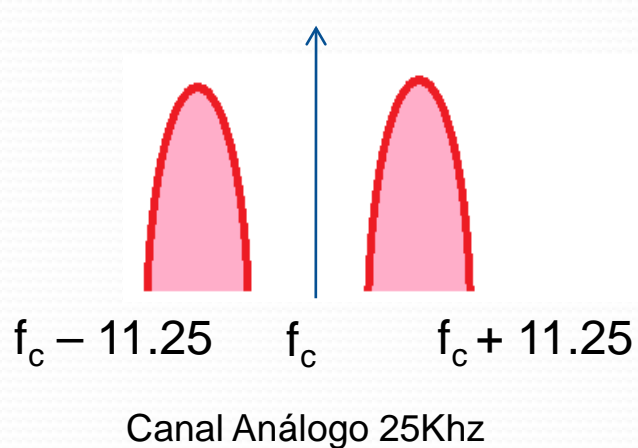
- Las ventajas de la tecnología MOTOTRBO o DMR son: eficiencia espectral y calidad superior del audio.
- La tecnología DMR puede resumirse de la manera siguiente en el figura 1



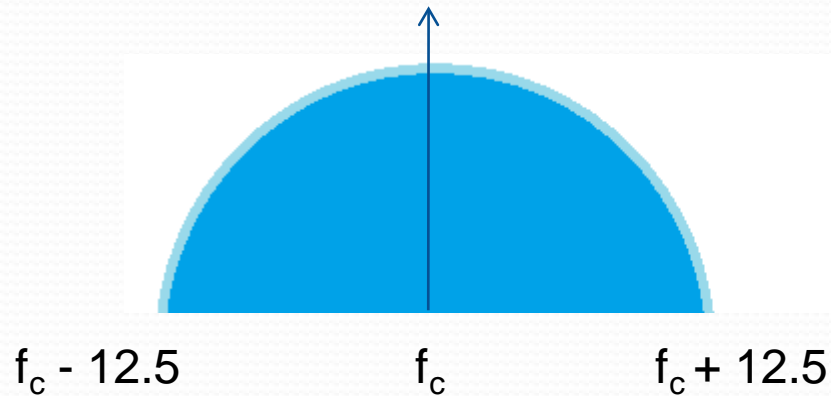
- Parte 1, el micrófono del radio recibe la voz y convierte la onda acústica en una onda eléctrica analógica, y esta es digitalizada por el conversor A/D.
- Parte 2, el Vocoder AMBE+2™ desarrollado por Digital Voice System, Inc. Realiza la compresión de los datos digitales.
- Parte 3, preparación de trama o paquetes a ser transmitidos.
- Parte 4, se codifica la señal para su transmisión por (FSK), mediante la tecnología TDMA (acceso múltiple por división del tiempo).

EFICIENCIA ESPECTRAL

- La arquitectura TDMA divide el canal en 2 intervalos de tiempo alternos, mediante lo cual se crean dos canales lógicos en un canal físico de 12,5 KHz. Cada llamada de voz utiliza sólo uno de estos.



Mitad de Ancho de banda

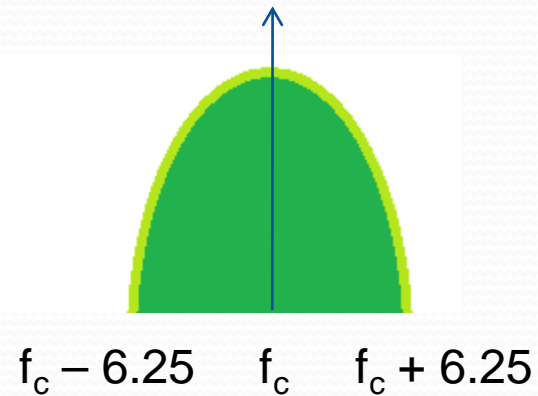


Canal análogo
tradicional de
25 kHz

de ancho de banda

1 Canal

1 Repetidor



Canal DMR de
12.5 kHz

Ancho de banda

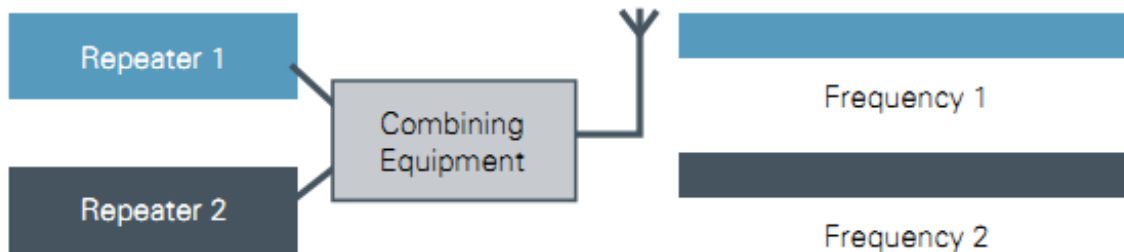
2 Canales

1 Repetidor

¡Dos Repetidores en Uno!

TDMA saves licensing and equipment costs by enabling the equivalent of two 6.25 kHz channels within a single licensed 12.5 kHz channel

Two-channel Analog or Digital FDMA System



One call per repeater and channel



Radio Groups

Two-channel Digital TDMA System



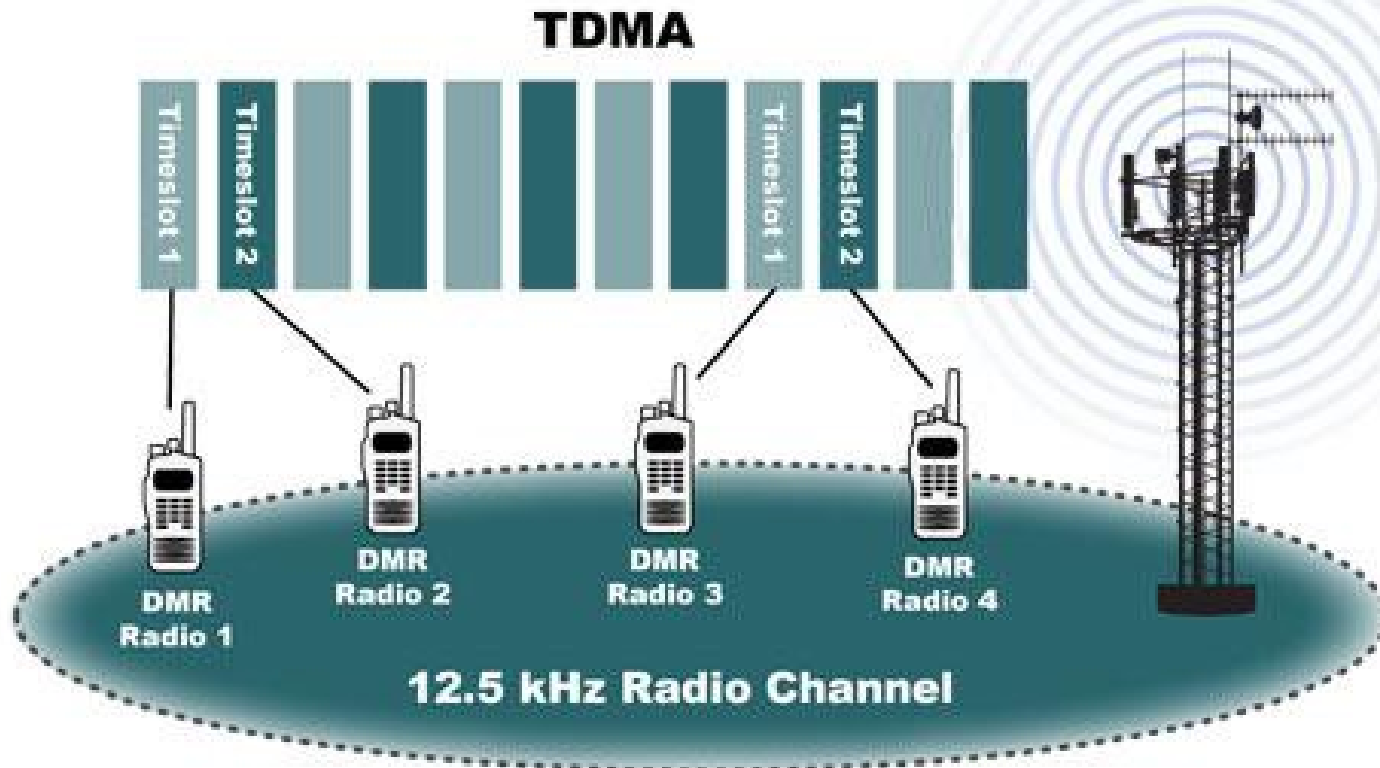
Two calls per repeater and channel



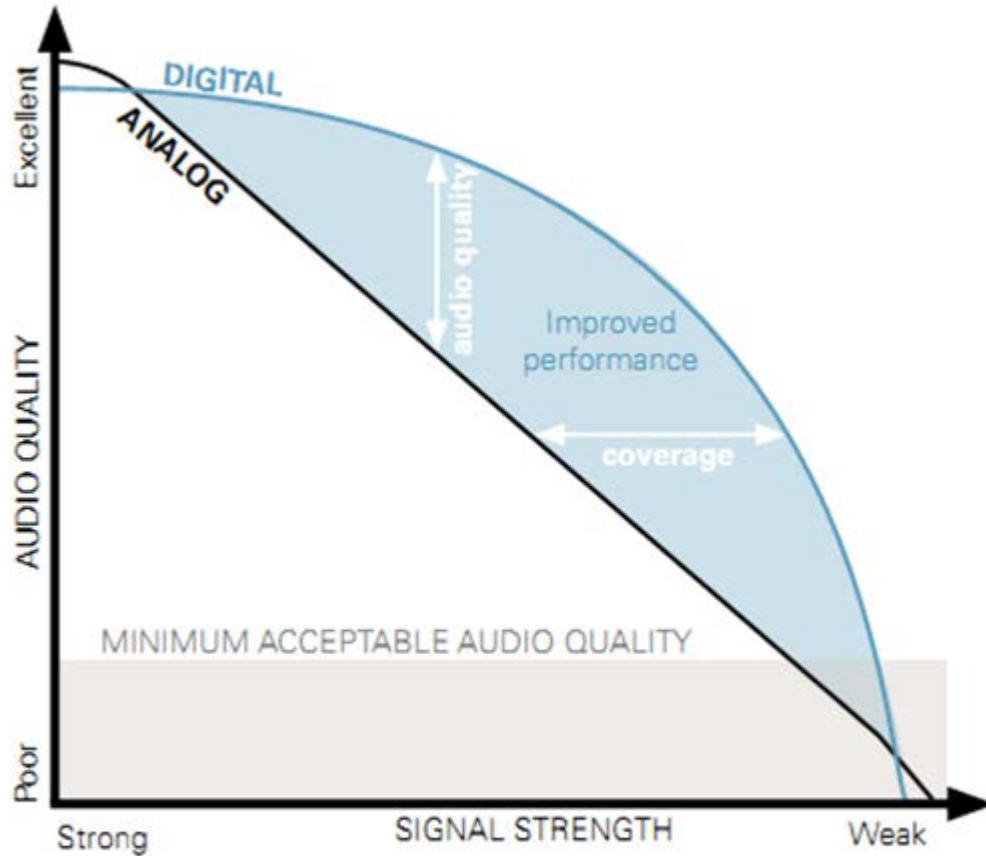
Radio Groups

***Menor costo de infraestructura, 1 solo estante
2 canales de Voz en un solo repetidor.***

Conversación de Voz Simultánea



Mayor Calidad de Señal



- No “hiss”, “popping”, o estática.
- Mejor rango RF sobre las tecnologías digitales anteriores.
- .Corrección de errores.

La voz digital conserva mejor calidad que la analógica, a medida que la intensidad de la señal decrece.

Major Calidad de Audio

- La principal diferencia entre la cobertura analógica y digital es la manera como la calidad de audio se degrada a lo largo y ancho del área de cobertura.
 - Análogo:
 - Ruidoso al final de la cobertura.
 - Puede ser escuchado por otros equipos.
 - Digital:
 - Audio de buena calidad al final de la cobertura.
 - Para ser escuchado por otros equipos requiere de la “llave” digital.



Voz y Datos al mismo tiempo



Slot 1 Voz



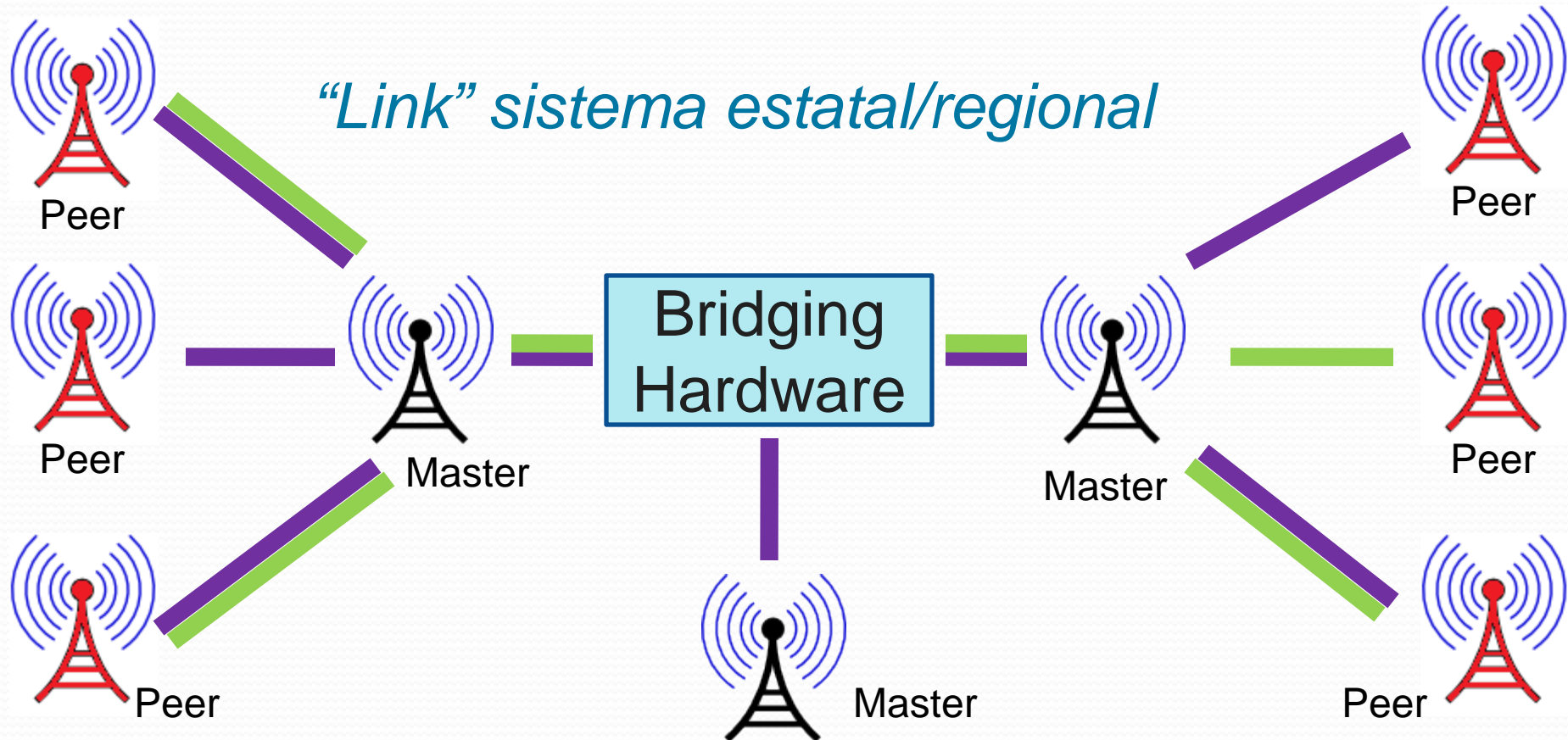
Slot 2 GPS / Texto

(o voz en el segundo canal cuando no hay datos)



IP Site Connect (conexión IP)

1 ó 2 “slots” (canales)



Modo Dinámico mezclado:

Primero al entrar – Primero al salir

Análogo



O



Análogo



Slot 1 TDMA



Slot 2 TDMA

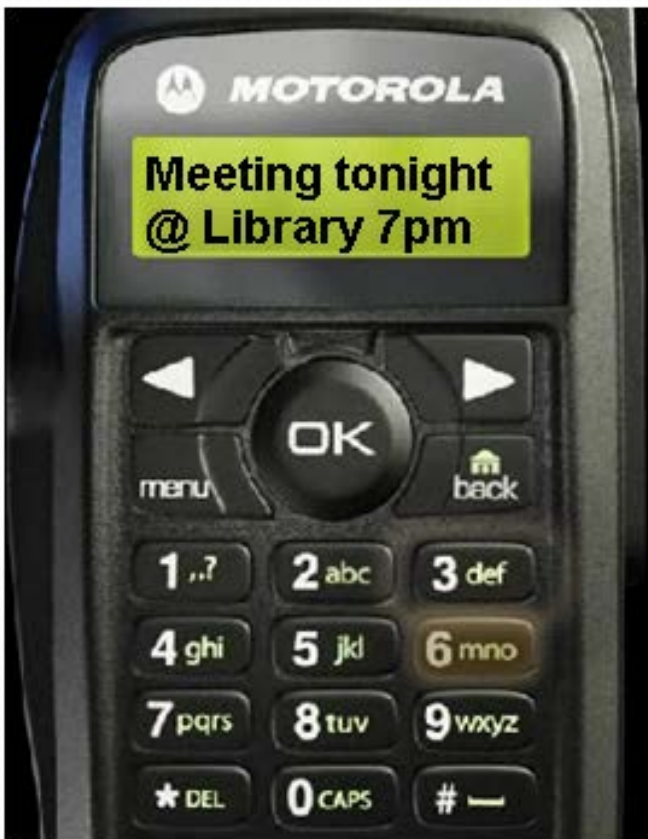
Slot 1 TDMA



Slot 2 TDMA

*El repetidor detecta automáticamente el tipo de entrada.
Conexión a Internet no soportada en modo dinámico*

Mensajes de Texto



Envíe a una persona o a un grupo.

- Alertas de clima.
- Información de reuniones.
- Anuncios.

Network Map



Red México TS 2, Grupo 334



Inicio del Usuario DMR

1. Verificar que tenga cobertura de un repetidor DMR.
2. Solicitar un ID en www.dmr-marc.net
3. Obtenga un radio DMR, así como el software y cables necesarios.
4. Programe su radio DMR.
5. Si no pertenece al radio club, afíliese.
6. Usted esta listo y sea bienvenido a la red DMR.



El DMR-MARC Red Mundial

- Nuestra red es un grupo totalmente digital de más de 700 repetidores MOTOTRBO DMR en 22 países con más de 8,600 usuarios. Todos somos radioaficionados operadores muchos de los cuales son empleados de Motorola Solutions, empleados de Estaciones de Servicio Motorola, distribuidores, instaladores de sistemas, y los aficionados del equipo Motorola.

Misión

- Ofrecerle una opción fiable y escalable de conectividad: local, regional, nacional, e internacional. ¿No es el momento de estar a la vanguardia de la radio digital?





DMR-MARC

Motorola Amateur Radio Club Worldwide Network



- Motorola Amateur Radio Clubs and other private XPR8300/8400 and MTR3000 repeater owners
- 90+ site network in USA, Germany, Australia, South Africa, New Zealand, Spain, Switzerland, Austria, Canada, and Finland. (Nearly 4x growth in 1 year)
- 100% Pure Digital. Voice and text messaging supported.
- Weekly nets to discuss technical issues
- More than 1800 registered users
- To register or learn more <http://dmr-marc.net>
- There you will also find links to our bridge partners, our Yahoo group and other programming aids.

Talk Groups (new 2012)

- Time Slot 1, Talk Group 3 – North America, South Africa, South Pacific. NEW as of May 2012! **Reprogram radios if necessary!**
- Time Slot 1, Talk Group 1 – calls to Europe and the weekly DMR net only. Do not use for NAm- NAm QSOs.
- Time Slot 2, talk group 2 – Local Repeater QSOs.
- Time Slot 2, first 4 digits of state ID (KS = 3120) for statewide linked TS2 systems.
- Be courteous and use the local time slot for local repeater QSOs and don't monopolize the linked network time slot 1 if you don't have to.

Common Courtesy

- ALL RADIOS MUST HAVE A VALID 7-DIGIT DMR ID from our website <http://dmr-marc.net>, Under “Contact Us” Radios without an official ID should not be on the system. Period. Do not make up your own ID.
- Do not key up on TS1 and blow into mic to test your radio. You key up 90+ repeaters and that is annoying to all of us who listen.
- Do radio tests on TS2 with a voice ID.
- You must identify your callsign just like you did in the past on an analog repeater per FCC rules.

Status of C-bridge

- Links master repeaters (groups of 15-20), and bridges
- Mfr: Rayfield Communications Springfield, MO
- We have 5 masters (NYC, Schaumburg, Plantation, Montreal, and Germany), and 2 bridges connected to the DMR-MARC C-bridge and the DMR-MARC-IL C-bridges
- We have connections to multiple bridge partners including DCI, NC-PRN, NorCal, AZ TRBO, WØPM (MO), KØUSY (KS), Georgia DMR, SF TRBO

Ham Friendly Dealers

- Rayfield Communications, contact John Rayfield, Jr 800.743.9711. Mention you are part of MARC and inquire about ham pricing.
- Sandy's Communications in Mission Hills, CA
- E-Bay or Local Dealer
- TRBO DMR radios are DMR –and- Analog monoband
- Mobile: XPR4550 UHF band 1 (403-470 MHz) 25-45W, Portable: XPR6550 UHF band 1

RDAC repeater diagnostics and control

K9MOT-Sch

Alarms	Radio ID	Radio Name	Service	Firmware Version	State	Channel Name	TX Power	RX Alarm	TX Alarm	Temp Alarm	AC Power Alarm	Fan Alarm	VSWR Alarm	TX Power Alarm
▶	311702	K9MOT-Schaumburg	Master	R01.07.02	Enabled	444.79375 T12	High	●	●	●	●	●	●	●
	262410	DF0MHR Muelheim	Peer	R01.07.00	Enabled	IP-DIG TS1 TS2	Low	●	●	●	●	●	●	●
	262100	DM0MOT Berlin	Peer	R01.07.00	Enabled	IP-DIG TS1 TS2	High	●	●	●	●	●	●	●
	262430	DB0AVR Alsdorf	Peer	R01.07.00	Enabled	IP-DIG TS1 TS2	High	●	●	●	●	●	●	●
	262450	DB0ZO Doerenberg	Peer	R01.06.20	Enabled	IP-DIG TS1 TS2	High	●	●	●	●	●	⊗	⊗
	310400	KE7JFH Mesa AZ	Peer	R01.07.02	Enabled	WIDE1	High	●	●	●	●	●	●	●
	262601	DF0MOT Frankfurt	Peer	R01.07.00	Enabled	IP-DIG TS1 TS2	High	●	●	●	●	●	●	●
	310600	N6DVA Los Angele	Peer	R01.07.00	Enabled	IP-DIG TS1	High	●	●	●	●	●	●	●
	311202	N4AMC LalelandFI	Peer	R01.07.00	Enabled	Dig-Not Linked	High	●	●	●	●	●	●	●
	311203	W4MOT-PlantatnFL	Peer	R01.07.00	Enabled	443 TS1	High	●	●	●	●	●	●	▲
	312900	312900-KC	Peer	R01.07.02	Enabled	World 1 Net	Low	●	●	●	●	●	●	●
	313100	K0BOY Omaha NE	Peer	R01.07.00	Enabled	IP-DIG TS1	Low	●	●	●	●	●	●	●
	315100	W4YP - Haymarket	Peer	R01.07.02	Enabled	Digital TS1	High	●	●	●	●	●	●	●
	3124100	N3LHD-Wash DC	Peer	R01.07.00	Enabled	IP-DIG TS1	High	●	●	●	●	●	●	●
	505600	vk6ztn-1	Peer	R01.07.02	Enabled	Channel1	High	●	●	●	●	●	●	●

Diagnostics

RSSI Slot 1:
 RSSI Slot 2:

Repeater Log

Name	Type	State	Time (sec)

Control

Current Channel:

TX Power:

State:

Knockdown:

Clicking Write or Reset will reset the repeater. It may not be available for 8-10 secs.

GW3TRBO – Who's on Where?

Activity (Admin)

Filter Pause View Help

Connected to Module: Yes

Packet Types

- [Call Activity] Channel Assignment: Group
- [Call Activity] Channel Assignment: Group Radio Data
- [Call Activity] Channel Assignment: Private
- [Call Activity] Channel Assignment: Private Radio Data
- [LE] Deregistration Request
- [LE] Deregistration Response
- [LE] Master Keep Alive Request

Press F1 for Help

Select All

Unselect All

Site ID	Site ID Alias	Type	Group	ID Alias	ID	Target ID Ali	Timestamp	Elapsed T
310699	DMR-MARCC-BRIDGE	Group	1	K6EH - PAUL P1	3106001		7/14/2011 01:15:31.781	00:00:00.
2000				Peer 2000	2000	Peer 311210	7/14/2011 00:42:37.484	
262410	DFOMHR - Muelheim EU					Peer 262410	7/14/2011 00:30:16.671	
262410	DFOMHR - Muelheim EU					Peer 262410	7/14/2011 00:30:06.406	
2000				Peer 2000	2000	Peer 262410	7/14/2011 00:29:42.296	
7						Peer 7	7/14/2011 00:25:15.843	
7						Peer 7	7/14/2011 00:22:41.562	
310699	DMR-MARCC-BRIDGE	Group	1	K6EH - PAUL P1	3106001		7/13/2011 23:51:56.640	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:51:20.343	00:00:00.
311702	K9MOT - Schaumburg IL	Group	1	AA9VI - MIKE M	3117121		7/13/2011 23:50:55.625	00:00:15.
2001						Peer 2001	7/13/2011 23:50:55.250	
311702	K9MOT - Schaumburg IL	Group	1	AA9VI - MIKE M	3117121		7/13/2011 23:50:40.500	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:50:35.250	00:00:28
2001						Peer 2001	7/13/2011 23:50:35.156	
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:50:07.515	00:00:00.
311702	K9MOT - Schaumburg IL	Group	1	AA9VI - MIKE M	3117121		7/13/2011 23:49:25.515	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:49:00.937	00:00:00.
311702	K9MOT - Schaumburg IL	Group	1	AA9VI - MIKE M	3117121		7/13/2011 23:48:02.468	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:47:58.203	00:00:00.
311702	K9MOT - Schaumburg IL	Group	1	AA9VI - MIKE M	3117121		7/13/2011 23:47:53.000	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:47:24.953	00:00:00.
310699	DMR-MARCC-BRIDGE	Group	1	K6EH - PAUL P1	3106001		7/13/2011 23:47:09.453	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:46:42.890	00:00:00.
310699	DMR-MARCC-BRIDGE	Group	1	K6EH - PAUL P1	3106001		7/13/2011 23:45:27.812	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:45:06.359	00:00:00.
310699	DMR-MARCC-BRIDGE	Group	1	K6EH - PAUL P1	3106001		7/13/2011 23:44:27.390	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:44:02.843	00:00:00.
310699	DMR-MARCC-BRIDGE	Group	1	K6EH - PAUL P1	3106001		7/13/2011 23:43:20.781	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:43:01.937	00:00:00.
310699	DMR-MARCC-BRIDGE	Group	1	K6EH - PAUL P1	3106001		7/13/2011 23:42:44.546	00:00:00.
311203	N4AMC - Lakeland FL	Group	1	W4RCC - Richard P	3112010		7/13/2011 23:42:36.406	00:00:00.

Customer Programming SW

The screenshot displays the MOTOTRBO Customer Programming Software interface for a device named K9MOT S1. The window title is "MOTOTRBO Customer Programming Software - [aa9vi-mobile.ctb]". The interface includes a menu bar (File, Edit, View, Device, Features, Remote, Window, Help) and a toolbar with icons for Open, Save, Delete, Cut, Copy, Paste, Search, Read, Write, Clone, Reports, and About.

The left sidebar shows a tree view of settings categories for the XPR 4550 device, including General Settings, Accessories, Buttons, Text Messages, Telemetry, Menu, Privacy, Network, Signaling Systems, MDC, FISHFAR, Quik-Call II, Sys1, Digital Emergency, Capacity Plus Em, Contacts, MDC, Call1, Quik-Call II, Call1, Digital, ALL CALL, PC CALL, AA9VI Mike, AA9VI Mike, AA9VI Mike, AB3AC Bruo, D02DPK Phil, D03FG Fran, D03YWR Wc, D04DO Pete, D05APR Anc, D05APR Anc, D05DS Diete, DB9PF Augu, DC1TJH Thc, DD0IZ Michs, DC5AJ Alexe, and DD2JU Rudc.

The main area is titled "K9MOT S1" and contains the following settings:

- Option Board Trunking:
- Lone Worker:
- Allow Talkaround:
- IP Site Connect:
- Messaging Delay (ms): 90
- Compressed UDP Data Header:
- RX Only:

Below these are two sections for RX and TX settings:

RX Settings:

- Frequency (MHz): 444.793750
- Ref Frequency (MHz): Default
- Group List: DMR-MARC1
- Emergency Alarm Indication:
- Emergency Alarm Ack:
- Emergency Call Indication:

TX Settings:

- Frequency (MHz): 449.793750
- Ref Frequency (MHz): Default
- Contact Name: DMR-MARC1
- Emergency System: None
- VOX:
- Power Level: Low
- TOT (sec): 180
- TOT Rekey Delay (sec): 0
- Allow Interruption:
- TX Interruptible Frequencies:
- Admit Criteria: Color Code Free
- In Call Criteria: Follow Admit Criteria

At the bottom of the window, the status bar shows "K9MOT S1", "Expert View", "19.96% Used", and "NUM".