

FRS, GMRS, & HAM Radios

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Outline

- Family Radio Service (FRS)
- General Mobile Radio Service (GMRS)
- Amateur Radio (HAM)
- Hybrid Radios (FRS/GMRS)
- FRS/GMRS Radio Frequencies
- Codes (tones)
- CERT & Radios
- Deployment example

FRS

Family Radio Service

- The **Family Radio Service (FRS)** is a unlicensed walkie talkie radio system
 - FRS radios are compact, handheld, wireless 2-way radios
 - FRS radios provide very good clarity over a relatively short range
 - FRS is a license free radio service



Garmin



ICOM



Midland



Cobra



Uniden



Motorola

FRS

key features

- Uses “channelized” frequencies in the ultra high frequency (UHF) band. Operate on any of 14 dedicated channels (1-14)
- Is quiet and clear because it uses frequency modulation (FM) instead of amplitude modulation (AM).
- Has limited range (~0.5 mi) because
 - They have a maximum allowable power of 1/2 watt, and
 - They have a fixed small (poor) antenna

Note: FRS Radio transceivers and their antennas may not be modified to extend their range.

FRS radio distinctions:

- 1) Unlike with CB (citizens band), Ham radios, and most other 2-way radios, there is no license required to use an FRS radio.
- 2) There are no fees for usage, airtime or per-call charges. (Aside from the cost of batteries, they are virtually free to use.)

GMRS

General Mobile Radio Service

- The **General Mobile Radio Service** (GMRS) is a licensed walkie talkie or base station radio system
 - GMRS radios are typically handheld portable devices much like FRS radios, and share some frequencies with FRS
 - GMRS radios provide very good clarity over a slightly longer range than FRS
 - GMRS is a licensed radio service (\$85/5 years)

Note: A Ham radio license does not cover GMRS frequencies



Motorola

GMRS

key features

- Uses “channelized” frequencies in the ultra high frequency (UHF) band. Operate on any of 15 dedicated channels (1-7, & 15-22)
- Is quiet and clear because it uses frequency modulation (FM) instead of amplitude modulation (AM).
- Has slightly longer range (~1-2 mi) because
 - HT's have a typical power of 1-5W, but
 - Still have a small antenna (sometimes removable)

Note: GMRS Base stations can have power up to 50W (on channels 15-22) and may use an external, gain antenna.

GMRS

- Is intended for use by an individual who possesses a valid GMRS license, as well as his or her immediate family members.
 - FCC definition of immediate family includes a spouse, children, parents, grandparents, aunts, uncles, nephews, nieces, and in-laws
 - Immediate relatives of the GMRS system licensee are entitled to communicate among themselves for personal or business purposes.
 - Employees or friends of the licensee, who are not family members, may not use this service.
- There is no longer a GMRS license available for clubs or groups.

Radio Amateur - HAM

- **The Amateur Radio Service (HAM)** is a licensed radio service for many radio bands and many radio types
 - CERT teams often use HAM radios that are handheld portable devices call handy talkies (HT's) on the 2M (VHF) or 440 (UHF) bands
 - HT radios on these bands provide very good clarity over a much longer range than GMRS
 - HAM radio is a licensed radio service that requires passing a test.

Comparison

FRS



~0.5 mi range*
\$15-\$80
AA or AAA
No License

GMRS



~1-2 mi range*
\$30-\$200
AA or NiMH
FCC License

Ham



~5 mi range* **
\$100-\$400
AA or NiMH
FCC test &
License

* typical range in a city **much farther using repeaters

Dual-Service or Hybrid Radios

FRS/GMRS

- These common radios provide access to both the FRS and GMRS bands
 - FRS channels (1-14) and
 - GMRS channels (1-7 & 15-22).
 - GMRS channels requires an FCC operator's license.
- These radios may be used without a license, if ...
 - the "FRS only" channels (8-14) are used, or
 - channels 1-7 are used on low power (<0.5 w)

FRS/GMRS Shared Frequencies

(Ch 1-7, GMRS 5w max power)

Name	Frequency (MHz)	Motorola convention	Icom F21-GM convention
"FRS 1" or "5625"	462.5625	** Ch. 1 **	Ch. 9
"FRS 2" or "5875"	462.5875	Ch. 2	Ch. 10
"FRS 3" or "6125"	462.6125	Ch. 3	Ch. 11
"FRS 4" or "6375"	462.6375	Ch. 4	Ch. 12
"FRS 5" or "6625"	462.6625	Ch. 5	Ch. 13
"FRS 6" or "6875"	462.6875	Ch. 6	Ch. 14
"FRS 7" or "7125"	462.7125	Ch. 7	Ch. 15

** National Call/Distress Channel by REACT & National SOS Radio Network

FRS Only Frequencies

(Ch 8-14*, 0.5w max)

Channel	Frequency	Notes
FRS 8	467.5625	FRS use only
FRS 9	467.5875	FRS use only
FRS 10	467.6125	FRS use only
FRS 11	467.6375	FRS use only National Drill Channel
FRS 12	467.6625	FRS use only
FRS 13	467.6875	FRS use only
FRS 14	467.7125	FRS use only

* Great channels for CERT, no license needed on any radio

GMRS Only Frequencies

(Ch 15-22, GMRS up to 50w)

Name	Simplex frequency (MHz) Repeater output	Repeater input (MHz)	Motorola convention	Icom F21- GM convention
"550"	462.550	467.550	Ch. 15	Ch. 1
"575"	462.575	467.575	Ch. 16	Ch. 2
"600"	462.600	467.600	Ch. 17	Ch. 3
"625"	462.625	467.625	Ch. 18	Ch. 4
"650"	462.650	467.650	Ch. 19	Ch. 5
"675"	462.675	467.675	Ch. 20	Ch. 6
"700"	462.700	467.700	Ch. 21	Ch. 7
"725"	462.725	467.725	Ch. 22	Ch. 8

Codes (Tones) 1 of 4

Tone	Cobra 250/300	Cherokee 465	Midland 75-510	Motorola Sport	Motorola TalkAbout	Radio Shack
67.0	1	1	1		1	1
69.3		2				
69.4						2
71.9	2	3	2		2	3
74.4	3	4	3		3	4
77.0	4	5	4	A	4	5
79.7	5	6	5		5	6
82.5	6	7	6		6	7
85.4	7	8	7		7	8
88.5	8	9	8	B	8	9
91.5	9	10	9		9	10
94.8	10	11	10		10	11
97.4	11	12	11	C	11	12

Codes (Tones) 2 of 4

Tone	Cobra	Cherokee	Midland	Motorola Sport	Motorola TalkAbout	Radio Shack
100.0	12	13	12		12	13
103.5	13	14	13		13	14
107.2	14	15	14	D	14	15
110.9	15	16	15		15	16
114.8	16	17	16		16	17
118.8	17	18	17	E	17	18
123.0	18	19	18		18	19
127.3	19	20	19	F	19	20
131.8	20	21	20		20	21
136.5	21	22	21	G	21	22
141.3	22	23	22		22	23
146.2	23	24	23		23	24
151.4	24	25	24		24	25

Codes (Tones) 3 of 4

Tone	Cobra	Cherokee	Midland	Motorola Sport	Motorola TalkAbout	Radio Shack
156.7	25	26	25		25	26
159.8		27				27
162.2	26	28	26		26	28
165.5						29
167.9	27	29	27		27	30
171.3						31
173.8	28	30	28		28	32
177.3						33
179.9	29	31	29		29	34
183.5		32				35
186.2	30	33	30		30	36
189.9		34				37
192.8	31	35	31		31	38

Codes (Tones) 4 of 4

Tone	Cobra	Cherokee	Midland	Motorola Sport	Motorola TalkAbout	Radio Shack
196.6		36				
199.5		37				
203.5	32	38	32		32	
206.5		39				
210.7	33	40	33		33	
218.1	34	41	34		34	
225.7	35	42	35		35	
229.1		43				
233.6	36	44	36		36	
241.8	37	45	37		37	
250.3	38	46	38		38	
254.1		47				

CERT & Radios

- FRS are great radios for CERT teams
 - Radio communication within the team
 - Radio comms with CERT local command
 - Follow simple "FRS Radio Basics"
 - **Do not use codes (tones) use "separation"**
- BUT - most "blister pack" Radios sold today are dual purpose (FRS/GMRS) and CERT trailers and teams will most likely have this type, so...
 - Assign & Practice with FRS only channels (8-14)
 - **Do not use the GMRS frequencies unless all (or key) team members have a GMRS license**

Ham & FRS/GMRS

Ham radios

- Are excellent for communications from CERT team "monitors" to the local, city or county EOC's (Emergency Operation Center)
- Can monitor all FRS/GMRS frequencies
 - Can be set to scan all frequencies
 - Excellent for monitoring multiple teams
- Cannot be used to communicate to the teams on FRS or GMRS frequencies

FRS Summary

■ License

- None

■ Pros

- Simple Operation
- Inexpensive
- Plentiful
- No license required
- Shares frequencies with GMRS

■ Cons

- Poor range in urban areas
- Interference from other FRS/GMRS users
- Not usually rugged or waterproof

■ Uses

- Intra-Field Team Communications
- Staging Area Communications



GMRS Summary

- **License**
 - \$85 for 5-year FCC license
- **Pros**
 - Simple Operation
 - Inexpensive
 - Plentiful
 - Shares frequencies with GMRS
 - Pro-grade radios available
 - License requires no test
- **Cons**
 - Limited range in urban areas
 - Interference from other FRS/GMRS users
- **Uses**
 - Command/Field Team Communications
 - Intra-Field Team Communications
 - Staging Area/Logistics Communications



HAM Summary

(Amateur Radio Service)



■ License

- \$14/Exam for 10 year FCC license

■ Pros

- Quality construction
- Compatible with City systems
- Many frequencies & longer range
- Powerful mobile & base station units available

■ Cons

- Complicated operation
- Exam required
- Expensive

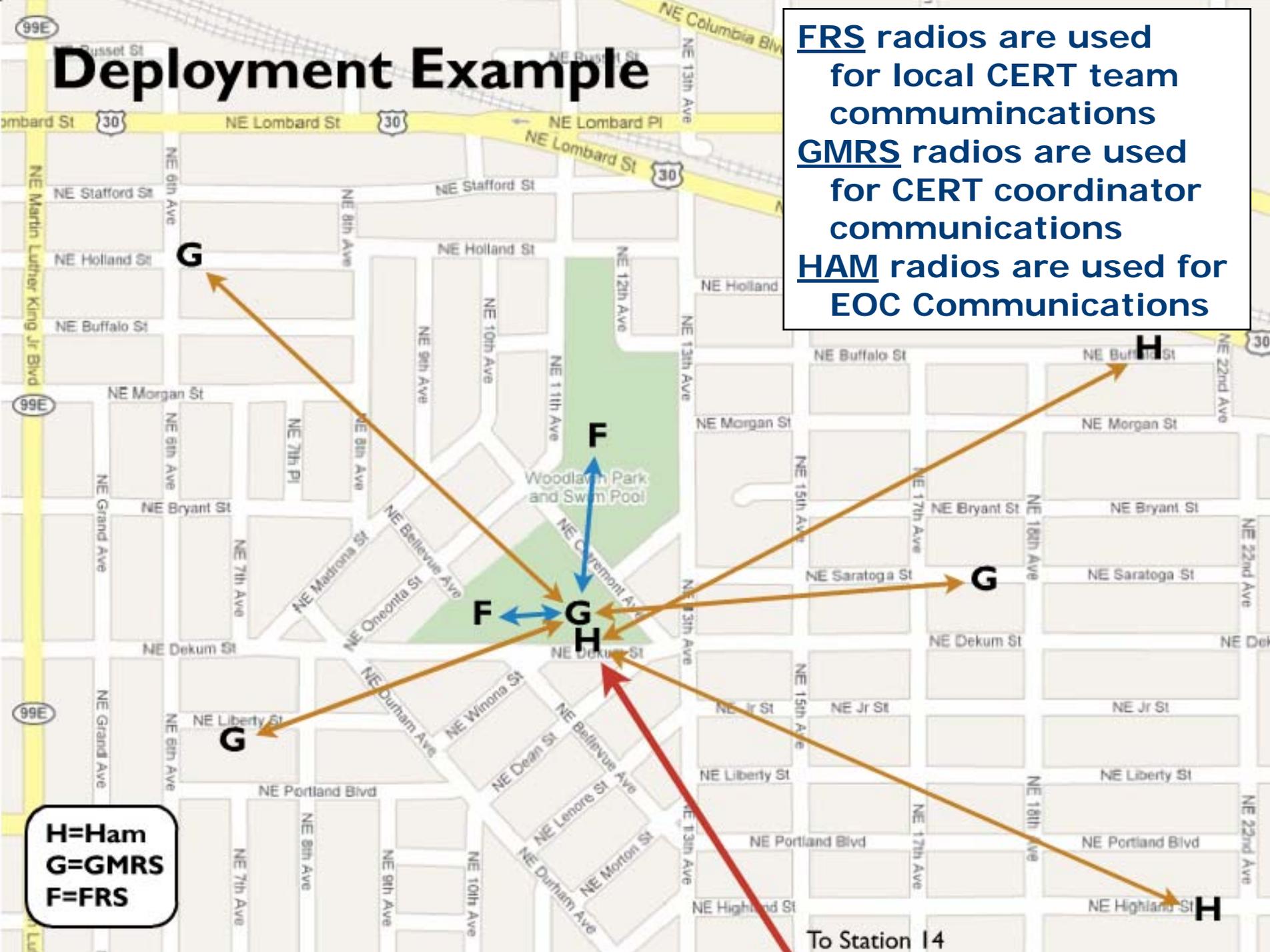
■ Uses

- Command / EOC / FMZ (fire management zone)
- Command / Field Team
- Health & Welfare



Deployment Example

FRS radios are used for local CERT team communications
GMRS radios are used for CERT coordinator communications
HAM radios are used for EOC Communications



H=Ham
G=GMRS
F=FRS

To Station 14

END

- Q&A
- Hands On

Material referenced:

FCC

Wikipedia

Portland Net

Motorola

ICOM

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