Grassroots Emergency Communications Operations

Sticky Notes

GECO Newsletter
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Ready to Serve and Sustain Our Community

Base Station Radio Back-up Plan

GECO resilience calls for a back-up plan if any of our radios in the station fails. There are two layers of recovery for rapid replacement:

1) Substitute one of our mobile field radios (TYT TH9800D, QYT KT8900, and QYT KT8900R);
2) Temporarily one of our HT radios (Bao Feng UV5R and F8HP, or Zastone UV-8DR). This would be an extreme step as the TX power is limited to 1-8 watts, and cooling issues could be a major issue. Field radios are stored in faraday cages.

The chart on the right shows the current radio / antenna set up. Bold faced bands are the best SWR match for the antenna. PL-259 connectors are on All coax to the radios.

We envision two basic failure situations: non-emergency or emergency. A non-emergency failure occurs under "normal" operating conditions.

The table on the right is the plan for "normal" radio back-up assignments. During a disaster, the split 220, 144 repeaters are optional. Circumstances may require different assignments based on field radio deployments.

All GECO field radios can be used to back up the radios in the base station radio rack.

Main radio / Band	Antenna / Band	Coax@ rack
ADI AR-447 / 440 TX[1]	Diamond F-718A / **440**	
ADI AR-446 / 440 RX[1]		
TH9000 / 220 TX[2] (split repeater)	Diamond X3200A 440 / **220** / 144	PL-259
ADI AR-147 / 144 TX[2] (split repeater)	Diamond X200 **440** / 220 / **144**	
TH9800 / Base station[1] (mainly 440/144 use)	Home Brew **440** / 220 / **144**	
	Yagi 440 / 144	
	Quad band mobile whip 440 / 144 / 49.9 / 29.9	

Notes: 1=priority operation; 2=optional. Quad band antenna needs detailed SWR testing.

Main radio	Band	Priamary Back-up	HT Back-up
ADI AR-447	440 TX[1]	KT 8900R 440/144	UV5R 70 cm/2 m
ADI AR-446	440 RX[1]	KT 8900R 440/144	UV8DR 1.25m/2m
TH9000	220 TX[2]	TH 9800D[2] 220 / 144 / 49.9 / 29.9	UV8DR[2] 1.25m/2m
ADI AR-147	144 TX[2]	KT 8900[2] 440/144	F8HP[2] 70 cm/2 m + amp
TH9800	Base station[1]	KT8900[1] 440/144	F8HP[1] 70 cm/2 m

Notes: In an emergency, circumstances will dictate the priority for repeater operation or deployment of radios for field service. Under normal conditions:
1. Priority given to the 440 repeater and Base Station radio to monitor 2m.
2. Emergency operation of the 220 and 2m split repeaters is at the dsicretion of N6WZK relative to our station power availability and reserves.

In This Issue

The table on the right shows the main radio and HT radio antenna fittings. All antenna coax at the rack have PL-259 connectors. Using the HTs with the base station antennas requires jumpers or adapters. We have these on hand (see photos on right). With these, any HT can be used with any base station antenna. The jumpers and adapters are kept near the radio rack for rapid access.

Back-up Mobile Radio Connector	HT Back-up Radio Connector	HT Radio Antenna Jumpers & Adapters
SO-239 	SMA-Male 	Bao Feng UV5R Bao Feng F8HP Zastone UV8DR
SMA-F to SO-239 jumpers 		SMA-F to SO-239 Adapter 

The key is to match the frequency / power. This is more critical when using the HTs as the replacement mobile radios are comparable to the main radios on the rack. Using the HTs are temporary replacements for the main station radios will undoubtedly reduce the effective coverage area. For 2m operations, this can be mitigated by using a linear amplifier.

Mark N7YLA donated a Radio Shack HTA-20 2m 30 Amp linear amplifier to GECO. It is part of the field radio inventory. It runs on 12 VDC. When used in the field, the HTs are connected to portable field or mobile whip antennas, not the OEM rubber duck or HT high gain whip antennas. The amplifier could be used with an HT as an emergency substitute 2m radio at the base station. The HTA-20 is fitted with Anderson PowerPole connectors. It can readily connect to any GECO field battery pack and the the station's 12 VDC battery bank. The required jumpers are kept on hand near the radio rack.

HT Radio	TX Power		MHz	2M Linear Amplifier 30 W
Bao Feng UV5R	1 W, 4W		144	X
			440	
Bao Feng F8HP	VHF	1, 4, 8 W	144	X
	UHF	1, 4, 7 W	440	
Zastone UV8DR	VHF	1, 5 W	144	X
			220	
	UHF	2, 4 W	440	

USE ONLY FOR 2M.
144-148 MHz VHF Band
RF Input Power 0.5 - 5 W
Output Power 30 W

Notes:
1. All HT radio antenna connectors are SMA-M.
2. HT use of the RS HTA-20 requires use of an SMA-F to PL-259 Jumper

GECO operates on a shoe-string budget. The interoperability of all radios, antennas, and batteries provides flexibility and resilience. The enables field radios to reinforce the base station if priority is give to sheltering in place. If evacuation is necessary, GECO field radios, antennas, and batteries are ready. [**Note:** We are working on developing portable EchoLink SysOp and a separate portable repeater capability as well.]

FFI about GECO Radios, Antennas, and Batteries

GECO Radio Systems
2018 GECO Mobile Radio/Antenna Systems
2018 GECO HT Radio/Antenna Systems v4

Planning Your Battery Needs
GECO_Power Interconnectivity
GECO Standard Battery Harnesses_Connectors

GECO Battery Box Quick Connect-Disconnect System
GECO Field Battery Box Upgrade
GECO Field Battery Box Upgrade 2
GECO_Station Emergency Power-Battery Back-up
EmComm Readiness: HT Battery Charging

Base Station Antenna Back-up Plan

This is the GECO plan should any base station antenna be damaged or put out of service for any reason. The Diamond F-718A is mounted on a separate mast. The HH-9000 is on a Magmount outside a window. All mobile and field antennas would be mounted on an emergency 3.6 m / 12 ft tall PVC mast enough for to clear the roof peak. The emergency mast would be secured to the porch railing.

Main porch mast

F-718A mast

This chart shows the possible GECO radios and antennas substitutions if any base station antenna is damaged		Diamond X3200a (440/220/2m)	Diamond X200A (440/220/2m)	Home brew (440/220/2m)	Yagi (440/2m)	Diamond F-718A (440)	HH-9000 Quad band (70 cm / 2m / 6m / 10m)	TMS-1602 folding (70 cm / 2m)	Comet SBB224 (70 cm / 1.25m / 2m)	HH-9000 Quad band (70 cm / 2m / 6m / 10m)	N9TAX Slim Jim roll up (70 cm / 2m)	DBJ2 J-pole roll up (70 cm / 2m)
Radios / Frequencies		**Base Station**						**Mobile[1]**			**Field**	
TYT TH 9800	440/70 cm	♦	♦	♦	♦	*This antenna is dedicated for the KM6EON-R EchoLink Repeater.*	♦	♦	♦	♦	♦	○
	144/2 m	♦	♦	♦	♦		♦	♦	♦	♦	♦	○
	6 m	N/A	N/A	N/A	N/A		♦	N/A	N/A	♦	N/A	N/A
	10 m	N/A	N/A	N/A	N/A		♦	N/A	N/A	♦	N/A	N/A
QYT KT 8900	440/70 cm	♦	♦	♦	♦		♦	♦	♦	♦	♦	○
	144/2 m	♦	♦	♦	♦		♦	♦	♦	♦	♦	○
QYT KT8900R	440/70 cm	♦	♦	♦	♦		♦	♦	♦	♦	♦	○
	220[2]/1.25 m	*Not US Band Plan*			N/A		N/A	N/A	N/A	N/A	N/A	N/A
	144/2 m	♦	♦	♦	♦		♦	♦	♦	♦	♦	○
Bao Feng UV5R[2]	440/70 cm	◇	◇	◇	◇		◇	◇	◇	◇	◇	⊙
	144/2 m	◇	◇	◇	◇		◇	◇	◇	◇	◇	⊙
Bao Feng F8HP[2]	440/70 cm	◇	◇	◇	◇		◇	◇	◇	◇	◇	⊙
	144/2 m	◇	◇	◇	◇		◇	◇	◇	◇	◇	⊙
Zastone UV8DR[2]	440/70 cm	◇	◇	◇	◇		◇	◇	◇	◇	◇	⊙
	220[2]/1.25 m	*Not US Band Plan*			N/A		N/A	N/A	N/A	N/A	N/A	N/A
	144/2 m	◇	◇	◇	◇		◇	◇	◇	◇	◇	⊙

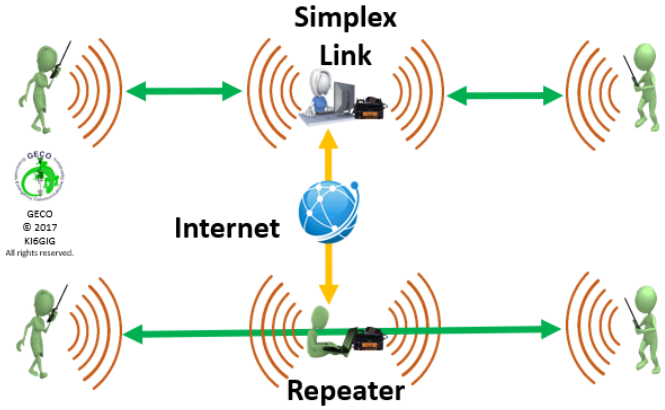
Notes: 1-Use appropriate magmount. 2-Not US band plan. ○=BNC-F to SO-239. ♦=no adapter needed◇=Standard SMA-F to SO-239 adapter. . ⊙=BNC-F to standard SMA-F.

Linking EchoLink SysOp Nodes

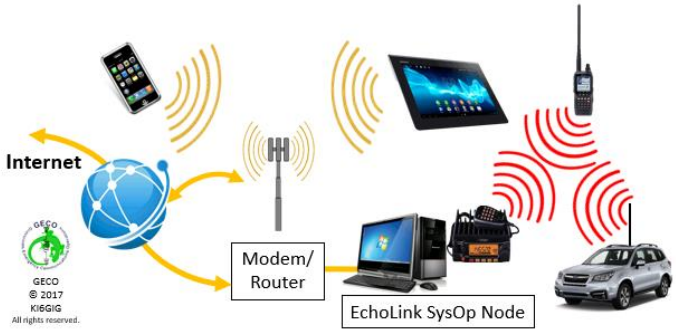
Mention EchoLink and a common cry is "It's not real HAM radio." With the rise in digital electronics and integration of computing technology in "real" HAM radios, we wonder what is all the flap about?

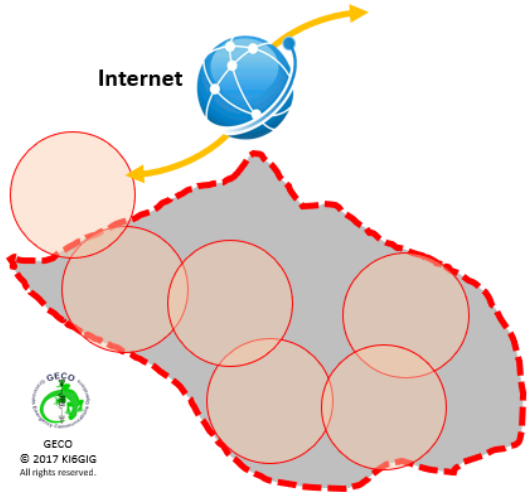
EchoLink was created by Jonathan Taylor K1RFD to ***extend the range of HAM radios*** by using VOIP (Voice Over Internet Protocol). The free EchoLink program can be implemented in 3 different ways: User (on a computer, tablet, or cell phone without a radio), or in SysOp mode (as a simplex link or as a repeater) when connected to radios.

We have advocated the use of EchoLink for EmComm based on the SysOp mode. This requires the interfacing a radio with EchoLink. There are two EchoLink SysOp modes: simplex link or a repeater (see diagram on the left). Two radio operators out of range of each other cannot contact each other. The Link Net Control can pass traffic between them. The Repeater node lets the two operators talk directly to each other with or without a Net Control. [**Note:** For EmComm, GECO only uses Directed Nets which requires a Net Control operator.]



EchoLink SysOp mode allows for a diverse mix of communications tools: radios, computers, cell phones, and tablets. This relies on RF (radio frequency), cell service (Internet, data, WiFi) technology. All of these adds resilience to your EmComm capabilities. If the Internet goes out, EmComm operations continue using RF and standard traffic relay methods. If the RF conditions are poor, EmComm can continue using VOIP. If both the Internet and RF conditions are not working. GECO advocates the use of non-radio EmComm methods. In the end, no single EmComm method or technology is perfect or bullet-proof. The more diverse your EmComm tool box, the better you will be able to hope to have a working EmComm network. Disasters are many and varied. No matter what your EmComm plan, once a disaster happens, initial chaos will reign until you can assess the situation and organize your response.



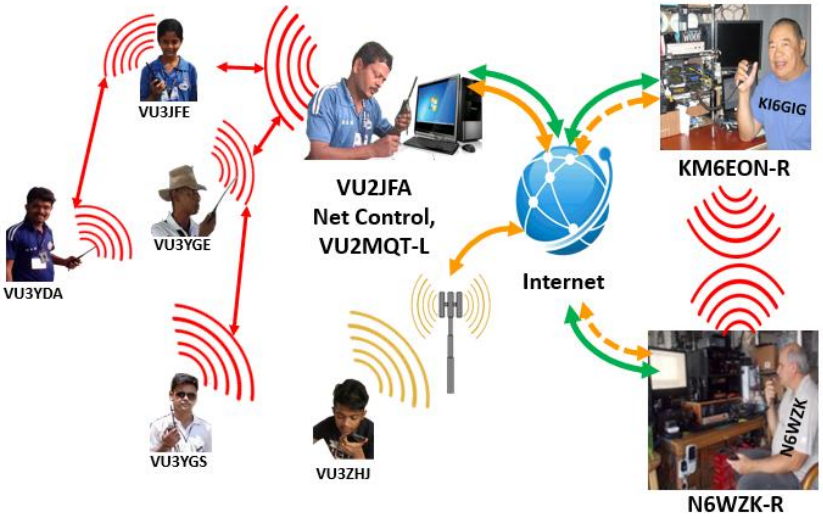


Linking EchoLink SysOp stations adds more resilience for an EmComm net. In the diagram to the left, each circle is an EchoLink SysOp station in RF range of another SysOp station. A common EmComm scenario is to assume repeaters are knocked out.

The stations inside the disaster area (shaded gray bounded by the red dashed line) lost their Internet, cell data, and WiFi. They can RF relay traffic to a station outside the disaster area with an Internet connection to relay traffic to the rest of the world.

Link nodes are easier to set up especially as portable emergency units. The more link nodes Within RF range of each other you can have in your area, the better an EmComm net you weave. Even more resilience is produced when all EchoLink SysOp stations are set-up to be interoperable to share radios, battery power, and antennas. This is demonstrated by the GECO back-up radio and antennas plans in the first two article of this newsletter.

The diagram on the right is an EchoLink SysOp Link node GECO suggested to the West Bengal Radio Club (WBRC). They began to implement this conceptual scheme. But before it was operational, parts of it were put into EmComm use. See the story about the Telinipara EmComm incident in India. None of the multiple India emergency services agencies on the scene had any radio communications. WBRC HAMs on the disaster scene were not able to make radio contact with their base station 15 km away. A WBRC HAM on site and at the base station used EchoLink on their cell phones to connect to KM6EON-R in Los Angeles, CA 13,138 km outside of India.



This is not an isolated case of a disaster where the Internet was still working. During the 2017 hurricanes Harvey, Irma, and Maria, core Internet connections survived. Not all local branches of those networks remained in tact, buy a significant number did. There are many reports and stories of people using cell phone apps for weather, VOIP and text communications to save themselves and to help others. In the broadest senes of the phrase, this is EmComm. It is grassroots and not the formal EmComm of ARES and RACES, but it is EmComm.

GERC Emergency Communicator's Creed

Mark N7YLA is our first Elmer. He is responsible for getting Greg KI6GIG licensed. Mark founded the Glendora Emergency Response Communications (GERC) group, as well as the 501(c)(3) non-profit Southern California Intermountain Repeater Association, Inc. (SCIRA).

Mark has actively created many learning opportunities for people to become HAMs and to foster many others to become active in EmComm.

As a direct result of Mark's efforts, Greg went to become a GERC supporter and member. When Greg retired and went to Thailand, he founded the Rural Training Center-Thailand EmComm program. This became Grassroots Emergency Communications Operations (GECO). When Greg left Thailand and returned to Los Angeles, be founded the Wanderers Amateur Radio Club (WARC) to implement GECO in southern California. All of Greg's efforts bear the strong imprint of Mark's thoughts and ideas regarding EmComm.

One of Mark's strong influences is the words and ideas of the GERC Emergency Communicator's Creed. Perfection and 100% compliance are ideals that often get confounded by the realities of everyday life. Every HAM EmComm operator should strive to attain as many of the skills and practices stated in the Creed. Over time, the hope is to be as complete as possible.

Gordon West (WB6NOA) suggests another EmComm ideal: to be able to get on the air within 60 minutes in response to a disaster. Together, these form the basis for a simple litmus test for EmComm readiness.

The GERC Emergency Communicator's Creed

- *My own house is in order, I have all the resources to get my family through an emergency.*
- *I am well informed on what to do and how to respond in an emergency. I keep my skills in First aid, CERT, and Disaster Communications Training up to date.*
- *I maintain well equipped personal and communications response bags and keep items in them current.*
- *I practice my communications and survival skills by participating in at least yearly outdoor camping and communications events.*

There are many facets to Emergency Preparedness and Emergency Communications. The Internet abounds with links and references to these broad topics. Here are some suggested starting points.

Emergency Preparedness:

https://www.fema.gov/pdf/areyouready/areyouready_full.pdf

Emergency Communications:

https://www.fema.gov/pdf/areyouready/areyouready_full.pdf