



GECO Mobile Radio/Antenna Systems

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Ready to Serve and Sustain Our Community

This paper is a continuation of our recent effort to assess the interoperability of GECO radio equipment. (See [2018 GECO HT Radio/Antenna Systems v4](#)).

GECO mobile radios are used for: 1) our base station, 2) mobile and field portable stations, and 3) backup to the Wanderers Amateur Radio Club (WARC) KM6EON-R EchoLink repeater operating at 445.060 MHz.

The repeater operates 12 hours / day.

Mobile and field portable stations may occasionally be used several hours per day testing repeaters to support the WARC and Mid-Cities Amateur Radio Club (MCARC). Some GECO mobile radios are designated as emergency spares for the WARC EchoLink repeater.

GECO general operational plans are to work out of the base station conducting recon scout trips. We have the capacity to participate in short-term (1-2 day) special events. We do not have the capacity to deploy for EmComm operations. However, we do have contingency plans to evacuate the station if necessary.

Basic GECO Mobile Radio Kit

Each GECO Mobile radio kit has the following:

- Transceiver
- Cooling fan
- Microphone
- Callsign placard
- FCC license (copy) and Log book
- 7.6 m RG58 coax (PL259/PL259)

Note: All GECO mobile radio power cords. These were modified with Anderson PowerPole connectors. This gives us flexibility to have two connection options to GECO batteries at the base station or in the field.



QYT KT8900 field radio box.



*TYT TH9800
Quad Band Base Station*



*QYT KT8900
Dual Band Field Radio*



*QYT KT-8900-R
Dual Band Backup Radios*



*TYT TH9800DD
Quad Band Field Radio*

Mobile Radio System Survivability







All radios (except the base station unit) are stored in surplus military ammo boxes. The boxes are sealed against water / dust and serve as Faraday cages. They are very easy to pick-up and go if we need to evacuate the station. For example, the photo on the right shows a QYT KT8900 mobile radio storage box. The storage box is a surplus military ammo can ~15cm X ~30 cm X ~19 cm. It contains the QYT KT8900 radio, cooling fan, microphone, User Manual, GECO memory frequency reference card, a copy of the FCC license, call sign placard, log book, and 7.6 m RG58 coax (PL259/PL259).

In an identical can are components shared between GECO mobile and HT radios. This box contains: the RS HTA20 2M 30w amplifier, two different (a J-Pole and a Slim Jim) dual band (144-450 MHz) roll up antennas and nylon paracord, extension coax cables (RG714 and RG58), and needed adapters indicated in the radio summary charts (starting on pages 5-6).

GECO Mobile Power Supply Options

The GECO base station power battery bank system is described in the report [GECO Station Emergency Power-Battery Back-up](#). The upgraded battery bank has Anderson quick disconnectors (see [GECO Battery Box Quick Connect-Disconnect System](#)). This makes it easy to 1) easily break down the battery bank for station evacuation; and 2) to add / subtract field battery boxes to the station battery bank/charging system.







Each field battery / battery box is fitted with a standardized wiring harness. (See [GECO Standard Battery Harnesses Connectors](#).) This consists of an inline fuse holder, Anderson PowerPole connectors, and 12 VDC accessory socket. This permits any GECO mobile radio to connect to any GECO field battery or battery bank.

GECO Mobile Power Supply Options		TYT TH9800	QYT KT8900	QYT KT8900R	TYT TH9800D
12 VDC Station Battery Bank 	<ul style="list-style-type: none"> Has twelve 16 Ah batteries for radios; nine for 120 VAC EchoLink equipment Anderson PowerPole 12 VDC accessory plug 	■	■	■	■
19A Regulated Power Supply  In: 120 VAC Out: 13.8 VDC	This unit is connected to the Base Station Battery Bank and UPS battery charging system.	■	■	■	■
12 VDC 16 Ah Battery 	<ul style="list-style-type: none"> 12 VDC accessory plug Anderson PowerPole connectors to radio 	■	■	■	■
12 VDC 16 Ah Field Battery Box 	<ul style="list-style-type: none"> Has three batteries 12 VDC accessory plug Anderson PowerPole connectors 	■	■	■	■
12 VDC Car Battery 	12 VDC accessory plug with Anderson PowerPole connectors to radio	■	■	■	■
HTA20 2M Amplifier  In: 0.5-5W Out: 30W 12 VDC	<ul style="list-style-type: none"> Anderson PowerPoles to battery SO239 to coax to antenna and radio 	■	■	■	■
Notes: The amplifier: 1) can ONLY be used for 144 MHz (2m) operations; 2) set radio TX to low power.					

Notes: The station battery bank consists to two sections: 1) Radio Power: a set of twelve 12 VDC 16 Ah batteries; 2) Internet/EchoLink Power: a set of nine 12 VDC 16 Ah batteries for 120 VAC station equipment. There are two field battery boxes, each with three 12 VDC 16 Ah batteries. We also have two single batteries available for field use or bench testing: 1) A 12 VDC 16 Ah battery; 2) a 12 VDC 11 Ah battery.

Battery Charging

All battery chargers are fitted Anderson PowerPole connectors. This enables any battery charger to charge any GECO battery and battery box. All batteries are kept on float charge. The base station battery bank is on float charge but set up to automatically switch to 12 VDC if commercial main power is lost. The field batteries are on float charge to be ready for use at short notice. During field use, the guide line is to draw batteries down to 80% of full charge (i.e. discharged only 20%) before being recharged. All batteries returned from field use are recharged. Once fully charged, they are put on float charge for maintenance.

		<h3 style="text-align: center;">GECO Lead-Acid Battery Chargers</h3> <ol style="list-style-type: none"> 1. Cen-Tech Automatic Battery Float Charger (69955) 2. Deltran Battery Tender Plus 3. Cen-Tech Battery Charger (60431) 4. CyberPower 850VA VRA Uninterruptable Power Supply (modified) <p>Note: All chargers require 120 VAC power supplies.</p>
		
		<ol style="list-style-type: none"> 5. 1.5-watt Solar battery float charger <p>Note: A 12 VDC accessory plug and battery clips are supplied with the charger.</p>
 <p>Originally intended for car-to-car jump starting via the 12 VDC accessory sockets in both vehicles.</p>		<ol style="list-style-type: none"> 6. Titan Auto 12V DC Cigarette Lighter Charger Cord 7. Thunderbolt 4 amp 12 VDC Solar Charge Controller <p>Note: This charging option uses a vehicle's charging system AND requires the use of the solar charge controller (Item #7).</p> <p>Note: Use a 12 VDC accessory socket on the Solar Panel leads via Anderson PowerPoles to connect Item #7.</p>
<p>Note: In the future, we would like to have larger solar panels installed for our based station and at least one 125 W solar PV panel for field operations. Both would require better solar charge controller units.</p>		

Mobile Radio Antennas / Alternative Antennas

As of Mar 2018, the main operational mobile radio antennas are on the mast at the base station and a dual band (144/440) folding mobile antenna on a Magmount on a car. We need to expand out mobile field antenna inventory. The table below is the current inventory of GECO antennas available for use with our mobile radios. Antennas highlighted in tan are mounted at the base station and are not available for field use. The yellow highlight is an advisory note to TX with LOW power when using HT antennas with mobile radios.

Mobile & HT Antennas, Antenna Mounts & Cables / Fittings

All the following antennas can be connected to all GECO Mobile Radios. Remember, just because combinations of adapters enable you to use any antenna with any radio doesn't mean it makes sense to do so. Always use the least number of adapters / jumper cables possible to minimize dB losses.

During emergencies, you can use an HT antenna with a mobile radio. Be sure to TX at **LOW** power. Most HT antennas are rated at ~ 10 watts.

power. Most HT antennas are rated at ~ 10 watts.					Coax/Adapter		
Mono & Dual Band Antennas	1	Larsen Kulrod (220B)			NMO→	NMO magmnt	
	1	On station	Dual Band Yagi (144/440)		BNC→	Adapter L / Coax 1	
	1	mast	Diamond X200A (144/440)		SO-239→	Coax 1	
	1	N9TAX Slim Jim roll up (144/440) RG58			SO-239→	Coax 1	
	1	HT Ant.	HPA-771 (144/430)	Use ONLY at Low power on mobile radios	SMA-Female-outside thread→	Jumper M1 to radio	
	XP-771 (144/430)		SMA-Female-outside thread→		Adapter H to SO239 magmnt Adapter K to Coax 1 to radio		
	1	TMS-1602 folding antenna (144/430)				PL-259→	SO239 magmnt
	1	DBJ2 J-pole roll up (144/440) RG174			BNC-Male→	Adapter G	
		DBJ-2 Extension cable RG174			BNC- Female / BNC- Male→		
	Tri-/ Quad band Antennas	1	On station	Diamond X3200A (144/220/440)		SO-239→	Coax 1
1		mast	Homebrew Tri-band Vertical (144/220/440)		SO-239→		
2		HT Antennas	HT whip RD-377 (144/220/440) HT whip RD-301 (144/220/440)	Use ONLY at Low power on mobile radios	SMA-F-outside thread→	Jumper M1 to radio Adapter K to Coax 1 to radio	
2			HT whip JT-776 (144/220/430)		SMA-Male outside thread→	Adapter H Adapter I	
					Adapter J		
2		Comet SBB224 (146/220/446)				PL259→	SO239 magmnt
2		At station mount	HHTX H-9000 Quad band (2m/6m/10m/440)		PL259→		
Magmounts	1	3" base Workman RG58	Base NMO (to antenna)		Coax (to radio) PL259→	None needed	
	1	3" base Tram RG58	Base NMO (to antenna)				
	1	4" Diamond RG58	Base SO239 (to antenna)				
	1	5" Salvaged RG58	Base SO239 (to antenna)				
	1	Hypario UV (144/430) RG174		Use ONLY at Low power on mobile radios	SMA-Female-outside thread→	Jumper M1	
	1	Nagoya UT-108UV (144/430) RG174			SMA-Female-outside thread→		
Color code		At station; not available for field use.			TX use Low Power Warning		



We plan to make or acquire vertical mono band and yagi antennas for 144, 220, and 440 MHz. These are intended for field and portable operations. They will be used in field testing efforts with Mid-Cities Amateur Radio Club for their repeaters and other network projects (i.e. scouting alternative operating sites in the event of station evacuation).

GECO Mobile Radio/Antenna Systems Summary Tables

The following summary tables show the antennas and accessories that can be used for the four types of mobile radios in the GECO inventory. For each radio, the items highlighted in light blue are antennas assigned to that radio. Station antennas are in tan highlight. All other items can be shared between all the mobile and HT radios. Using a dual band antenna with a tri-band HT limits it to dual band operations. Using a tri-band antenna with a dual band mobile radio does not impair the dual band radios' performance so long as the operating bands are compatible with the antenna. Under no circumstances should HT antennas be used the KT8900 or KT8900-R mobile radios. The lowest TX power for these radios is 20 watts. Most HT antennas are only rated to about 10 watts.



TYT TH-9800 144/430/6m/10m/ Mobile



This is the GECO Base Station Radio. It primarily operates on 440 MHz and 144 Mhz. This radio monitors the WARC KM6EON-R EchoLink Repeater. It is the primary radio used for local 2m nets.



<div>TYT TH9800</div> <div>Quad Band</div> <div>Base Station</div> <div>Radio</div> <div></div> <div>SO-239</div> <div>TX: 5, 10, 20,50</div> <div>watts</div> <div>12VDC</div>	Dual-Band Antennas	TMS-1602 folding antenna (144/430)		PL-259→	SO239 Magmnt				
		DBJ2 J-pole roll up (144/440) RG174		BNC-Male→	Adapter G				
		N9TAX Slim Jim roll up (144/440) RG58		SO-239→	Coax 1				
		Diamond X200A (144/440)		SO-239→					
		Dual Band Yagi (144/440)		BNC-Male→	Adapter L / Coax 1				
		HT Ant.	Hypario UV (144/430) RG174		SMA-Female-outside thread→	Jumper M1 to radio			
	Nagoya UT-108UV (144/430) RG174								
	HPA-771 (144/430)		SMA-Female-outside thread→		Jumper M1 to radio				
	XP-771 (144/430)		SMA-Female-outside thread→					Adapter H to SO239 magmnt	
	Use for emergency ONLY ; TX at LOW power.					Adapter K to Coax 1 to radio			
	Tri & Quad Band Antennas	Comet SBB224 (146/220/446)		PL259→		SO239 Magmnt			
		HHTX H-9000 Quad band (2m/6m/10m/440)		PL259→		Coax 1 on station mast			
		Diamond X3200A		SO-239→					
		Homebrew Tri-band Vertical		SO-239→					
		HT Ant.	RD-377 (144/220/440)	SMA-Female-outside thread→	Jumper M1 to radio		Adapter K to Coax 1 to radio		
			RD-301 (144/220/440)						
			JT-776 (144/220/430) (20 w rating)	SMA-Male-inside thread→					Adapter H
Adapter I									magmnt
Use for emergency ONLY ; TX at LOW power.					Adapter J to Coax 1 to radio				
Color Code		Items assigned to this HT radio unit.		At station; not available for field use.					









Zastone QYT KT8900 144/430 Mobile Radio

This is the GECO Primary Mobile Field Radio for general mobile operating and repeater testing. It primarily operates on 144 and 440 MHz. It can be used to monitor the KM6EON-R and for supporting MCARC repeater testing on 144 and 440 MHz.

<div>QYT KT8900</div> <div>Dual Band</div> <div>Field Radio</div> <div></div> <div>SO-239</div> <div>TX: 20,25 w</div> <div>12VDC</div>	Dual-Band Antennas	TMS-1602 folding antenna (144/430)		PL-259→	SO239 Magmnt	
		DBJ2 J-pole roll up (144/440) RG174		BNC-Male→	Adapter G	
		N9TAX Slim Jim roll up (144/440) RG58		SO-239→	Coax 1	
		Diamond X200A (144/440)		SO-239→		
		Dual Band Yagi (144/440)		BNC-Male→	Adapter L/Coax 1	
	Tri & Quad Band Antennas	Comet SBB224 (146/220/446)			PL259→	SO239 Magmnt
		HHTX H-9000 Quad band (2m/6m/10m/440)			PL259→	
		Diamond X3200A			SO-239→	Coax 1 on station mast
		Homebrew Tri-band Vertical			SO-239→	
		HT Ant.	JT-776 (144/220/430) (20 w rating)	SMA-Male-inside thread→		Adapter I to SO239 Magmnt
Use for emergency ONLY ; TX at LOW power.			Adapter J to Coax 1 to radio			
Color Code	Items assigned to this HT radio unit.			At station; not available for field use.		

Zastone QYT KT8900R 144/220/430 Mobile Radio							
GECO has two of these Tri-band radios. But the 220 MHz is outside the US HAM band plan. One radios is a backup radio for portable field operations on 144 and 440 MHz Mhz. The other is a spare radio for the WARC KM6EON-R EchoLink Repeater. If necessary, both could be replacements for the KM6EON-R repeater radios.							
<div>QYT KT8900R Tri-Band Backup Radio</div> <div></div> <div>SO-239 TX: 20,25 w 12VDC</div>	Mono & Dual-Band Antennas	Larsen Kulrod (220B)		NMO→	NMO magmnt		
		TMS-1602 folding antenna (144/430)		PL-259→	SO239 Magmnt		
		DBJ2 J-pole roll up (144/440) RG174		BNC-Male→	Adapter G		
		N9TAX Slim Jim roll up (144/440) RG58		SO-239→	Coax 1		
		Diamond X200A (144/440)		SO-239→			
	Tri & Quad Band Antennas	Dual Band Yagi (144/440)		BNC-Male→	Adapter L/Coax 1		
		Comet SBB224 (146/220/446)			PL259→		SO239 Magmnt
		HHTX H-9000 Quad band (2m/6m/10m/440)			PL259→		
		Diamond X3200A (146/220/446)			SO-239→		Coax 1 on station mast
		Homebrew Tri-band Vertical (144/220/430)			SO-239→		
		HT Ant.	JT-776 (144/220/430) (20 w rating)		SMA-Male-inside thread→	Adapter I to SO239 Magmnt	
						Adapter J to Coax 1 to radio	
		Use for emergency ONLY ; TX at LOW power.					
Color Code	Items assigned to this HT radio unit.			At station; not available for field use.			

TYT TH-9800D 144/220/6m/10m/ Mobile										
A GECO Field radio primarily operating on 220 MHz and 144 Mhz. It is mainly to support Mid-Cities Amateur Radio Club repeater testing.										
<div>TYT TH9800D</div> <div>Quad Band</div> <div>Field Radio</div> <div></div> <div>SO-239</div> <div>TX: 5, 10, 20,50</div> <div>watts</div> <div>12VDC</div>	Mono & Dual-Band Antennas	Larsen Kulrod (220B)		NMO→	NOM Magmnt		<div></div>			
		TMS-1602 folding antenna (144/430)		PL-259→	SO239 Magmnt					
		DBJ2 J-pole roll up (144/440) RG174		BNC-Male→	Adapter G					
		N9TAX Slim Jim roll up (144/440) RG58		SO-239→	Coax 1					
		Diamond X200A (144/440)		SO-239→						
		Dual Band Yagi (144/440)		BNC-Male→	Adapter L/Coax 1					
		HT Ant.	Hypario UV (144/430) RG174		SMA-Female-outside thread→	Jumper M1 to radio				
			Nagoya UT-108UV (144/430) RG174							
			HPA-771 (144/430)		SMA-Female-outside thread→		Jumper M1 to radio			
			XP-771 (144/430)		SMA-Female-outside thread→					
	Use for emergency ONLY at LOW power.						Adapter H to SO239 magmnt			
							Adapter K to Coax 1 to radio			
	Tri & Quad Band Antennas	Comet SBB224 (146/220/446)		PL259→	SO239 Magmnt					
		HHTX H-9000 Quad band (2m/6m/10m/440)		PL259→						
		Diamond X3200A		SO-239→	Coax 1 on station mast					
Homebrew Tri-band Vertical		SO-239→								
HT Ant.		RD-377 (144/220/440)		SMA-Female-outside thread→	Jumper M1 to radio					
		RD-301 (144/220/440)								
		JT-776 (144/220/430) (20 w rating)		SMA-Male-inside thread→	Adapter K to Coax 1to radio		Adapter H		SO239 magmnt	
					Adapter I					
Use for emergency ONLY at LOW power.						Adapter J to Coax 1 to radio				
Color Code		Items assigned to this HT radio unit.			At station; not available for field use.					

GECO Adapter / Jumper / Extension List				
Adapter			Uses	
H	SMA-Male inside thread	PL259	• HT antennas (dual or tri-band) SMA-female outside thread to SO239 Magmount	
I	SMA-female outside thread	PL259	• HT whip JT-776 ¹ (144/220/430) SMA-male inside thread to SO239 Magmount	
J	SMA-Female outside thread	SO239	• HT whip JT-776 ¹ (144/220/430) SMA-male inside thread to Coax 1	
K	SMA-Male inside thread	SO239	• HT antennas (dual or tri-band) SMA-female outside thread to Coax 1	
L	BNC-Male	SO239	• BNC-F to Coax 1	
JM1	SMA-Male inside	PL259	• HT antennas SMA-F outside to Mobile radio	
Coax 1	PL259	PL259	• Antenna with SO239 to Mobile radio	
				
G		H		I
				
J		K		L
				
JM1		Coax 1		

This GECO Mobile Radio/Antenna System summary report is current as of Mar 2018. As with so many other HAM station activities, we expect our Mobile Radio/Antenna Systems to change over time. We are planning to add additional portable field antennas for our Mobile radios. 🌱