

**GENERAL DYNAMICS HOOK2™ GPS  
COMBAT SEARCH AND RESCUE (CSAR) SYSTEM  
FREQUENTLY ASKED QUESTIONS (FAQs)**

***The following information is intended to address some frequently asked questions about the General Dynamics Decision Systems HOOK2™ GPS CSAR system and the current status of our offerings in this area.***

**1. GENERAL INFORMATION/HISTORY**

***Q. Is General Dynamics Decision Systems a new player in the CSAR market?***

A. No, we have been involved in the development CSAR radios for 25 years. On 28 September 2001, Motorola Inc. sold its Integrated Information Systems Group to General Dynamics. The employees at General Dynamics Decision Systems have been producing CSAR radios since the mid-1980s. We have shipped radios and interrogators to military and government customers in U.S and non-U.S. locations, so our organization is well known within the CSAR-user community. In fact, our system is the current, *de facto* standard, with more systems over the last 20 years than any other CSAR solution.

***Q. Approximately how many AN/PRC-112 CSAR radios of all versions have been delivered to date?***

A. Around 25,000 AN/PRC-112 radios were produced and delivered to users in all of the major branches of the U. S. military as well as 11 NATO countries and 10 other nations. Of these, we have upgraded about 7,000 to date to the AN/PRC-112B1 version by adding GPS position location and encrypted two-way messaging via the GPS Appliqué. Added to the 1,000 AN/PRC-112B radios and the 1,200 AN/PRC-112G™ radios sold, the number of world-wide GPS-enabled HOOK2 radios totaled over 9,000 as of May, 2003 and continues to grow.

***Q. What is the name of your current system and what products does it include?***

A. The system is called the HOOK2™GPS CSAR System and includes the following products.

- The **AN/PRC-112B1 radio** is comprised of a legacy AN/PRC-112 radio

upgraded with our new GPS Appliqué. This Appliqué provides U.S. and International owners of legacy AN/PRC-112 radios with a cost-effective way to add GPS and HOOK interrogation. The GPS Appliqué also adds encrypted, two-way messaging convenience to provide a means for downed crewmembers to send messages and protect the critical communication. This capability to communicate directly with the aircrew member provides Terminal Guidance for rescue forces.

- The **AN/PRC-112G radio**, the latest in the line of HOOK2 transceivers, is a software-defined radio that began shipping in December 2002. Designed for growth, the AN/PRC-112G radio can be upgraded with new features and waveforms, either via software download or hardware upgrade, in cases where the capability requires a hardware addition. It still includes all of the features and capabilities of and is interoperable with the earlier HOOK2 and AN/PRC-112 radios.
- The **Quickdraw2™ Handheld Interrogator**, provides airborne search crews with the capability to communicate directly, via line-of-sight, with the PRC- 112B and B1 radios and provides a convenient, flexible, low-cost alternative to bulky radio interrogators built into dedicated search aircraft. The light, portable unit conveniently plugs into the intercom system of virtually any military aircraft available without any aircraft modifications.
- The Rockwell Collins 125G is currently available as an airborne **Personal Location System (PLS) with the integrated ability to interrogate the HOOK waveform. Consisting of an Antenna Unit, a Control Unit and a Processor Unit, the New RSC-125G provides multi-beacon, multi-platform and multi-mission flexibility for rotary and fixed wing platform installations.**
- The **GPS-112 Program Loader** enables the user to easily and quickly load GPS and DME I.D. codes, datum, waypoints, frequencies and encryption keys into the AN/PRC-112B (HOOK 112), AN/PRC-112B1, and AN/PRC-112G transceivers. The Program Loader also loads the legacy AN/PRC-112 (frequencies and DME I.D. codes), as well as Quickdraw, Quickdraw2, HOOK suitcase and URC-QD2 briefcase interrogators. The Loader now includes a new set-up wizard and cloning feature and can also load new Operating System software and new waveforms/operating modes as upgrades become available.

***Q. What does the HOOK2 GPS CSAR System bring to the fight?***

A. The HOOK2 System brings the following benefits to bear: an encrypted data burst capability; line-of-sight and beyond line-of-sight communications; robust system with redundant communication and reporting paths; terminal guidance capability via secured LOS; an architecture compatible with the current C4I

structure; solid, proven systems; interoperability with allies for coalition operations; GPS interference detection with DME as an independent geo-location; user friendly, intuitive man-machine interface. The HOOK2 System brings a truly battlefield proven, user-endorsed, dependable way to help protect and find our people or allies.

***Q. How does the HOOK2 GPS CSAR System provide communications security?***

A. The HOOK2 System protects communications in a variety of ways:

- The GPS position and two-way message data is encrypted
- Encrypted two-way messaging reduces the need for voice communications
- The interrogatable HOOK waveform data burst provides a level of Low Probability of Detect/Low Probability of Interception (LPD/LPI) not seen before in survival radios
- The transmission takes a fraction of a second, adding to LPI/LPD protection
- Additional security-related waveforms or capabilities are planned for the AN/PRC-112G radio include: 406 SARSAT, 2-way SATCOM; DAMA-C; and AES encryption.

***Q. Can the HOOK2 GPS CSAR System communicate over-the-horizon (OTH) when I need to communicate to distant personnel and assets that are not within direct line of sight of the radio?***

A. Yes, the HOOK2 System, in conjunction with other assets, can currently provide OTH communications in two ways. First, the AN/PRC-112B, AN/PRC-112B1 or the AN/PRC-112G radio can transmit the pilot's current situation and GPS location to a secure tactical network via satellite data burst, using national assets to disseminate the information worldwide. Second, because the Quickdraw2 Interrogator has two relay modes (manual and automatic), it can relay messages and position from an AN/PRC-B, AN/PRC-112B1 or AN/PRC-112G radio to other Quickdraw2 units in aircraft or command centers.

In addition, the following OTH communications paths are currently under development or consideration for the AN/PRC-112G radio:

- 406 SARSAT beacon mode is currently under development and is scheduled for initial testing in the June time frame and certification testing at a certified SARSAT US Government test facility in September 2003. This waveform will meet the SARSAT International Standards.
- A 2-way SATCOM function (dedicated channel) has already been demonstrated in the AN/PRC-112G radio and will be productized as a

software upgrade to the radio. The final determination of when this waveform will be productized will be based on customer demand.

- DAMA-C waveform could be added to the AN/PRC-112G radio as a software upgrade. The DAMA-C enabled Hook/PRC-112 system would include a SATCOM radio such as our Digital Modular Radio as the base station/SIPRNET interface.
- Global Personal Recovery System (GPRS) L/S band OTH is also a planned future capability. General Dynamics has completed a proof of concept with an AN/PRC-112B1/G and an MTS GPRS during the JFEX 2002 at Nellis AFB.

***Q. Motorola and General Dynamics have manufactured several different CSAR systems, several different radios and several interrogator models/versions. Can you list them and explain the difference?***

A. Over approximately 20 years, 14 different versions of the AN/PRC-112 and other radio models have been made, with or without DME and with other customer-requested features or changes. In addition, multiple versions of an Interrogator and other CSAR products have been produced. For more complete details, please refer to Appendix A for the full table.

***Q. Does General Dynamics have training classes available for its HOOK2 products?***

A. Yes, we have a 2 1/2 day training class that is available at our General Dynamics facility in Scottsdale, Arizona or at your site. Please consult our website for details at [www.gdds.com/radioproducts](http://www.gdds.com/radioproducts) or call us at 800-424-0052.

## **2. PROCUREMENT/AVAILABILITY**

***Q. Since the mid-1990s, aircrews have needed a CSAR radio with integrated GPS to make it easier for rescue forces to locate downed aircrew. When will this capability be available?***

A. General Dynamics Decision Systems is shipping two radios with this capability now as part of the HOOK2 GPS CSAR System. We are adding GPS location precision and encrypted two-way messaging to the AN/PRC-112 radio, using a new GPS Appliqué, to become the AN/PRC-112B1 radio. Upgrading existing PRC-112 radios is a cost effective solution for U.S. military and International forces that already own PRC-112s. In addition, we began shipping the latest HOOK2 radio, the AN/PRC-112G transceiver, which has these capabilities integrated into the radio. And the radio has a new, low price, which makes it an excellent value for CSAR operations. Both of these products capitalize on previous logistics and training investments in HOOK2 products.

***Q. Have National Stock Numbers been issued for the HOOK2 GPS CSAR System?***

A. Yes, the United States has assigned the following NSNs for products in the HOOK2 family:

<u>PRODUCT</u>	<u>NSN#</u>
AN/PRC-112B1 radio	5820-01-493-9675
AN/PRC-112G radio	5820-01-504-5465
Quickdraw2 Interrogator	5895-01-494-5228
GPS-112 Program Loader	5895-01-497-5386

***Q. What's the turnaround time now for converting an AN/PRC-112 radio into a B-1 once an order has been put in?***

A. The turn-around for upgrading standard, operational AN/PRC-112 radios with the GPS Appliqué, to form an AN/PRC-112B1 radio, is approximately 30 days under normal circumstances.

***Q. How can I procure the HOOK2 products?***

A. General Dynamics Decision Systems is currently selling HOOK2 products through DOD contracts, on a GSA contract, via a U. S. Army CECOM contract for Foreign Military Sales (FMS) and by direct sale. To learn more about the various contract vehicles, please contact Geri Evans at [Geri.Evans@gdds.com](mailto:Geri.Evans@gdds.com)

### **3. CSAR SYSTEM COMPARISONS**

***Q. What is the operational difference between the AN/PRC-112B1 and the CSEL System?***

A. One of the main differences is that the General Dynamics HOOK2 system provides direct secured communications between the Search and rescue forces and the downed aircrew member for terminal guidance. The HOOK2 AN/PRC-112B1 and AN/PRC-112G radios communicate to the on-scene rescue forces as well as CSAR command and control centers (CAOC, JSRC) through a variety of redundant communication paths (see Appendix C for a diagram). These include transmission of a HOOK data burst with a position message relayed over-the-horizon (OTH) through National Assets; by direct interrogation using our new, handheld Quickdraw2 Interrogator in any suitable aircraft (fixed or rotor wing, manned or unmanned UAV) or by a Personal Locator System radio built into dedicated CSAR aircraft. With the HOOK2 System, the on-scene commander controls the communications directly. The rescue forces with either a Quickdraw2 or a PLS receives terminal guidance via LOS data communications to the downed aircrew thus, it is truly a CSAR System. The CSEL System routes communications through a centralized system, using a series of government-operated gateways that to relay communications to a central commander.

***Q. Are there other significant differences between the systems?***

A. Yes. The AN/PRC-112G and AN/PRC-112B1 radios feature a capability called GPS interference detection that displays the presence and relative strength of any GPS interference that might be present. This allows the user to take

effective measures, possibly including switching to DME as an alternative, independent location determination if GPS is denied. This feature is not available on the legacy AN/PRC-112B radios.

The HOOK2 system also features continuous GPS position location update at a rate of 1 per second and this information is processed in real time from both the Nationals and U-2 or UAV to the HAVE CSAR aircraft. On the other hand, the CSEL GPS is not continuous and information can take considerable time to reach the rescue forces.

The HOOK2 CSAR system also includes our interrogatable HOOK waveform that provides interoperability across the thousands of delivered radios in our product line.

Also, the HOOK2 system features the handheld Quickdraw2 Interrogator, a portable interrogator that can be carried on to virtually any aircraft. The CSEL system does not include a man-portable interrogator product and CSEL does not have Terminal Guidance (secured LOS) capability.

Finally, the HOOK2 system is exportable (under U. S. Department of State regulations) and future feature upgrades will be offered as separate options so we can continue to offer exportable models. This system has been sold to many International countries and has been used in coalition operations, including the recent Operation Iraqi Freedom.

***Q. How do the communications methods differ between the AN/PRC-112B1 radio and other proposed search and rescue radios such as the CSEL System?***

A. The PRC-112B, PRC-112B1 and AN/PRC-112G radios all transmit **voice** AND secure **data** via line-of-sight and OTH via National Assets. Other communications methods are currently under development or planned as future upgrades. The CSEL System is currently in development, but the current design only transmits **voice** via line-of-sight and CSEL uses SATCOM for **data** transmissions. Under certain tactical situations, the two-method transmission link may present problems since they do not operate simultaneously, but require the user to switch from one to the other.

***Q. Are there any similarities between HOOK2 and other systems in the communications methods used?***

A. Yes, the CSEL and the HOOK2 systems are both CSAR systems and both communicate via voice or secure data to provide the pilot's GPS location and other critical information to assist in the recovery.

***Q: Doesn't CSEL solve the CSAR problem once and for all?***

A. Once delivered, CSEL will be a capable system for covert SAR tracking/rescue. Current plans, however, anticipate procuring relatively modest

quantities over the next few years. In addition, the Joint Tactical Radio System's (JTRS) Joint Program Office (JPO) will begin to procure JTRS-compliant radios, including handhelds, in the next few years. Nevertheless, past CSAR history has shown that radios remain in the inventory for years after the procurement of newer models. Thus, we expect that the majority of current PRC-112 users will continue to rely on the PRC-112 for many years to come. Additionally, the HOOK2 System (AN/PRC-112B1, AN/PRC-112G and Quickdraw2) will have advantages over CSEL in some applications, such as:

- **Terminal Guidance** via Secured LOS communications, between the downed operator and the rescue forces.
- **Future capabilities** of DAMA-C, 406 SARSAT which meets International standards.
- **Search and rescue operations** in areas without a dedicated Joint Search and Rescue Center. In these operations, on-scene airborne platforms can execute search and rescue operations under local command and control. The HOOK2 system has been flown by UAVs and U2s and these aircraft bring powerful capabilities to compliment traditional CSAR platforms.
- **Multi-national operations with NATO and other allies.** The HOOK2 System is exportable to many countries and has already been bought by several nations, including NATO countries, so it is the rapidly becoming standard CSAR radio for many of our allies. For the foreseeable future, CSEL is a U.S.-only system.
- **Larger scale operations.** The HOOK2 System costs significantly less than CSEL at current price points, meaning more radios can be put in the hands-off more war fighters for a given budget. In addition, the HOOK2 System's B1 and G radios and Quickdraw2 Interrogator provide terminal guidance capability through secured Line-Of-Sight data communications. And, based on over 30 years of CSAR experience, HOOK2, PRC-112 and CSEL would be expected to coexist for some time to come, even with current procurement plans.

***Q: But aren't HOOK2 and CSEL incompatible?***

A. Not at all. CSEL works by forwarding messages and location information via satellite to the appropriate Joint Search and Rescue Center (JSRC), which then coordinates rescue activities. The HOOK2 system also allows messages and location information to be forwarded to the appropriate JSRC, using either a satellite-based National Asset or an airborne platform as relay. With this operational concept, warfighters can work side-by-side with different radios. Both systems use line-of-sight voice communications at the final stage of pickup. The HOOK2 system, however, provides the additional option of immediate, direct interrogation and relay from search and rescue aircraft, using secured LOS data to provide terminal guidance.

***Q: I have heard that the CSEL Operations & Requirements Document (ORD) requires the CSEL radio to have a 4-day battery life but the B1 battery only has 11 hours. Why the difference?***

A. The battery life expected on a radio is linked to the conditions and scenario of operation. In a representative CSAR scenario, as described in the CSEL ORD, the AN/PRC-112B1 or AN/PRC-112G battery mission life is predicted to be greater than 4 days (96 hours using the original BA-5112/U battery) so it meets or beats the CSEL requirement, using the original BA-5112/U battery. In this scenario, the downed aircrew turns on the radio once each hour, updates the GPS position and transmits a data burst with that position; during the terminal phase of the rescue, the scenario assumes that the survivor uses the radio for voice transmission for 15 minutes to effect the rescue.

An alternative set of conditions measures battery life is when the radio is continuously activated. As you would expect, the battery life changes. In this case, the typical life of the B1 and G radio is 11+ hours, while receiving 90% of the time and transmitting 10% of the time, at 25\_C, using the original BA5112 battery. With Radio and GPS appliqué simultaneously activated, this interval will drop to approximately six hours at 0°C. or 11 hours at 25 °C, using the original BA 5112 battery.

A new, higher power/longer lasting battery as well as a re-chargeable version are currently being evaluated. Please contact us for further information at 800-424-0052 or 480-441-4079 or email us at [P26245@gdds.com](mailto:P26245@gdds.com).

***Q: The HOOK2 system uses GPS CA code, rather than PY code. Doesn't SAASM, the latest version of PY GPS, work to avoid jamming and spoofing of the GPS signal?***

A. SAASM (Selective Availability Anti-Spoofing Module) technology, often referred to as P(Y)- code GPS, has been designed to provide a more robust operational capability and reduce spoofing of the GPS signal. However, SAASM implementations that fit the size and power requirements of a handheld unit, and that properly protect PY keying, are only now maturing. If approved by the Government, we expect to implement SAASM in our AN/PRC-112G radio within the next year, with full volume production in the same time frame as CSEL's. In the meantime, we have added a capability called GPS interference detection to both our AN/PRC-112B1 and AN/PRC-112G radios which indicates the detection and relative strength of any GPS interference that is present so that appropriate measures can be taken, including switching to DME as an independent method of determining location. In addition, we are shipping, in volume, a solution with <25 Meter accuracy without DOD-imposed Selective Availability. Even with SA, the accuracy becomes <100 meters, still sufficient to effectively complete a CSAR operation.

***Q: Don't other waveforms provide more communications security than the HOOK waveform?***



A. The current HOOK waveform in the AN/PRC-112B1 and AN/PRC-112G radios, with its short data burst, provides a certain level of LPI/LPD security. Many of the DOD's PRC-112 radios have been upgraded to add this new security. Operationally, the radios we are delivering today significantly improve the communications security of earlier generation CSAR radios. Of course, the operational value of sophisticated communications security features depends on the threat. We are looking into additional waveforms if approved by the Government, which provide increased communications security.

***Q: How can we train and support two systems?***

A. Currently, the Department of Defense (DOD) trains and supports the AN/PRC-90, the AN/PRC-112, the AN/PRC-112B, the AN/PRC-112B1 and the AN/PRC-112G. CSEL is planned to be implemented in 3 Blocks, or versions. For the next 10-20 years, DOD undoubtedly will need to support multiple configurations. Thus, a mixture of CSAR systems is a reality. The proper question is what mix of existing types best meets anticipated needs within available funding.

***Q. What Interrogators can be used with your B1 radios?***

A. Almost any aircraft assigned to a CSAR mission can interrogate the AN/PRC-112B, AN/PRC-112B1, and AN/PRC-112G radios using General Dynamics' handheld Quickdraw2 or Quickdraw1 Interrogator.

These interrogators plug directly into the aircraft communication system through the pilot's helmet/headset. CSAR aircraft equipped with the new Rockwell Collins RSC-125G PLS system can also interrogate the AN/PRC-112B, AN/PRC-112B1, and AN/PRC-112G radios. This system is available now from Rockwell Collins. Existing, dedicated CSAR aircraft equipped with the legacy ARS-6 can interrogate in the DME mode only. The General Dynamics briefcase sized and HOOK suitcase interrogators can also interrogate the AN/PRC-112B, AN/PRC-112B1, and AN/PRC-112G radios.

***Q. How does the cost of the Quickdraw2 Interrogator compare with existing, built-in PLS radios?***

A. The Quickdraw2 interrogator costs roughly one-fourth that of current Personnel Locator Systems prior to considering installation costs for the PLS. Because of the significant reduction in weight and the portable nature of the Quickdraw2, we anticipate significant life cycle cost savings.

#### **4. EXPORT CONSIDERATIONS**

***Q. Do foreign nations have HOOK2 CSAR Systems and are they interoperable with the U.S. HOOK2 System for joint operations?***

A. Multiple foreign nations have already acquired the HOOK2 CSAR System, including radios and interrogators. Many have acquired PRC-112 radios and some of these have been upgraded with the GPS Appliqué to the AN/PRC-112B1 configuration. In addition, several nations have bought the AN/PRC-112G

radio. All of these radios are interoperable and provide communications among allies in coalition operations.

***Q. Are AN/PRC-112B1 and AN/PRC-112G radios and Quickdraw2 units exportable?***

A. The HOOK2 System has been designed to use a type of encryption that the U.S. has previously approved for export to foreign customers under license from the U.S. Department of State.

## **5. RADIO BENEFITS/CHANGES/USE**

***Q. What are the differences between the latest HOOK2 radio, the AN/PRC-112G, and the earlier AN/PRC-112B1 model?***

A. The AN/PRC-112G radio is a software-defined radio that has been re-designed with updated electronics that allow the radio to grow with new capabilities, via a software or hardware upgrade. (See "Future Trends" for complete details about these features.) The AN/PRC-112G is also being offered at a very attractive, reduced price. Please contact Bobby Boyle at 800-424-0052 for further information. A new software capability, GPS interference detection, has been developed for both products. This feature will display the presence and relative strength of any GPS interference it detects so appropriate measures can be taken, including switching to the DME mode to obtain alternative position location information.

***Q. I am familiar with the operation of the HOOK-112 radios. Do I have to re-learn a totally new user interface with the AN/PRC-112B1 and AN/PRC-112G radios?***

A. No. Although significant features and benefits have been added to both the B1 and G radios, they use the same user interface and menu structure that you are familiar with from the HOOK-112. In addition, users tell us that it is very user friendly and intuitive to operate.

***Q. What are the differences between the AN/PRC-112-B1 and the AN/PRC-112B radios acquired by DOD several years ago?***

A. The new, AN/PRC-112B1 radio has many upgraded features and benefits over the previous model. The most important ones are:

(1) We have shortened the time to first satellite fix significantly, so the operator gets a GPS location faster (2.5 minutes, typical, vs. approximately 2 minutes, with 13 minutes as a minimum);

(2) The AN/ PRC-112B1 has lower power consumption and a significantly reduced part count, which should lead to even higher reliability and longer battery life;

(3) The AN/PRC-112B1 has 250 waypoints versus 99 in the earlier model, providing better tracking capability and greater flexibility for mission planning and execution;

- (4) A convenient, earphone hanger is now included for improved ease of use;
- (5) The AN/PRC-112B1 has a backlit, night vision goggle compatible display and keypad. The keypad has enhanced keypad marking for easier night operation;
- (6) Convenient fuel gauge icon; and
- (7) GPS Interference Detection feature indicates detection and relative strength of any GPS interference that may be present.

***Q. If I have my AN/PRC-112 radio upgraded to the AN/PRC-112B1 standard by adding a GPS Appliqué, will I lose any of the radio's original features?***

A. The AN/PRC-112B1 retains all of the original features of the standard AN/PRC-112 radio, including the ability to locate the radio through the Distance Measurement Equipment (DME) transponder. One version, the AN/PRC-112A (C) radios with the Type 1 voice encryption module will no longer have Type 1 encrypted voice after an upgrade. Instead, they will have non-Type 1 encrypted two-way messaging.

***Q. How does the radio upgrade process work and how long will it take?***

A. Owners of existing AN/PRC-112 radios must place a purchase order directly with General Dynamics, or place an order under a direct contract. For international direct sales customers, General Dynamics must obtain an export license from the Department of State prior to accepting an order. Once under contract, you ship your radio(s) to General Dynamics' Scottsdale, Arizona facility. Radios are tested as received to identify those AN/PRC-112s requiring repairs prior to upgrade. Testing and retrofit of fully functional AN/PRC-112 radios takes about 30 days from receipt at General Dynamics. Radios needing repair take longer. Of course, actual delivery times vary based on backlogs, higher priority orders, and availability of parts. For further information about this process, please contact Patti Gutos at 480-441-3137 or, by email at [Patti.Gutos@gdds.com](mailto:Patti.Gutos@gdds.com).

***Q. Batteries for the CSAR radio are a critical part of the system. What is the average life of the AN/PRC-112B1 and AN/PRC-112G HOOK2 radio battery?***

A. The battery life expected on a radio is linked to the conditions and scenario of operation. In a representative CSAR scenario, as described in the CSEL ORD, the HOOK2 battery mission life in the original BA-5112/U battery is predicted to be greater than 4 days so it meets or beats the CSEL requirement. In this scenario, the downed aircrew turns on the radio once each hour, updates the GPS position and transmits a data burst with that position; during the terminal phase of the rescue, the scenario assumes that the survivor uses the radio for voice transmission for 15 minutes to effect the rescue. An alternative set of conditions to measure battery life is when the radio is continuously activated. As you would expect, the battery life changes. In this case, the typical life of the HOOK2 radio is 11+ hours, while receiving 90% of the time and transmitting 10%

of the time, at 25°C using the original BA-5112/U battery. With Radio and GPS appliqué simultaneously activated, this interval will drop to approximately six hours at 0°C. or 11 hours at 25°C, using the original BA-5112/U battery.

***Q. I understand that the BA-5112/U battery may develop a “passive layer” which can affect its use. Can you please explain?***

A. Lithium batteries build up a passive layer between the positive end of the battery cell connecting strip and the positive contact on the battery top during that long periods of storage. When a new battery is installed and the radio is turned on, DO NOT turn the radio off for at least 10 to 30 seconds, even if no sound is heard. This will allow the passive layer to be burned off to allow power to flow correctly.

***Q. On average, how long does it take for an AN/PRC-112B1 or AN/PRC-112G radio to acquire the GPS satellites?***

A. The satellite acquisition time depends on field conditions, radio model, and other factors, such as time since last fix. Time to first fix (TTFF) refers to the amount of time required to lock onto satellites to determine a position fix.

For the **AN/PRC-112B1 or AN/PRC-112G radio** which has a 12-Channel/12-Satellite receiver:

**Hot Start:** Last position fix is less than two hours old and the user has not turned the radio/GPS off.

Average TTFF time: approximately 20 seconds.

**Warm Start:** Last position fix occurred within one week and satellite orbits are approximately the same or the user has turned the radio/GPS off.

Average TTFF time: approximately 45 seconds.

**Cold Start:** Last position fix more than 6 months or AN/PRC-112B1 has been moved more than 1,000 miles from last position fix.

Average TTFF time: 2 minutes and 30 seconds. Worst-case time is 6 minutes. To decrease TTFF time during a Cold Start, select the Time and Position Entry screen from the MENU and enter your estimated position.

If a PRC-112B1 has not developed a position within 6 minutes, the unit may not have a clear view of the sky. To obtain a position, move to another location with a clear view of the sky. Cycle power using the radio VOL/ON/OFF switch and try again. The GPS receiver will not receive satellite signals inside a building or when its view of the night sky is significantly impeded.

The **AN/PRC-112B radio** has an 8-Channel/8-Satellite receiver and is slower to acquire a position.

**Hot Start:** Average TTFF is approximately 24 seconds.

**Warm Start:** Average TTFF time is approximately 54 seconds.

**Cold Start:** Average TTFF time is 13 minutes minimum.

***Q. Does the AN/PRC-112 B1 or AN/PRC-112G radio lose data when the battery is removed, and is there an internal battery that I must replace?***

A. The AN/PRC112B1 and AN/PRC-112G radios both use non-volatile memory storage for critical data retention of GPS receiver data, GPS user ID, encryption keys waypoints, messages, etc. This does not require an internal battery. On the other hand, the legacy AN/PRC-112B radio system used different memory and required battery power to retain data. Based on user comments, General Dynamics adopted non-volatile memory storage in the current radios.

***Q Can I operate the PRC-112B1 under low light conditions?***

A. The AN/PRC-112B1 and AN/PRC-112G radios have been re-designed to add low level, night vision goggle compatible, backlighting of the keypad and display for use in low ambient light situations. However, to avoid over-illumination in covert operations, the backlight has been designed to come on at a low level that the user can increase in intensity if desired. To operate the backlight, the user will need to turn the "Volume/On/Off" knob to the "ON" position (the single, large knob on the side of the radio). This powers on the GPS appliqué and the radio, but not the backlighting. The user, after determining that it is safe to do so, then pushes the keypad button marked "LIT" (second key from the left, bottom row on the keypad) to turn on the display and keypad backlighting.

***Q. What kind of testing do you do to verify the water-resistance of the AN/PRC-112B1 and AN/PRC-112G radios?***

A. General Dynamics performs a Helium leak test on every radio produced. During design verification testing, both the AN/PRC-112 B1 and the AN/PRC-112G radios have passed Environmental Qualification tests including a 50- foot water immersion test, 33- foot water immersion test and a 3-foot water immersion test.

***Q. What other hardware/testing modifications has General Dynamics made to its AN/PRC-112 radio?***

A. General Dynamics has paid close attention to comments from field customers; thus, we have retooled the casting for the housing of the AN/PRC-112 and AN/PRC-112B and modified and stiffened the keypad/display cover to provide a more robust seal for water conditions. Additionally, the new unit has undergone rigorous testing for electromagnetic Interference.

***Q. What checklist is provided to users for loading and how can one assure the frequencies are set for the consecutive radio after the first radio has been loaded?***

A. General Dynamics has developed a checklist and it is now being included in the Government tech order/manual. The radio frequency can be validated by any standard test equipment such as an IFR test set or frequency counter. However, the consecutive loading of various radios has been greatly simplified with the new set-up wizard and cloning feature available in the new GPS-112 Program Loader.

***Q. What makes the 12-satellite version of GPS vs. eight satellites better in a thick jungle environment? Would it give a better satellite lock through the canopy of trees?***

A. The availability of more satellites allows for a faster Time To First Fix (TTFF), faster almanac acquisition and gives the user more satellites to select from to get a fix in the event that some satellites are not operational or there are obstructions. For example, the TTFF for the B1 radio for a warm start is 45 seconds and, worst case, for a cold start is 2.5 minutes, typical. Also, the sensitivity of the 12-channel receivers is improved over the 8-channel as a result of technology advancement.

***Q. What product software version do we need for A) loading and B) interrogating? Is there a possibility of using the older cables for the AN/PRC-112B radio with the new GPS-112 Program Loader?***

A. The most recent software versions of the General Dynamics HOOK2 products are:

- Quickdraw2 Interrogator, Version 2.10
- AN/PRC-112B1 Radio, Version 2.9
- AN/PRC-112G Radio, multiple versions; contact us for correct version for you application
- GPS-112 Program Loader, Version 2.9

Regarding the cables, the answer is Yes: On the new GPS-112 Program Loader, the serial cable for the regular AN/PRC-112B radio IS THE SAME AS the serial cable for the AN/PRC-112B1 and AN/PRC-112G radios. However, there are no cables available for the older version of the Hook Program Loader interface adaptor to use with the new GPS- 112 Program Loader software. In addition, the old Program Loader Adaptor cannot be used with the current Loader software.

***Q. Are the HOOK2 radios better suited for someone landing in the ocean (than the HOOK 112 radios)? Can they withstand the saltwater better than the regular Hook 112 radios?***

A. General Dynamics performs a leak test on every radio produced. During design verification testing, the AN/PRC-112B1 and the AN/PRC-112G radios passed Environmental Qualification tests, including a 50-foot, 33-foot and a 3-foot water immersion test.

## **6. INTERROGATOR/AIRCRAFT BENEFITS/CHANGES/USE**

***Q. How many types of aircraft has the Quickdraw2 been tested?***

A. The Quickdraw2 has been tested on over 39 different fixed wing and rotor Aircraft manned and unmanned. And it has been effectively used on high altitude reconnaissance aircraft to automatically relay the interrogation reply to another Quickdraw2 on the ground or on board a manned aircraft. This same capability can be employed on a UAV as well. Please refer to the list in Appendix B.

***Q. What Interrogator will operate with the AN/PRC-112B1 and AN/PRC-112G radios?***

A. The General Dynamics Quickdraw2™ and legacy Quickdraw handheld interrogators have been specifically designed to interrogate and operate with both radios. In addition, the HOOK waveform capability has been integrated into Rockwell-Collins' new RSC-125G Personal Location System (PLS), which is now available. Consisting of an Antenna Unit, a Control Unit and a Processor Unit, the New RSC-125G provides multi-beacon, multi-platform and multi-mission flexibility for rotary and fixed wing platform installations. In addition, the AN/PRC-112B1 and AN/PRC-112G radios will respond to interrogation by the briefcase and HOOK suitcase interrogators as well as to DME Interrogation by the ARS-6 PLS.

***Q. Does an aircraft need any modification/testing in order to fly with the Quickdraw2?***

A. While we have not tested the Quickdraw2 Interrogator on all aircraft, we have designed the Quickdraw2 unit to operate without aircraft modification and it has been tested on over 39 different aircraft. The Quickdraw2 unit plugs directly into the aircraft communications system via the pilot's headset or helmet, avoiding aircraft modifications. We have developed a variety of Quickdraw2 cables that support a large number of aircraft. Additionally, an operator can configure the Quickdraw2 Interrogator for new aircraft types not already listed with the user-defined configurable setup in the start-up menu or with the GPS-112 Program Loader. The Quickdraw2 unit supports manual entry of parameters (*i.e.*, the microphone output level, push-to-talk, and other parameters are to be software programmable in this mode).

***Q. Many of the "canned" messages are from the downed aircrew member perspective. Can I load in aircraft rescue-type messages into the Quickdraw2 prior to a mission?***

A. Yes. You can use the GPS-112 Program Loader to pre-load up to 25 messages prior to take-off. The capability to add even more messages is currently being planned as a future software upgrade.

***Q. If my mission requires Over-the-Horizon communications to distant personnel and assets that are not within direct line of sight of the radio, can I achieve that with the General Dynamics Quickdraw2 Interrogator?***

A. Yes, Depending on the mission scenario, you have the capability to achieve Over-The-Horizon communications in two ways: direct or by relay. In typical scenarios, the General Dynamics HOOK2 GPS CSAR system communicates voice and secure data via Line-of-Sight, directly into the hands of the on-scene commander and does not use or need satellite communications or require multiple hand-offs. However, when you need to communicate to distant personnel and assets that are not within direct line of sight of the radio, you can use the Quickdraw2 Interrogator's Relay function to relay the information to other

Quickdraw2 units or a series of units in the air or on the land. The Quickdraw2 relays the GPS location information, radio/user identification and encrypted message of the user's condition and environment to another Quickdraw2 Interrogator. In addition, as mentioned above, the HOOK2 System communicates OTH, sending the pilot's current situation and GPS location to a satellite tactical network via a secure data burst, using national assets to disseminate the information worldwide.

We have demonstrated 2-way SATCOM in the AN/PRC-112G radio and plan to implement it in the radio within the next year. And a fully compliant DAMA-C capability is being considered as an additional upgrade.

***Q. Does the new Quickdraw2 have an Auto Relay function?***

A. Yes, if the PTT connection is available to the Quickdraw2, it can operate in the Auto Relay mode.

***Q. Can the regular Quickdraw (older model) interrogate the HOOK2 radios?***

A. Yes, the original Quickdraw Interrogator is fully interoperable with the AN/PRC-112B1 and AN/PRC-112G radios since all of our products are backwards compatible.

## **7. OTHER PRODUCTS AND APPLICATIONS**

***Q. What does the GPS-112 Program Loader do and what products does it program?***

A. The GPS-112 Program Loader enables the user to easily and quickly load encryption key, datum, frequencies and user I. D. codes into the AN/PRC-112B, B1 and G transceivers and the Quickdraw and Quickdraw2 Interrogators. It can also load new Operating System software, including new waveforms, as upgrades become available as well as program the legacy AN/PRC-112 radios.

***Q. I often have to load a number of radios at the same time. How can I perform this operation easily while ensuring that all radios are programmed the same?***

A. The new GPS-112 Program Loader includes a set-up wizard and cloning feature to speed this operation.

***Q. What is included with the New GPS-112 Program Loader and what are the computer requirements to run it?***

A. The new GPS-112 Program Loader includes both new software and new hardware (Programming Interface Radio Adapter and cables). This new software will run on Windows® OS. The old legacy (HOOK112) Program Loader is DOS based only. The new Programming Interface Radio Adapter is an upgrade to allow for the use of standard parallel and serial cables. The legacy HOOK112 Programming Interface Radio Adapter is not compatible with the GPS-112



Program Loader software. The minimum computer system requirements for the new GPS-112 Program Loader software are as follows:

OS: Windows NT®4.0, Windows® 95, Windows® 98, Windows® 98 SE, Windows® ME, Windows® 2000, Windows® XP

Processor: Intel 486, Intel Pentium (for 486, must set Processor Speed in Setup screen to Manual)

Clock Speed: 66MHz or better

Disk Space: 10MB minimum, 15MB recommended for the hard drive

RAM: 24MB or per OS requirements

Parallel Port: ECP, EPP, Bi-directional (all assume a single device is connected, no daisy chains)

Serial Port: one available serial/com port

CD drive: one available

The new Program Loader works on both laptop and desktop computers.

***Q. Will the old Program Loader work with the new AN/PRC-112B1 or AN/PRC-112G radio?***

A. No, the old Loader will not program these radios. However, the new GPS Program Loader will program the AN/PRC-112B, B1 and G radios and all Quickdraw and Quickdraw2 Interrogators. The new Program Loader will also program the briefcase and HOOK2 suitcase interrogators and the legacy AN/PRC-112 radio.

***Q. Does the HOOK2 CSAR System have other uses besides Combat Search and Rescue?***

A. Yes, the system can be used for border patrol, tagging and tracking, and situational awareness applications. In the case of border patrol, the system can warn personnel if they are getting too close to a restricted area like a border or mine field. The interrogatable GPS transponder allows the unit to transmit its position on a periodic basis or when accessed by a remote control center. The SOLDIER911 and other 911 systems are examples of these other uses of the General Dynamics CSAR system.

In addition, we plan to add capabilities to make the AN/PRC-112G radio suitable for BFT applications such as Global Personnel Recovery System (GPRS) technology. Thus, users would need to carry just a single radio for both CSAR and Blue Force Tracking (BFT).

***Q. Can your company make a loader that is compact for use in the field?***

A. Yes, this can be done. To discuss your specific need, please contact Bobby Boyle at 800-424-0052.

## **8. FUTURE TRENDS**

***Q. What is on the horizon for the AN/PRC-112G radio in the future?***

A. Since the AN/PRC-112G radio is software-defined, several features can be added via software upgrade. These include:

- 406 SARSAT Beacon mode (currently under development and scheduled for initial testing in June, 2003 and for certification testing at a certified SARSAT US Government test facility in September 2003. This waveform will meet the SARSAT International Standards.
- A 2-way SATCOM function (dedicated channel) has already been demonstrated in the AN/PRC-112G radio and will be productized as a software upgrade to the radio. The final determination of when this waveform will be productized will be based on customer demand. This demonstration was done primarily to validate link margins and prove that the AN/PRC-112G was a viable satellite communication device.
- The DAMA-C waveform could be added to the AN/PRC-112G radio as a software upgrade in conjunction with 2-way SATCOM.

In addition, several capabilities require the addition of hardware modules. Volume is available in the AN/PRC-112G radio to accommodate such modules as SAASM GPS and GPRS (Global Personnel Recovery System). We have demonstrated the GPRS L/S band OTH capability as part of the Air Force's JEFX 2002. The development, priority and timeframe of some of these features and capabilities will depend on customer demand.

***Q. When the GPRS module is integrated in the AN/PRC-112G radio, does this mean that I would only need to carry a single radio for both the CSAR and the BFT functions?***

A. Yes, users would have the advantages of redundant communication paths and methods for both CSAR and for BFT. The GPRS system will securely support communications among thousands of users simultaneously.

***Q. I have heard about the U. S. military's new radio program, JTRS. What plans does General Dynamics have to address this new requirement in its HOOK2 products?***

A. General Dynamics has been involved or plans to be involved in several of the different JTRS clusters. We were awarded and have been delivering the first, fully Software Defined Radio, the Navy's DMR. Since our AN/PRC-112G CSAR radio is software defined, it can migrate towards JTRS SCA compliance once this has been defined for hardware radios.

## APPENDIX A – LIST OF MODEL AND PART NUMBERS

	<b>Nomenclature</b>	<b>General Dynamics P/N</b>	<b>SPEC</b>	<b>DESCRIPTION-Electrical</b>
1.	AN/PRC-112(V)	01-P21261J001	12-P21600J	Original Standard SAR Radio with DME Transponder (1985)
2.	AN/PRC-112	01-P21261J001	12-P21600J	Standard SAR Radio with DME Transponder
3.	AN/PRC-112	01-P21261J001A	12-P21600J	International Radio with DME Transponder, Formerly J003
4.	AN/PRC-112	01-P21261J001B1	12-P21600J	No DME Transponder, International Radio
5.	AN/PRC-112	01-P21261J001AB	12-P21600J	Refitted-Upgraded PRC11Radio/DME Transponder with improved receiver sensitivity & knob (Assembly Per ECP 5650-0002)
6.	AN/PRC-112	01-P21261J002	12-P21600J	Uses 01-P21307J002 Cover Assembly, Otherwise Same As J001
7.	AN/PRC-112	01-P21261J003	12-P21600J	International DME Radio, Label Change Only, Otherwise Same As J001
8.	AN/PRC-112	01-P21261J003A	12-P21600J	No DME Transponder, Australia
9.	AN/PRC-112	01-P21261J004	12-P21600J	PRC112 Radio/DME Transponder with improved receiver sensitivity and knob (Assembly Per ECP 5650 0002)
10.	AN/PRC-112C	01-P21261J005	12-P21600J	Assembly, Same As J004, Per Customer Request
11.	AN/PRC-112A(C)	01-P21610J001	12-P21601J	PRC112 with type 1 voice encryption
12.	AN/PRC-112B	01-P35000J001	12-P34998J	PRC112 radio with GPS & HOOK waveform
13.	AN/PRC-112B1	01-P49400F001	12-P49343F	PRC112 Radio with GPS and HOOK waveform in a new GPS Appliqué
14.	AN/PRC-112G	01-P46610J001	12-P49698F	Software-defined PRC11 radio with GPS and Hook; GPS Interference detection; software/ hardware upgrade

## APPENDIX A (cont.) – LIST OF MODEL AND PART NUMBERS

	<b>Nomenclature</b>	<b>General Dynamics P/N</b>	<b>SPEC</b>	<b>DESCRIPTION-Electrical</b>
1.	Quickdraw Interrogator	01-P37680J001	12-P37715J	Handheld GPS Interrogator
2.	Quickdraw2™ Interrogator	01-P49800F001	12-P49843F	Upgraded Handheld GPS
3.	Hook Program Loader Adapter Assy.--	01-P38950J001	12-P34999J	Hook Program Loader Interface
		01-P35080J001		Obsolete Old Loader DOS software
4.	GPS-112 Program Loader Kit	67-P49798F001	12-P49478F	GPS112 Program Loader Interface  Windows Based (95/98/ME/2000/NT/XP) & Downloads all stored interrogation and reply data from the AN/PRC-112B1, AN/PRC-112G and Quickdraw2 data into a standard PC. Loader includes one each: radio adaptor, PC to radio connector cable, Quickdraw2 to PC connector and Loader Software disk. Software works on standard PC windows environment. PC is not included.
5.	KY913	01-P21700J001A	12-P33905C	AN/PRC-112 program loader
6.	Hook-112 Suitcase Interrogator	01-P38970J001	12-P34999J	Hook-112 Suitcase Interrogator
7.	Soldier911			Border patrol 112 radio with GPS and TDMA
8.	Korea911			Situation Awareness Soldier112 radio with Vehicle Mount

<b>Table of Supported Quickdraw2™ Cables</b>			
<b>Aircraft Type</b>	<b>Cable Part Number Dwg</b>	<b>Cable Kit P/N</b>	<b>PTT Mode</b>
A-10	30-P49828F & 30-P49841F	67-P49857F	Manual
AC-130U	30-P49828F & 30-P49841F	67-P49857F	Manual
AH-Mk7 (LYNX)	30-P49433F & 30-P49434F	67-P49476F TBD	Manual ***
AV-8B**	30-P49828F & 30-P49829F	67-P49858F	Manual
CH-46E MAN	30-P49851F & 30-P49828F	67-P49864F	Manual
CH53E, MH53E, CH46E AUTO	30-P49850F---TBD	TBD	Auto B
CH-53E & MH-53E* MAN	30-P49851F & 30-P49828F	67-P49864F	Manual
E-2C AUTO	30-P49849F---TBD	TBD	Auto B
E-2C MAN	30-P49829F & 30-P49828F	67-P49858F	Manual
E-3 AWACS AUTO	30-P49830F	67-P49860F	Auto B
E-3 AWACS MAN	30-P49828F & 30-P49841F	67-P49857F	Manual
EA-6B	30-P49829F & 30-P49828F	67-P49858F	Manual
EC-130E	30-P49848F---TBD	TBD	Auto B
F-14 & F-18	30-P49828F & 30-P49829F	67-P49858F	Manual
F-15E & F-16	30-P49828F & 30-P49841F	67-P49857F	Manual
HH-60G (Front)	30-P49828F & 30-P49841F	67-P49857F	Manual
HH-60G (Rear)	30-P49852F	67-P49865F	Auto C
HH-60H AUTO	TBD	TBD	Auto
HH-60H* MAN	30-P49851F & 30-P49828F	67-P49864F	Manual
KC130J	30-P49828F & 30-P49841F	67-P49857F	Manual
M/C130	30-P49828F & 30-P49841F	67-P49857F	Manual
MH-53M/J	30-P49828F & 30-P49841F	67-P49857F	Manual
MH60R/S MAN	30-P49873F & 30-P49874F	67-P49872F	Manual
P3 AIC34 AUTO	30-P49769F & 30-P49764F	67-P49770F	Auto B
P-3 ORION-2 Customs MAN	30-P49870F & 30-P49828F	67-P49871F	Manual
P-3 ORION-1 Customs AUTO	30-P49761F & 30-P49764F	67-P49760F	Auto B ***
PREDATOR/UAV	30-P49828F & 30-P49841F	67-P49857F	Manual
PUMA MAN	30-P49828F & 30-P49841F	67-P49857F	Manual
PUMA AUTO	30-P49873F & 30-P49764F	67-P49765F	Auto B ***
RC135 MAN	30-P49828F & 30-P49841F	67-P49857F	Manual
SH-60B/F/H, MH60R/S AUTO	TBD	TBD	Auto B
SH-60B/F/H* MAN	30-P49873F & 30-P49874F	67-P49872F	Manual
U2 MAN	30-P49828F & 30-P49841F	67-P49857F	Manual
UH-1N	30-P49852F (pending)	67-P49865F	Auto C
<b>Other Radio Interfaces</b>			
U.S. Navy Ships	30-P49762F001		Manual ***
URC-200, URC-QD2, LST-5 Radio AUTO 1	30-P49771F001		Auto A
URC-200, URC-QD2 Radio AUTO 2	30-P49842F001 – Future orders for this cable will be replaced with the 30-P49771F001 Cable		Auto A
URC-200, URC-QD2, LST-5 Radio MAN	30-P49869F, 30-P49828F & 30-P49841F	67-P49768F	Manual

\* Requires Quickdraw2 software version 2.8 or later.

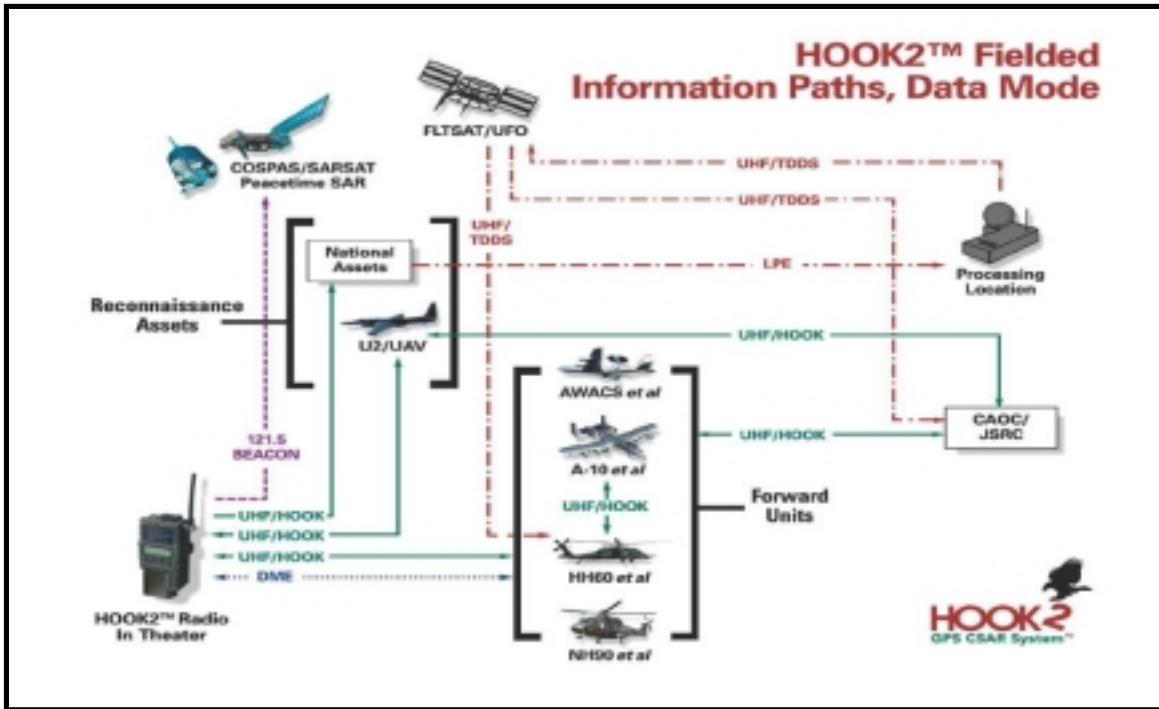
\*\* AV-8B works on all Quickdraw2 software versions using the F-14 setting.

\*\*\* Need Gain Settings

TBD References Future Cable Availability/currently not supported.

Note: Auto A: PTT is shorted (during transmit) to MIC LO, which is connected to ground.

## APPENDIX C – Hook2™ Fielded Information Paths



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