



# PATHFINDER

**The Army GPS Newsletter Since 1994**

An informal electronic newsletter published for the GPS user community by PM GPS. Information presented is based on published and submitted news items of interest to the general user. Widest dissemination and reproduction is encouraged. Newsworthy items are solicited for inclusion. Editor Don Mulligan at PM GPS, Ft Monmouth NJ DSN 992-6137 or (732) 532-6137 or email:

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July 2009

## Military GPS Technology in Army Ground Vehicles

### From The Product Manager



#### **Hello GPS Users!**

Mid-summer 2009 finds the PM GPS shop busy fielding DAGR and working sustainment issues for DAGR and PLGR as well as cooperative research with several

other Army agencies regarding embedded and next-generation military GPS.

I look forward to meeting some of you at the upcoming GPS conference in Michigan. These meetings are great opportunities for my staff to share knowledge but also for us to learn from soldiers and weapon system managers using GPS.

This newsletter includes a great explanation of solar activities from Glen Collins, one of my outstanding GPS program engineers.

Other questions or comments? See the Contact Info on the back page!

*Jay Spencer*

**LTC, QM,  
Product Manager, GPS**



**The Stryker program continues to receive priority attention from Army PM GPS. We have now provided DAGR and installation accessories to seven Stryker-equipped IBCTs to date.**

**Photo courtesy DefenseTech.org**

The next meeting of the GPS Integration Conference will be held on September 15th and 16th at Sterling Heights, Michigan.

The location is 17 miles north of Detroit, adjacent to the US Army Tank Automotive and Armaments Command (TACOM) and General Dynamics Land Systems.

The GPS Integration Conference provides an opportunity for weapon system managers to discuss how GPS technology is incorporated into today's weapon systems and to share 'lessons learned' about installation. It is also a forum to exchange ideas on the next generation of military GPS technology.

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**Only a keyed military GPS receiver provides you with SECURE GPS.**

## PM GPS Deputy Chris Manning Recognized

PM GPS LTC Jay Spencer recently recognized Deputy PM GPS Christopher P. Manning for his many successes.

During the past 30 months, Chris was instrumental in getting funds to field DAGR at a record pace; he also initiated actions to expand the embeddable GPS product line.

Representing PEO IEW&S in the advance party for Base Realignment and Closure (BRAC), he made the transfer of the GPS center of gravity from Ft Monmouth NJ to Aberdeen Proving Grounds, MD a seamless event and completed staffing actions to bring highly qualified new core civilian, military and contract personnel to PM GPS.

Chris moves on to the DAU Senior Service College Fellowship program and Mr. Eric Adair has assumed the duties of Acting Deputy PM GPS.



**LTC Jay Spencer presents Deputy PM GPS, Chris Manning with the Civilian Achievement Medal in recognition of his outstanding work here at Army PM GPS. Chris made the transition of PM GPS activities from Fort Monmouth NJ to Aberdeen Proving Grounds a seamless event with no disruption to Warfighter support.**

## The Impact of Solar Maximum, Flares & Bubbles

### **Glen Collins, PM GPS Engineering**

Even though the Sun is 93 million miles from the Earth, events occurring on the surface of the Sun can impact your GPS receiver and many of the other electronic gadgets that we have all come to depend on.

Like the Earth, the sun has a magnetic field. The sun's magnetic field is much stronger than the Earth's, and it is constantly shifting. These changes generally occur without warning and can result in explosions called **Solar Flares** that act like enormous catapults to fling solar particles out into space with explosive force.

Although the Sun's turbulent surface gives the impression of being random from our view here on Earth, there is actually a pattern that can be seen over time in which solar activities wax and wane on about an 11-year cycle.

So what is a **Solar Maximum**?

Think of the 11-year cycle of the Sun as a series of waves on an otherwise smooth body of water. Between the waves, the water is smooth and glassy, but the peaks of the waves are rough and white-capped.

In a similar way, the solar cycle has periods of time called minimums (or minima if you want to be academic) when there is little or no activity on the surface of the sun, and rough peaks of high activity lasting 1-2 years, referred to as maximums (or maxima). During the Solar Maximum there is a greater possibility of strong flares that can affect Earth's weather, magnetic field, and technology.

If an especially strong flare erupts, it sends out a huge **bubble of energy** particles. This is usually not a big problem and it makes an interesting show for anyone watching the Sun

through a strong telescope.

But if the Earth is in the path of that energy bubble, our weather, radios, telephones, GPS receivers, and even electrical power grids may be in for a few hours of unusual behavior. Why?

That bubble of energy consists of **plasma** made up of roughly equal numbers of positive and negative charge-carrying particles.

In a normal situation, the positive and negative charges in the bubble attract each other and come together in a neutral or uncharged state. But when the particles have been kicked up and energized by the sudden strong force that pushed them out of the Sun, the higher level of energy and speed may keep them separated for a longer time - long enough until they approach the earth! Here comes the problem:

**Continued on page 6.**

## **Best Advice - DAGR Repair Return Procedures!**

All DAGRs are supported by an extended Warranty or Maintenance Agreement. When you return a DAGR for depot repair, your receiver is diagnosed and a replacement DAGR is shipped to your address. The documentation accompanying the replacement DAGR is your authorization to update the serial number accountability.

So your DAGR appears to be faulty or is just plain 'dead'. You checked the battery and power connections. Maybe the Built-in-Test indicates an internal fault. Or maybe there was an accident and your DAGR display screen got whacked, the keypad was torn or your DAGR now consists of several large 'parts'.

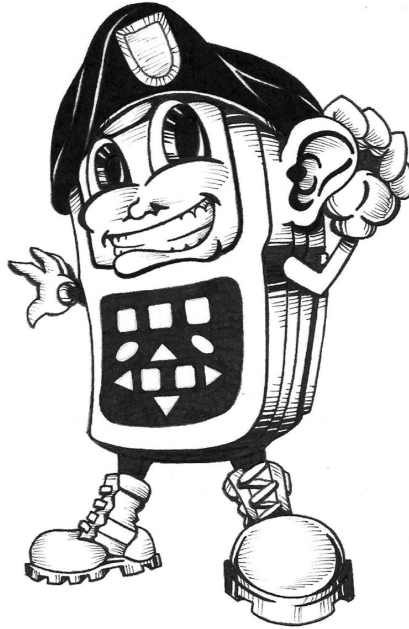
Don't hide it. Don't wait until you get a dozen bad DAGRs! Send faulty or damaged DAGRs back for repair as soon as you can in order to get a replacement!

The procedure is the same whether the DAGR is under a warranty or a Maintenance Agreement. If you have a Direct Support unit, go to them; if not, return the DAGR directly to:

DODAAC: EZ7415  
Rockwell Collins  
855 35th Street NE  
ATTN: DAGR Repair, MS 139-141  
Cedar Rapids, IA 52402-3613  
(mark for "DAGR Warranty")

### **DO THE FOLLOWING:**

1. Remove the main power batteries from the battery pack and **reinstall the empty primary battery pack** to seal the DAGR from moisture.
2. Delete the crypto-key using the MENU, not the "Emergency Zeroize" function. Note: if your DAGR is non-responsive to power, remove the main power batteries and the AA



**Returning a DAGR without a battery pack may result in "no support"!**

memory battery. This "total power cycle" will delete the crypto-key. Now re-install the memory battery and the empty battery pack!

3. Leave the memory battery in place (unless you had to do a "total power cycle" to delete the crypto key). This enables your DAGR to retain fault codes which can be read for diagnosis at the repair shop.
4. Package the receiver to protect it from in-transit damage.
5. Provide essential information on a DD Form 1149 including:

A good Point of Contact and a commercial phone number in case the repair team needs to contact you.

A complete return shipping address w/bldg number (not just your DODAAC!).

Note: The folks at the repair shop will

appreciate any comments such as what you think may be wrong or how long the DAGR was operating prior to failure; anything to help understand what may have caused the fault.

### **DON'T DO THE FOLLOWING:**

1. **Don't return DAGR without an installed battery pack.**
2. Don't return DAGR accessories.
3. Don't remove memory battery.
4. Don't throw DAGRs into a box without adequate packing!
5. Don't send surplus or damaged DAGRs to a Defense Reutilization and Marketing Office (DRMO). The internal security chip requires demilitarization which DRMO is not authorized to perform.

### **THE REPLACEMENT DAGR**

Allow sufficient time for processing before inquiring about the shipment of your replacement DAGR.

How much time? Figure the transit time to and from your location to Iowa plus 5 days "turnaround" time at the depot.

If that amount of time has passed and you still haven't received a replacement DAGR, call PM GPS for status at (732) 532-8406 or DSN 992-8406 or send email via the "Contact Us" link at website. Have the serial #s handy either way.

### **PACKAGING A DAGR**

When returning a DAGR for repair, you need to protect it.

If you have any of the original DAGR fielding containers with the foam inserts, use them! If not, you can refer to MIL-STD 2073 1D for advice on how to package electronic items for safe shipment.

See Para 1.12 in Chapter 1 of the DAGR O&M Manual for more information on how to return a DAGR for warranty repair!

## GPS Integration Conference Coming Up - Call Now!

### Continued from Page One

Recent Secretary of Defense policy promotes greater use of embeddable GPS for weapon systems. The GPS integration conference is a good opportunity for host system designers to discuss their future requirements for embedded GPS.

The conference location is "home turf" for Army vehicle managers at the Tank automotive and Armaments Command or TACOM.

Although Abrams tank production at the Detroit arsenal ended in 1996, the area is still home for Program Executive Offices (PEO) for Ground Combat Systems (GCS), Combat Service and Combat Service Support (CS&CSS) and PEO Soldier.

TACOM is also parent to the Tank Automotive Research, Development, and Engineering Center (TARDEC) and the Armaments Research, Development, and Engineering Center (ARDEC).

The Henry Ford museum in nearby Dearborn is one of America's great collections of vehicular history.

During the conference, Army ground vehicle managers will display or present information on many Army vehicles including Abrams, MRAP, Stryker, Wolverine and vehicles from Heavy Brigade Combat Teams.

Vehicle GPS installations run from 'quick and dirty' to fully integrated. Many vehicles utilize a PLGR or DAGR for PPS-rated GPS but these systems are subject to the new OSD policy requiring the use of embedded GPS devices as part of any major modernization effort after FY12.

Attendees will also be updated on the Army PM GPS initiatives to reduce the size, weight and power requirements for embeddable GPS. PM GPS is seeking input on host



**Contact conference managers Mr Willie Jackson at (410) 278-9379 or Mr Mike Vincelli at (410) 278-9391. The DSN prefix is 298**



**Just a few of the tactical vehicles managed at TACOM include the MRAP, Fox, Mine-Protected Tactical Vehicle and the Wolverine. Photos courtesy General Dynamic and DefenseTech.org websites**

system requirements to ensure we have the right embeddable GPS products available in the future.

The GPS integration conference is open to any DoD weapon system manager, US Contractor providing technical or logistical support to a DoD weapon system or member of military organization. GPS vendors are also invited to present displays at the conference. Registration, security and hotel info is available at the website or by contacting the

Mike or Willie (see box above).

One more thing: PM GPS maintains an online group titled "GPS Ground Receiver Integration Group" or GRIT for short. GRIT members have access to all of the releasable briefings presented at recent GPS integration conferences. Join GRIT by first registering at the GPS website, then contact Willie or Mike and tell them you want to join the GRIT Group.

We hope to see you in Michigan!

## What's Up with DAGR!

### Operating Software:

Recent (March 2009) operating SW update provided improvements for using DAGR with Gun Laying, Azimuth Determination and Laser Range Finder interface. It also included an update of the Earth Magnetic Model (calculating position) and a half-dozen other improvements. Please see the detailed descriptions in the Jan 09 issue of Pathfinder newsletter.

The next (2QFY10) operating SW update will upgrade the signal acquisition and recovery functions, mission data entry and transfer functions (related to map toolkit).

### Hardware:

PM GPS continues development of an improved security chip called SAASM 3.7. In due course this item will be incorporated to production DAGR, probably in FY11. The change in security chip design should have no impact on the user.

Several new DAGR Accessories are in the works, based on requests from field users. These include a new MOLLE carry case, improved DAGR Mount (lockable), DAGR power cable (swivel capability) and Advanced Computer Based Training (ACBT). PM GPS will post the price and availability status for new DAGR accessories to the GPS website and in the GPS Pathfinder newsletter.

### Product Support:

The DAGR production contracts are being transferred from the USAF GPS Wing at Los Angeles CA to the USAF Logistics Center at Warner Robins GA. This transfer should have no impact on procurement or sustainment support to the warfighter. Any changes in Points of Contact for support issues will be posted to the GPS website and the Pathfinder newsletter.



### User Feedback:

PM GPS has a "Human Factors Engineering" survey as well as a short form user survey at the GPS Website. Please take the time to let us hear your likes/dislikes and suggestions for DAGR and the next-generation of handheld GPS receivers.

All of the DAGR product improvements to date are based on USER FEEDBACK so your input will be read and will be used for improving today's DAGR and tomorrow's next-generation receiver.

### DAGR BY THE NUMBERS

#### Nomenclature p/n NSN

AN/PSN-13  
(the first 5,000 DAGRs)

5825-01-516-8038  
p/n 822-1873-001

AN/PSN-13A  
(265,000 and counting)

5825-01-526-4783  
p/n 822-1873-002

### Extension for Completing DAGR Software Installation

**MWO 11-5820-1172-20-4**

Recent newsletters (available at the website) provide details on new DAGR operating software. Versions **984-2461-016** for AN/PSN-13 and **984-3006-006** for AN/PSN-13A are now available. Authorized DoD users can obtain the software through their supporting MWO coordinator, your CECOM LAR or direct from Army PM GPS via the GPS website.

The MWO cited above directs Army users to load new SW within 30 days of receipt of the MWO or to request an extension of that time period. It is important that new DAGR SW be loaded as soon as possible subject to mission and equipment availability. PM GPS recognizes this may be a problem for some units and obtained a blanket extension of 90 days.

The extension memo is at the GPS homepage under "Breaking News".

## The Army Publications Website: <http://www.apd.army.mil>

Your essential GPS pubs are available for softcopy download from the PM GPS website. If you are looking for hardcopy pubs you can establish an account at the Army Publications Directorate (APD) website at the above

### Establishing an APD account

The reference Directive is DA PAM 25-33. Start with DA Form 12-R. You can find it at the back of DA PAM 25-33 or at the APD website. Complete the form, scan and email to the Customer Service Team at: [dolwcustsrv@conus.army.mil](mailto:dolwcustsrv@conus.army.mil) or fax it to (314) 592-0923 (DSN 892).

If you have questions or need assistance filling out DA Form 12-R contact APD at (314) 592-0910 or DSN 892-0910 or email: [CustomerService@mdd.army.mil](mailto:CustomerService@mdd.army.mil)

You can contact Customer Service for order status, availability of pubs or forms or emergency requisitions.

Note the current DA Form 12-R does not provide a block for e-mail address! Write in your email address

in Block 7b of DA Form 12-R so APD can notify you by email when your account is established.

### Maintaining an APD Account

Once your account has been established, keep your info current. If you log in to place an order, that process will keep your account valid but the system will still prompt you to validate your info periodically.

That means updating your DA Form 12-R info when changes occur such as Unit description, Publication officer, Classification level or Change of address.

Keeping your address current is important! If any shipment is returned to Army Pubs due to an incorrect address, the APD account will be frozen until the user submits corrected information.

<http://www.apd.army.mil>

## SOLAR FLARES & BUBBLES

### Continued from page 2.

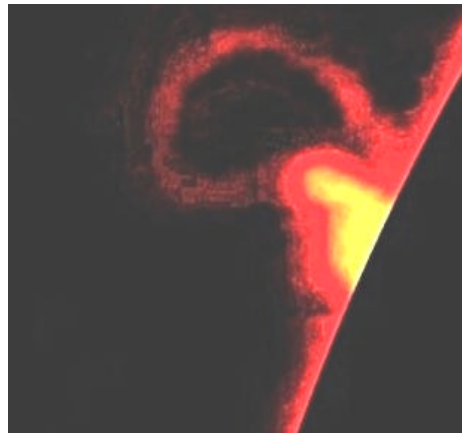
As the bubble comes close to Earth, the positive and negative charges start to collapse and collide with one another. This releases their energy in **electromagnetic waves** that can interfere with technologies that use radio waves including GPS.

That isn't the worst of it though!

If the bubble maintains this strong magnetic field up to the point when it approaches the Earth and if the Earth's and the bubbles' magnetic fields are aligned the wrong way, the result can also produce a **sudden shift** in the Earth's magnetic field.

The most likely place for this sudden shift to occur is in North America where the Earth's magnetic field is low to the surface of the Earth and in close proximity to large populated areas.

A sudden shift can induce **large voltage spikes** into power lines, overloading power stations and potentially disrupting the national power grid. In an event this big, GPS reception may not



**Solar Flares, as shown here in a photo at Wikipedia, have potential to disrupt any radio-based device.**

be your main concern!

Fortunately, a less dramatic and more likely scenario is a **Solar Flare** that causes a lesser disruption of radio signals that lasts for a relative short period of time.

Such an event occurred when a relatively mild pair of solar flares hit in Sep 05. GPS users on the "day-side" of Earth experienced signal disruptions lasting about 15 minutes.

Solar Flares are most likely to occur in

conjunction with a Solar Maximum but the Sep 05 flares were not related to a Maximum which just goes to show how unpredictable the Sun can be!

### Is it possible to predict the **next Solar Maximum** or **Solar Flare**?

Not so much. The National Oceanic and Atmospheric Administration (NOAA) has a panel of experts who do what they can to predict solar events

The NOAA panel projects the next Solar Maximum to peak in May of 2013 but to be weaker than the last Solar Maximum which occurred in 2000.

Solar Flares and bubbles are harder to predict and are often not detected until their impact is already being felt on the Earth.

For more info on the subject, visit the NOAA space weather center website: <http://www.swpc.noaa.gov/index.html>.

We can't control the Sun but we can keep Magnetic Variation data tables (used to calculate GPS position) up to date. PM GPS supplies those updates through periodic reprogramming of GPS receiver software.

## ***There are Two Component Parts to every DAGR***

***When returning DAGR for warranty repair remove the BATTERIES not the BATTERY PACK!***



***Even though the DAGR battery pack has its own part number 987-6641-001 and NSN 6135-01-521-3064, the DAGR is not a complete item without a battery pack!***

The DAGR battery pack is detachable and has its own part number and NSN, so it's a separate item, right?

Yes and No.

Even though it has its own "ID" and you can requisition additional battery packs as 'spares' to make swapping battery packs in the field faster, one battery pack always remains with DAGR as a Component Part!

If your unit uses the DAGR Cold Weather Battery Pack accessory you will need to requisition additional DAGR battery packs as each cold weather set requires two standard DAGR battery packs.

But when you return a DAGR for repair or when you execute a Lateral Transfer to move DAGR to a new owner, you must include one battery pack!

Returning a warranty item or transferring ownership of a DAGR without an installed battery pack is an incomplete transaction.

So what? In the case of DAGR returned to the vendor depot for warranty repair, Uncle Sam has to buy a replacement battery pack to make the receiver "whole" again before it can be issued to a new owner. That is costing us "Big \$".

In the case of Lateral Transfer of DAGR ownership, you need to include the battery pack along with any other items currently listed as BII by the DAGR TM. In the worst case you can attach a shortage list, DA Form 2062. You were issued a DAGR with battery pack so its not right to transfer it without one and to expect the gaining command to buy a replacement.

Besides holding batteries and being a Component Part of the DAGR, the pack has another key function in that it forms a moisture barrier to protect the DAGR's guts and power connections from environmental exposures.

So help us avoid unnecessary costs. Whether it is a warranty repair return or ownership transaction, remove the batteries not the battery pack!

## ***DAGR FIELDING and NET***

During 3QFY09, PM GPS fielded over 15,300 DAGR to Army National Guard units in Missouri, Virginia, Idaho, Rhode Island, Alabama, South Dakota, Nebraska, Kentucky and South Carolina.

### Active duty units at:

40<sup>TH</sup> CAB, CA & UT

7<sup>TH</sup> Army & USAREUR, Germany

3 /4<sup>th</sup> ID, Ft. Carson, CO

8<sup>th</sup> Army, 2<sup>nd</sup> ID, & 210 FA, Korea

16<sup>th</sup> SIG BDE, Ft. Hood, TX

2 /25<sup>TH</sup> SBCT, Schofield Barracks, HI  
and 513<sup>th</sup> MI BDE, Ft. Gordon, GA



***NET manager Jorge Pinargotte with a group of soldiers from 2nd ID Korea checking out DAGRs.***



## **How to Contact PM GPS <https://gps.army.mil>**

### **Product Manager (PM GPS)**

Ft Monmouth, NJ, Warner Robins, GA and  
Aberdeen Proving Grounds, MD

LTC Jay Spencer  
(732) 532-3169, DSN 992-3169  
Ronald.j.Spencer@us.army.mil

### **Deputy PM GPS (DPM GPS)**

Mr. Eric Adair (Acting)  
410) 278-9386, DSN 298-9386  
eric.adair@us.army.mil

### **Army Fielding Manager**

Mr. Dennis Rotenberry  
(410) 278-9372, DSN 298-9372  
dennis.rotenberry@us.army.mil

### **Logistics Manager**

*For Army Logistics Issues*  
Mr. Rodney Griffin  
(410) 278-9388, DSN 298-938  
rodney.griffin@us.army.mil

*For Other Service Logistics issues on DAGR, PLGR*  
Willie Jackson (478) 926-3518, DSN 468-3518  
willie.jackson@robins.af.mil

### **GPS Chief Engineer**

Mr. Frank Rowe  
(478) 926-9511 DSN: 468-9511  
frank.rowe@robins.af.mil

### **Army Weapon System Integrations—DAGR**

Mr. Willie Jackson  
(410) 278-9379, DSN 298-9379  
willie.c.jackson@us.army.mil

### **Army Weapon System Integrations—GB-GRAM**

Mr. Mike Vincelli  
(410) 278-9391 DSN 298-9391  
michael.vincelli@us.army.mil

### **Who to Call for Army Issues?**

Call the Army Logistics Manager for:

- Army GPS User Equipment Policy
- User Equipment Authorizations & Procurement
- Maintenance Status or GPS Loans

Call the Army Fielding Manager for Army DAGR fielding and NET issues.

### **Other Service/Civilian Agencies?**

Contact our representatives at the GPS Joint Service Support Office at Warner Robins AFB, Georgia: Frank Rowe or Willie Jackson as listed in the column at left.

### **Or use the User Information Request Form**

**Go to <https://gps.army.mil>**

**Click on the “Contact PM GPS” tab at the homepage.**

### **Or use the GPS Help Line**

by contacting Mr Willie Jackson (info at left) or

Vincent Solomeno at (410) 278-9371 DSN: 298-9371  
Vincent.solomeno@us.army.mil

### **Please Note**

**We have had some recent personnel changes. If you have trouble reaching anyone at GPS, please use the “contact PM GPS” tab at our homepage and we will route your query to the right person.**

## **Why Use Military instead of Commercial GPS?**

**Soldier Safety! Mission Accuracy! Signal Protection!**

**View the video on the GPS homepage! <https://gps.army.mil>**