



PATHFINDER

An informal newsletter produced for the GPS user community by PM GPS of Project Manager Navigation Systems. 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 Mr. Don Mulligan at PM GPS, PM NAV SYS, Ft Monmouth NJ DSN 992-6137 or (732) 532-6137 or email: Donald.Mulligan@IEWS.monmouth.army.mil

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Visit the Army GPS Website: <http://army-gps.robins.af.mil>

April 2003

GPS was Everywhere in Operation Iraqi Freedom

PM's CORNER



Once again, GPS played a key role in the navigation of the featureless desert. As was the case with Operation Desert Storm in 1991, GPS technology greatly aided ground and air force navigation. Unlike a decade ago, this time there were large numbers of military-rated GPS receivers, primarily the PLGR for ground forces.

While we work on the next generation of GPS receivers (the handheld DAGR and embedded GB GRAM), we also maintain substantial support for the PLGR. Widely used in the handheld mode, PLGR is also connected to a variety of communications, command and control and weapons systems to provide position location and timing data.

In a few cases, the PLGR has been used with systems that were not thoroughly tested in advance: We need to be careful when doing this. Please read the article about VIPER and PLGR in this issue.

If you have any doubt about connecting PLGR to another system, contact us to find out if the host system has published installation instructions or procedures for the use of PLGR.

Good maintenance procedures mean you perform Built-in-Test (BIT) and return faulty equipment for repair when it is detected. Don't accumulate faulty equipment at the unit level. The contractor-operated PLGR repair depot has a solid record of performance but they can't repair a PLGR if you don't return it. Check the repair/return guidance in this issue.

If you need more info, contact my staff in California, Georgia or New Jersey.

Skip Harborth

LTC, US ARMY

PM, GPS

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What is MAGVAR?

Magnetic Variation (MAGVAR) is the variation between true north (the direction to the North pole) and magnetic north (where your compass needle points). As the earth's magnetic fields shift slightly over time, MAGVAR data is used to compensate for the shift so that your displayed GPS position relates accurately to the magnetic references. In a GPS receiver, MAGVAR is a reference table of data stored in the computer memory and its use is transparent to the user.

Is MAGVAR of concern to the typical user?

Magnetic Variations affect the GPS user in the same way they affect the soldier using a map and compass who compensates for the variation between map and compass by adding or subtracting the Declination Angle printed on the map. In GPS, your receiver applies MAGVAR data to adjust your direction when calculating your azimuth and bearings. MAGVAR is not a direct factor in calculating your position location.

It is important that, to the maximum extent possible, all GPS receivers should reference the same MAGVAR data in order to use the same basis for calculating azimuth and bearings. This data is important for way-point & route navigation, but absolutely critical when PLGR is used with Laser Rangefinders for remote targeting.

So if MAGVAR drifts over time, should we update MAGVAR periodically?

MAGVAR data comes from the US Naval Observatory which publishes new magnetic variation data every 5 years or so. Since it consists of a data table in the computer, MAGVAR updates are installed to your

GPS receiver via software reprogramming.

When is the next MAGVAR Update?

Reprogramming over 80,000 PLGR is no simple task and PM GPS had scheduled a PLGR software update including MAGVAR for 2001. However, an unexpected software problem was discovered in 1999 and the decision was made to accelerate the reprogramming to correct the immediate problem. Since that date was out of sync with the next release from the Naval Observatory, we did not include a MAGVAR update.

At this time, the Army plans to initiate a full reprogramming effort in 4QFY03. It will be issued as an MWO / TCTO.. As noted in the PLGR Software article else-where in this newsletter, the new software is available for download from the CE-COM RDIT website. The new software will include the next MAGVAR update.

When the Army PLGR reprogramming is officially announced, all users should implement the MWO / TCTO promptly. PLGR reprogramming hardware kits were distributed previously. Organizations that do not have reprogramming kits should contact their MWO Coordinator or requisition additional kits through DLA. Follow the MWO/TCTO instructions to reprogram PLGRs and report completion through the MWO coordinator.

POC Frank Rowe, Software Engineer, (478) 926-9511 or DSN 468-9511

NAVSTAR. Scheduled Satellite Replacements

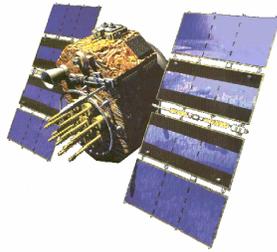
The US Air Force recently launched the newest GPS satellite into orbit as part of the program to maintain a constellation of 24 operating satellites. This is the eighth model of the Block 2 configuration and the 48th since the first satellite was put into orbit back on Feb. 14th, 1989. Four satellites operate in each of six orbital planes at 10,900 nautical miles. The constellation is maintained by the use of on-orbit

spares and periodic launch of new satellites.

The new "space vehicle" replaces satellite number 22 which was launched ten years ago. Although the satellites have a design service life of 7 years, most have lasted longer, often until the finite supply of adjustment rocket fuel is expended. There are no gas stations in space. (Cont'd next page)

Satellites (Cont'd)

The newest satellite contributes to the constellation of 24 operational spacecraft that continuously broadcast a precise navigation signal to millions of users all over the world.



The NANU is an advisory message to inform users of a change in the satellite constellation. NANU are issued 72 hours in advance for routine maintenance. Routine GPS users do not have to monitor NANU messages.

You can visit the Coast Guard website: <http://www.navcen.uscg.gov> and click on "GPS" to see the current status of all satellites and to read the "Notice Advisory to NAVSTAR Users" - NANU.

POC: Tech Management at (310) 363-1459 or DSN 833-1459.

PLGR Repair Return Procedures (warranty and exclusions)

So you think your PLGR is faulty? You've checked the battery, the power connections and/or the self-test still indicates an internal fault. Or maybe there was an accident and your PLGR display screen got whacked or the antenna was broken off (example at right!)



Don't hide the bad PLGR in a desk drawer! Don't wait until you get a dozen bad PLGR! Stockpiling broken PLGRs only makes it harder to get replacements. Send faulty or damaged PLGRs back for repair as soon as the fault is detected.

This PLGR was run over by a military vehicle. It was salvaged for parts as an Exclusion Repair.

The procedure is the same for both warranty and warranty-exclusion returns. If you have a supporting DS go through them; if not, return it directly. The address is:

DODAAC: EZ7415

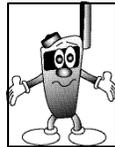
Rockwell Collins

855 35th Street NE

ATTN: PLGR Repair, MS 139-141

Cedar Rapids, IA 52402-3613

(mark for "PLGR Warranty")



"DO" the following when returning PLGR for repair:

Remove and retain the main power battery (e.g. the BA-5800) or AA battery tray.

Delete the Crypto-key using MENU choices **not the "Emergency Zeroize" function.**

Leave the 3.6 volt "AA" memory battery in place.

Package the receiver to protect it from in-transit damage and provide essential information: Your unit Point

of Contact and a commercial phone number in case the repair team needs to contact you. A complete return shipping address including Bldg. number (not just DODAAC!) Use DD Form 1149.

Write down what you think is wrong. Any information about how long the set was operating and what you were doing when it failed helps diagnosis and repair.

"DON'T" do the following when returning a PLGR:

Don't return PLGR accessories.

Don't remove the memory battery.

Don't throw PLGRs into a box without adequate packing – you'll end up with a lot of parts and no replacements.

Don't send PLGR regardless of condition to a Defense Reutilization and Marketing Office (DRMO).

To check the status of PLGR Contact PM GPS at (732) 532-5758/6140 or DSN 992-5758/6140.

Evolving Software for PLGR

When the first PLGR was delivered in 1994, it carried configuration number V04b.2 to indicate the hardware and software version. Later, the software version number was changed to a separate 10-digit number and a second number came into use to distinguish the original PLGR (Baseline II) from the Enhanced PLGR (Baseline III and above). In 1999, a third software version number was issued to identify PLGR+96 software used by selected users. Also in 1999, an MWO was issued to reprogram PLGR in the field. After the reprogramming, the official PLGR software versions were:

Baseline II: 613-9854-003

Selected Baseline III +96 users: 613-9868-006

Baseline III and above: 613-9544-008

In April 2002, an investigation revealed two "anomalies". Here is how each was addressed:

The first anomaly caused the PLGR to continuously reset upon start-up. It was triggered by certain satellite conditions. Changes were made within the satellite segment to temporarily eliminate the circumstances that triggered the anomaly. Rockwell developed a software fix and applied it on the PLGR repair line:

Interim Update Software (late FY02)

Baseline II: 613-9854-004

Selected Baseline III+96 users: 613-9868-007

Baseline III and above: 613-9544-009

The second anomaly caused the PLGR to display an intermittent high velocity when the PLGR was not moving. It occurred randomly when the PLGR was in continuous operation for more than 8 hours. Rockwell developed a software fix and applied it on the PLGR repair line:

Interim Update Software (early FY03)

Baseline II: 613-9854-005

Baseline III PLGR+96 users: 613-9868-008

Baseline III and above: 613-9544-101

In February 2003, CECOM published MWO 11-5825-291-30-4 , TCTO 31R4-2PSN11-507: The Army won't initiate an official reprogramming effort until 4QFY03, but users can obtain current software in advance through the RDIT website.

For ARMY users, Baseline II PLGR (NSN 5825-01-374-6643) is upgraded to version 613-9854-005 and Baseline III and above (NSN 5825-01-395-3513) to version 613-9544-101. The earlier versions, 613-9854-003 and 004 for Baseline II and 613-9544-008 and 009 for Baseline III and above are still acceptable for field use. *At this time*, the Army restricts the use of PLGR+ software to approved users of the Leica Vector VIPER rangefinder.

For Air Force, Navy and USMC users, PLGR+96 software version 613-9868-008 is the preferred software version if the hardware will support it, otherwise use 613-9854-005 as noted for Army users above.

For more info, the MWO/TCTO is available at CECOM RDIT website
<http://rdit.army.mil/rditindex.html>.

Software: (478) 926-9511 or DSN 468-9511.

Army Reprogramming: (732) 532-6136 or DSN 992-6136.

Contacting GPS for help:

Los Angeles Office for PM GPS and Technical Management (TMD): DSN 833-1459 CML (310) 363-1459. Email: Donald.Rice@LOSANGELES.AF.MIL

New Jersey Office for Army Readiness Management (RMD): DSN 992-4733 CML (732) 532-4733. Email: Dennis.Rotenberry@iew.s.monmouth.army.mil

Georgia Field Office (GFO) for Joint Service Sustainment: DSN 468-3288 CML (478) 926-3288. Email: Johnny.Walker@ROBINS.AF.MIL

Who to Call?

For the Space and Control Segments, GPS integration and new products, call California.

For sustainment support including software, supply, technical publications and accessories, call Georgia.

For equipment authorizations, Deferred Maintenance, fielding , host vehicle installations and New Equipment Training, call New Jersey.

Caution: VIPER & PLGR

Several years ago, a pilot program initiated Army use of binoculars fitted with Laser Target Location Systems to provide a new tool to identify targets for engagement by fire support systems. The approved system utilizes an Enhanced PLGR with special software: The Laser Target Locator provides range, azimuth and elevation angle and the PLGR uses "Plus 96" software to compute and display a target grid coordinate. These systems have proven to be very effective in recent combat operations.

Today, several Laser Target Location Systems are in the field. One of these, the VIPER, is based on the Leica "Vector IV" Binocular Laser Rangefinder marketed by Ashbury International Group in the US. It was recently discovered that when the Vector IV is used with a PLGR II or V-PLGR, it is possible for the system to sometimes generate the observer's coordinates as a target when operated in the "Hasty" or "Deliberate" Laser Rangefinder modes. Note: The PLGR II and V-PLGR are non-standard GPS receivers, not purchased by PM GPS and not fully tested for Army-wide use. They were purchase for specific applications and should not be co-mingled with standard PLGR or E-PLGR equipment.

The "self-targeting problem" described above does not affect the Vector IV model when used with an E-PLGR and "Plus 96" software issued in the original Army VIPER program. The CECOM Safety Office has published a Safety of Use Message to describe the safety issue in detail and to provide corrective actions. The manufacturer of the PLGR II and V-PLGR has released software that disables the "Hasty" and "Deliberate" modes on the PLGR II. Leica is working to develop a software patch to prevent inadvertent self-targeting with any PLGR.

If you are using a Leica Vector Binocular Laser Rangefinder (sometimes referred to as a "Viper") connected to a PLGR, we strongly recommend you verify that you are using an approved system. Remember, the use of any Laser Target Location System is still a controlled special issue program.

If you have questions, please contact PM Sensors and Lasers at 703-704-2705/3684/1204 or DSN-654-2705/3684/1204.

New GPS Receiver Program Moves Forward

DAGR is the next-generation handheld GPS receiver, intended to replace the PLGR. Prototypes from two vendors are currently being evaluated as we approach the decision point to select a winning product. DAGR integration demonstrations were recently conducted at Aberdeen Proving Ground and prototypes were successfully used in place of PLGR in the Bradley Fighting Vehicle, Abrams Tank, and the Stryker Infantry Carrier Vehicle (ICV). DAGR prototype also successfully performed Time of Day fill with SINCGARS radios. Our objective is to complete testing and select a winner for the production contract this Fall.

MAJ Hirschman at (310) 363-2925 or DSN 833-2925

Busy PLGR Repair Depot



Shown above, Jim Wilson, a repair technician at the Rockwell Collins PLGR Repair depot in Cedar Rapids Iowa places a repaired PLGR into a pressure chamber to verify the seal before shipping the set back to the owning unit. The Repair Depot processed 6,849 PLGR during the 12 months ending in March 2003 and continues to provide fast turn-around service. When PLGR are received from the field with proper documentation (e.g. complete return address), the replacement PLGR is usually on the way within 5 working days.

Even PM from Navigation Systems makes good use of GPS in Iraq



With map and PLGR in hand, LTC Doug Kuehl of PM Target Identification and Meteorological Sensors (TIMS) departs Camp New Jersey to assist Operation Iraqi Freedom units. PM TIMS and PM GPS are both assigned to Project Manager Navigation Systems. LTC Kuehl was in theater to assist with the installation of Combat Identification Panels (CIPs) on coalition force vehicles. The panels identify friendly forces on the battlefield and aid in reducing fratricide. They were developed by PM TIMS. Like many other deployed soldiers, LTC Kuehl made good use of the PLGR for land navigation.



PM GPS
SFAE-IEWS-NS-GPS
BLDG 563
Fort Monmouth NJ 07703
Mail Account 89