

# M-PA 101

## Part #1: *An Introduction of the M-PA Family of Two-Way Radios*

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### **INTRODUCTION:**

The intent and focus of this series of M-PA articles in the *Sparks31 Adventure Radio Club* will be geared more towards to the individual assembly and construction of not just amateur radio level radios, but also will cover the upgrade to include radios which have the ability to communicate in digital voice using the **AEGIS digital voice format** (9600 baud) in unencrypted mode, which by itself offers a level of protection from eavesdropping by casual listener. Or, taking it the further step of implementing either the following encryption algorithms:

- The US Government's **Digital Encryption Standard** (DES) algorithm encryption <sup>1</sup>(56-bit), published as **FIPS 140-1**, or
- GE's in-house encryption algorithm known as **VGE Encryption** (offered in either 64 or 128-bit versions), and the details of have never been publically disclosed.

### **HISTORY:**

The M-PA series of two-way portable radios in its day was one of the most high-tech portable two-way radios ever conceived, and one of the most rugged. Conceived and developed by General Electric's Private Radio Systems Division in Lynchburg, Virginia, it created a simple modular design scheme where different components can be assembled by almost anyone into a very durable, metal cased and secure voice two-way portable radio.

Something you can drive a 16d nail into a board with, or chock the tire of a fighter jet on the pitching flight deck of an aircraft carrier, then the next moment, pick the radio up and use it for encrypted communications, never skipping a beat.

Based in Lynchburg, Virginia, GE's two-way radio division was always a bit of an underdog compared to the chief rival in the industry: MOTOROLA. For many insiders in the industry, Motorola was always "The Dark Side" of the industry, the EMPIRE if you will, effectively controlling the radio industry through sheer brute force their legions of Corporate Attorney's (aka: Moto's Storm Troopers?). Plucky little GE down in Virginia was the REBELLION. The best thing about being the underdog in a situation is it give you freedom to



SCAN MODEL



SELECT MODEL



SYSTEM MODEL

conceive and execute new ideas. To take cutting edge concepts and run with them. Or as I like to call it; 'Being on the Bleeding Edge of technology'. The M-PA was one of these efforts, which had great success.

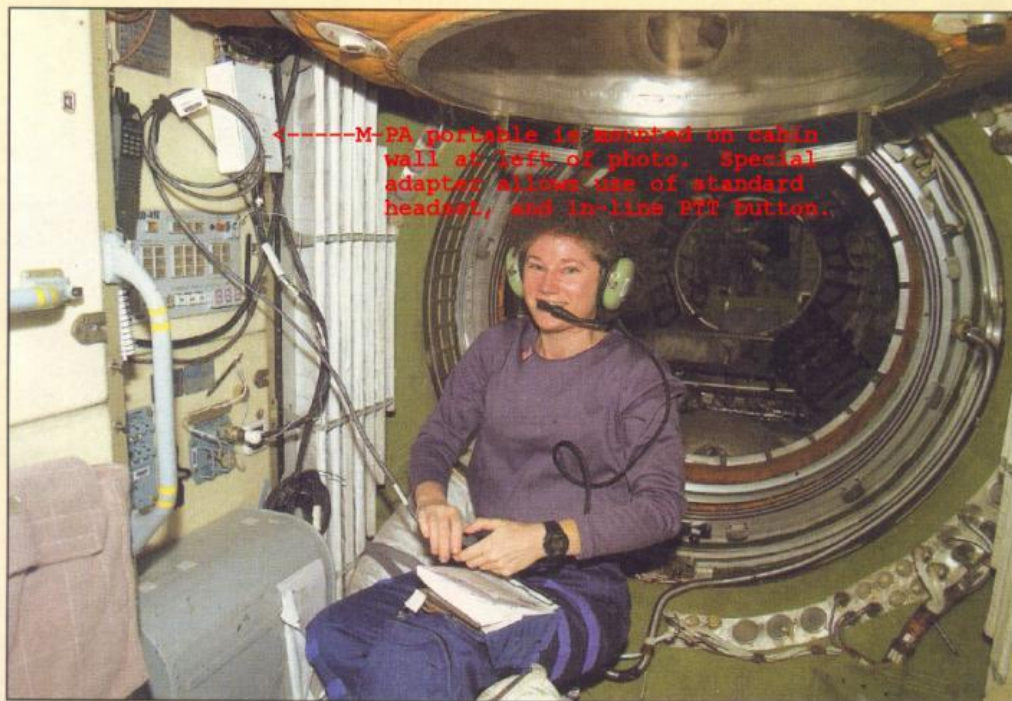
Lynchburg's other major contributions have been: Skeet Ulrich (Jake Green on the TV Series: Jericho), Liberty University, Country Music star Phil Vassar, and of course GE Radios.

*Jack Daniels Whiskey is from that OTHER Lynchburg, in Tennessee!*

### **SURPLUS EQUIPMENT:**

In early 2005, and the US Government's mandated (via NTIA) migration to narrowband modulation (2.5 kHz) for FM analog communications, the workhorse M-PA radio fell by the wayside due to its design, it was a <sup>2</sup>wideband FM (5.0 kHz) deviation only radio. As a result, tens of thousands of vhf-highband (136-150/146-162/157-174 MHz) and low-UHF (406-430 MHz) M-PA portable radio started flooding the surplus market, especially on-line auction websites such as eBay. *Manna from Heaven for the radio hobbyist.*

Speaking of Heaven, did you know the M-PA radio was considered so rugged and reliable, it was the first choice for the **Amateur Radio portable radios aboard the International Space Station (ISS)**? A total of six radios were hand-built for the task, three each on 2 meters and 70 cm.



Astronaut Susan Helms, KC7NHZ, proudly sports her Field Day 2001 pin while operating aboard the International Space Station.

102 December 2001 QST

In this photo, you can see the M-PA radio attached to the bulkhead.

A second, even larger wave of this surplus of non-narrowband radios started in 2007 when the FCC announced the wideband sundown dates for users of FCC issued Part-90 licenses (business, industrial, public safety, etc.). Tons of high quality, rugged as hell, perfectly serviceable radio equipment started appearing on the market from all manufacturers. Often selling for a few pennies on the dollar of their original price tag. For a modest investment of time, money and education, almost anyone with a desire could construct for themselves top quality, digital voice or secure voice two-way portable radios. In the case of Amateur Radio Operators, there was even a special aftermarket firmware available which could be loaded into a radio to allow direct keyboard frequency entry. (M-PA "HamFlash")

### **ADDITIONAL RESOURCES:**

To support this growing interest, on July 21<sup>st</sup> 2005 I started the **GE M-PA Yahoo Group**:

<http://groups.yahoo.com/neo/groups/GE-Mpa/>

Having been the Factory Product Support Engineer of the M-PA radio line for several years before it being discontinued, I had a wealth of product knowledge and documentation I could offer the potential Amateur Radio/Hobby builder. I uploaded to the M-PA group page everything I had on file, gave some introductory information, and let the group grow on its own. As of today, there are over 600 users on the group. I suggest anyone who is serious subscribe to the M-PA group and use it as a reference source.

Keep in mind, whereas the GE M-PA group is hobby oriented, this discussion will distill down the information contained in that forum into a simpler, direct construction conversation, then add on additional information on adding digital voice function and secure voice function (COMSEC) which will only be covered here.

Follow-up articles will cover topic of keyloading (keyfill) of cryptographic keys into the radios for high-level security, accessories, and several unique methods of powering the equipment when common Nickle Cadmium (NiCad) rechargeable batteries, 110 volt AC power would not be available in a grid-down situation.



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**Footnotes:**

1. **DES Encryption** as implemented under the original Federal Standard 1027 (FS-1027) and later republished as the **Federal Information Processing Standard 140-1** (FIPS 140-1) is described as a 64 bit encryption, but defines that structure of DES encryption consist of 56-bits of data, and 8-bits of parity. (56 + 8 = 64 Bits)
2. All models of the M-PA/MTL/P400 below 897 MHz were wideband deviation only, with one exception.
  - a. There was a special **Taiwanese National Police** (TNP MPA) produced in a unique 485-505 MHz, Narrowband deviation, with AEGIS digital voice format and VGE digital encryption.
  - b. There was also a companion **Taiwanese National Police** MDX 25 watt mobile radio produced with identical specifications, *but will not be covered in this discussion*.
  - c. Both of these unique model radios can be instantly identified upon powering up the radio. Instead of displaying the power-up system (channel bank) in the radio, the radio will display instead: **BOOT DSP** for several seconds.