Gigabit Ethernet Switch (GES)
Users Manual

AE301016-001

Rev A

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AERONIX

1775 West Hibiscus Blvd, Suite 200
Melbourne, FL 32901
(321) 984-1671
www.Aeronix.com

Document Revision History

Ver/Rev	Description of Change	Chg'd By	Chg/Rel #	Date
-001/-	Initial Release of Users Manual for the GEN2GES	R. Little	SP-619	10 October 2011
-001/A	Added Section 12 – Performance Parameters	R. Kneapler	SP-640	9 December 2011

Note:

This user manual is Part Number AE301016-001

This manual applies to the Aeronix AE101264
12-Port Gigabit Ethernet Switch

Table of Contents

1. Overview

Designed and produced by Aeronix, Inc. of Melbourne, Florida, the Gigabit Ethernet Switch (GES) is designed for use in hostile environments.

The GES is a lightly managed switch with twelve 10/100/1000BaseT Ethernet ports, and two RS-232 management ports. Its rugged monolithic design is intended to operate in severe environments without the need for forced air cooling.

This document is intended to provide the information required to interface with the Aeronix Gigabit Ethernet Switch (GES) hardware.

The part number of the Aeronix 12-Port Gigabit Ethernet Switch is AE101264-002.

2. Block Diagram

The basic functional blocks within the GES and their basic interactions are shown in Figure 2-1.

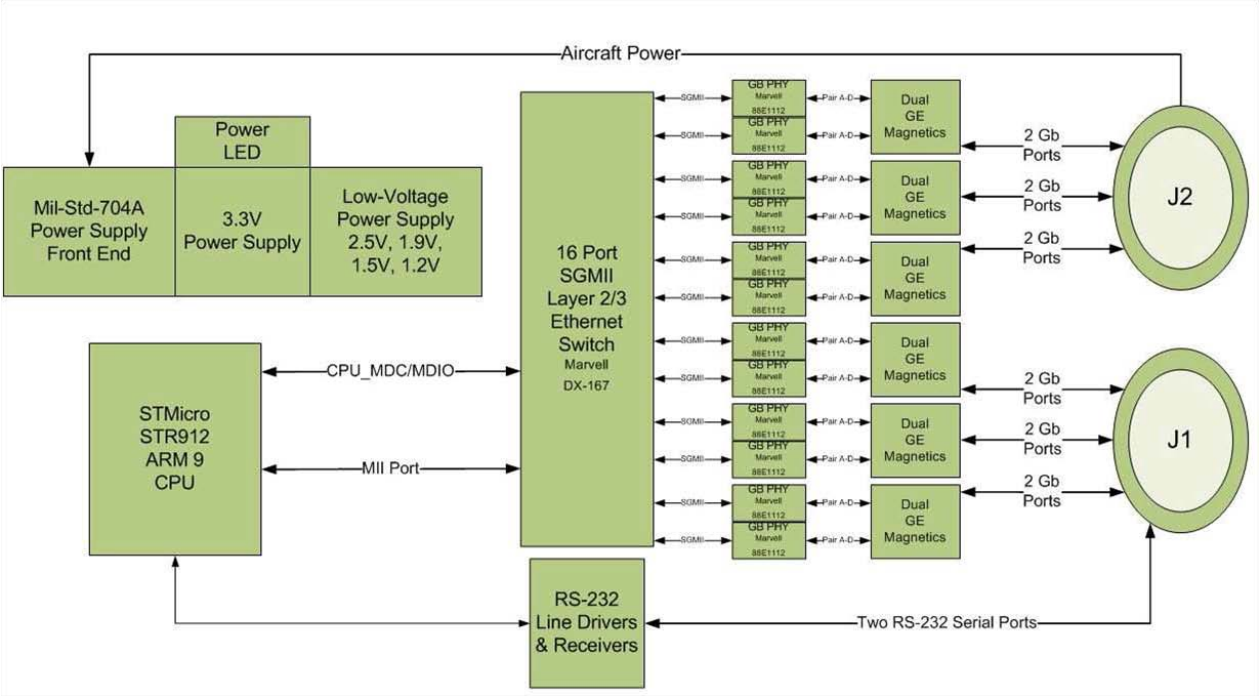


Figure 2-1: GES Block Diagram

3. Electrical Connections

The GES has two electrical connectors, J1 and J2.

3.1. J1 Connector

J1 is a 100 pin M38999 Series II connector, Part Number MS27508E22B35P.

An example mating cable connector for J1 is Part Number MS27473E22B35S.

J1 contains the following electrical interfaces:

- Six Ethernet Ports (0 – 5)
- Two RS-232 Serial Ports
    - DEV1 – Dedicated Maintenance Port for the Management Processor
    - DEV2 – Designed to be programmed as an Ethernet to Serial Bridge

3.2. J2 Connector

J2 is a 100 pin M38999 Series II connector Part Number MS27508E22B35PA.

An example mating cable connector for J2 is Part Number MS27473E22B35SA.

J2 contains the following electrical interfaces:

- Six Ethernet Ports (6 – 11)
- Input Power (nominal 28 VDC per MIL-STD-704A)

3.3. Table 3-1: Connector Pin-outs

J1					J2			
Pin	Signal	Pin	Signal		Pin	Signal	Pin	Signal
1	Chassis Ground	51	Chassis Ground		1	Chassis Ground	51	Chassis Ground
2	Port 0 - A(+)	52	Chassis Ground		2	Port 6 - A(+)	52	Chassis Ground
3	Port 0 - C(-)	53	Port 3 - A(+)		3	Port 6 - C(-)	53	Port 9 - A(+)
4	Port 0 - D(+)	54	Port 3 - C(+)		4	Port 6 - D(+)	54	Port 9 - C(+)
5	Port 0 - D(-)	55	Port 3 - D(-)		5	Port 6 - D(-)	55	Port 9 - D(-)
6	Chassis Ground	56	RX_FROM_DEV1		6	Chassis Ground	56	28VRTN
7	Port 1 - A(+)	57	TX_TO_DEV1		7	Port 7 - A(+)	57	28VRTN
8	Chassis Ground	58	Chassis Ground		8	Chassis Ground	58	Chassis Ground
9	Chassis Ground	59	Port 2 - B(+)		9	Chassis Ground	59	Port 8 - B(+)
10	Port 0 - A(-)	60	Port 2 - C(-)		10	Port 6 - A(-)	60	Port 8 - C(-)
11	Port 0 - C(+)	61	Port 2 - D(+)		11	Port 6 - C(+)	61	Port 8 - D(+)
12	Chassis Ground	62	Chassis Ground		12	Chassis Ground	62	Chassis Ground
13	Port 1 - A(-)	63	Port 3 - A(-)		13	Port 7 - A(-)	63	Port 9 - A(-)
14	Port 1 - C(+)	64	Chassis Ground		14	Port 7 - C(+)	64	Chassis Ground
15	Port 1 - D(-)	65	Chassis Ground		15	Port 7 - D(-)	65	Chassis Ground
16	Reserved	66	Chassis Ground		16	28V	66	Chassis Ground
17	Chassis Ground	67	RX_FROM_DEV2		17	Chassis Ground	67	28VRTN
18	Chassis Ground	68	TX_TO_DEV2		18	Chassis Ground	68	Reserved
19	Port 0 - B(+)	69	Chassis Ground		19	Port 6 - B(+)	69	Chassis Ground
20	Chassis Ground	70	Chassis Ground		20	Chassis Ground	70	Chassis Ground
21	Port 1 - B(+)	71	Port 2 - C(+)		21	Port 7 - B(+)	71	Port 8 - C(+)
22	Port 1 - B(-)	72	Port 2 - D(-)		22	Port 7 - B(-)	72	Port 8 - D(-)
23	Port 1 - C(-)	73	Chassis Ground		23	Port 7 - C(-)	73	Chassis Ground
24	Port 1 - D(+)	74	Chassis Ground		24	Port 7 - D(+)	74	Chassis Ground
25	Reserved	75	Port 5 - D(-)		25	28V	75	Port 11 - D(-)
26	GND	76	Port 5 - D(+)		26	Reserved	76	Port 11 - D(+)
27	Reserved	77	GND		27	Chassis Ground	77	28VRTN
28	Port 0 - B(-)	78	Chassis Ground		28	Port 6 - B(-)	78	Chassis Ground
29	Chassis Ground	79	Port 4 - A(+)		29	Chassis Ground	79	Port 10 - A(+)
30	Chassis Ground	80	Chassis Ground		30	Chassis Ground	80	Chassis Ground
31	Chassis Ground	81	Chassis Ground		31	Chassis Ground	81	Chassis Ground
32	Chassis Ground	82	Chassis Ground		32	Chassis Ground	82	Chassis Ground
33	Chassis Ground	83	Port 5 - A(+)		33	Chassis Ground	83	Port 11 - A(+)
34	Chassis Ground	84	Port 5 - C(+)		34	Chassis Ground	84	Port 11 - C(+)
35	Reserved	85	Port 5 - C(-)		35	28V	85	Port 11 - C(-)
36	Reserved	86	Chassis Ground		36	28V	86	Chassis Ground
37	Chassis Ground	87	Chassis Ground		37	Chassis Ground	87	Chassis Ground
38	Chassis Ground	88	Port 4 - A(-)		38	Chassis Ground	88	Port 10 - A(-)
39	Chassis Ground	89	Port 4 - D(-)		39	Chassis Ground	89	Port 10 - D(-)
40	Port 2 - A(+)	90	Port 4 - D(+)		40	Port 8 - A(+)	90	Port 10 - D(+)
41	Chassis Ground	91	Chassis Ground		41	Chassis Ground	91	Chassis Ground
42	Port 3 - B(+)	92	Port 5 - A(-)		42	Port 9 - B(+)	92	Port 11 - A(-)
43	Port 3 - B(-)	93	Port 5 - B(+)		43	Port 9 - B(-)	93	Port 11 - B(+)
44	Port 3 - C(-)	94	Chassis Ground		44	Port 9 - C(-)	94	Chassis Ground
45	Port 3 - D(+)	95	Port 4 - B(+)		45	Port 9 - D(+)	95	Port 10 - B(+)
46	Reserved	96	Port 4 - B(-)		46	Reserved	96	Port 10 - B(-)
47	GND	97	Port 4 - C(+)		47	Reserved	97	Port 10 - C(+)
48	Chassis Ground	98	Port 4 - C(-)		48	Chassis Ground	98	Port 10 - C(-)
49	Port 2 - B(-)	99	Chassis Ground		49	Port 8 - B(-)	99	Chassis Ground
50	Port 2 - A(-)	100	Port 5 - B(-)		50	Port 8 - A(-)	100	Port 11 - B(-)

3.4. Interface Port Details

3.4.1. Ethernet Ports

All connections in Table 3-1 that have a white background are Ethernet Port connections.

Table 3-2 indicates the appropriate wiring connections for the GES Ethernet ports relative to the available link speeds. Please note that MDI is the preferred connection choice. The GES and most modern Ethernet enabled electronics are capable of connecting using the MDIX scheme, but it is not advised.

Table 3-2: Ethernet Port Connections

GES Pin	RJ-45 Pinout P/N	MDI			MDIX		
		1000Base-T	100Base-T	10-Base-T	1000Base-T	100Base-T	10-Base-T
Port X - A(+/-)	1/2	BI_DA+-	TX+-	TX+-	BI_DA+-	RX+-	RX+-
Port X - B(+/-)	3/6	BI_DB+-	RX+-	RX+-	BI_DB+-	TX+-	TX+-
Port X - C(+/-)	4/5	BI_DC+-	Unused	Unused	BI_DC+-	Unused	Unused
Port X - D(+/-)	7/8	BI_DD+-	Unused	Unused	BI_DD+-	Unused	Unused

3.4.2. Serial and Programming Ports

All connections in Table 3-1 that have an Orange background are Serial Port connections.

The DEV1 serial port is a dedicated GES Management Processor Maintenance Port.

The DEV2 serial port was designed for future expansion as an in-band Ethernet to Serial Bridge.

Table 3-3 indicates the appropriate wiring connections for the DEV1 and DEV2 serial ports.

Table 3-3: Serial Port Connections

Signal	Direction	Type	Connects	Notes
TX_TO_DEVX	Output	RS-232	DB9-2	
RX_FROM_DEVX	Input	RS-232	DB9-3	
GND	Reference	RTN	DB9-5	J1-26,77

3.4.3. Management Processor

The GES provides an ARM 9 processor running at 96MHz for both internal and customer specified functions. This processor is in-band allowing control by any device on the Ethernet network that is connected to the GES.

This processor is lightly loaded after initialization of the GES allowing customer specified functions to use most of the available processing power if required.

The primary purpose of this processor is to:

- Initialize the Ethernet Switch IC for GES default operation
- PBIT and CBIT
- Customer specific functions if required

3.4.4. Input Power

The connections shown in Table 3-1 with a Red background are Power Connections. At least two of the +28V pins and two of the 28VRTN pins must be connected to the power source.

The input power requirements are as specified in MIL-STD-704A:
Aircraft, 28 VDC, Category B (curves 2 &3 of Fig. 9)
During normal operations the maximum power draw of the GES is 22 watts.

4. Port Details

4.1. Ethernet Port Mapping

In its factory default configuration, all twelve Ethernet ports of the GES are configured identically. When programming custom configurations into the GES, the External-Port numbers map to the Switch's MAC and Phy Port numbers as defined in Table 4-1.

Table 4-1 Ethernet Port Mapping

External Port	MAC Port	Phy Port
Port 0	10	4
Port 1	11	5
Port 2	9	6
Port 3	8	7
Port 4	7	8
Port 5	6	9
Port 6	4	10
Port 7	2	11
Port 8	3	12
Port 9	5	13
Port 10	1	14
Port 11	0	15
GES Internal		
Management CPU	CPU Port	n/a

4.2. Serial Ports

There are two serial ports associated with the Management Processor, DEV1 and DEV2. Both ports are RS-232 compatible and operate only at:

- 115.2K baud
- 1 Stop Bit
- No Parity
- No Flow Control

The DEV1 port supports out-of-band configuration management of the GES.

The DEV2 serial port was designed for future expansion as an in-band Ethernet to Serial Bridge. It operates only with the settings indicated above. See section 6.2 for details.

5. Bootloader

The GES management processor (STR912) executes code directly from flash. The GES supports running from either of two internal banks of flash. The smaller bank is dedicated to the bootloader. This allows upgrading of the GES application software in the field over the network. Immediately after power up the bootloader allows nine seconds to begin a code load before it jumps to the application that executes out of the main (larger) bank of flash.

6. Menu Interface

The GES Menu Interface is used for out-of-band control of the GES. It provides the ability to customize configurations and status monitoring.

6.1. Required Hardware

To interact with the STR9 CPU, the following hardware is required:

- Power supply
- Gigabit Ethernet Switch, Part Number AE101264
- Computer with Terminal Emulation software (i.e.: TeraTerm under Windows)

6.2. Serial Port Setup

Serial port setup is 115,200 Baud with N81 and no hardware or software handshaking. The command system is tied to DEV1.

The second UART (DEV2) will reply to an input character with a message string “Saw a NN on port 1\n”, where NN is a hexadecimal representation of the input character.

6.3. Menus

6.3.1. How the menus work

All menu selections require a single character to be input. There is no need to enter a carriage return.

6.3.2. Menu Header

```
GES Software Version: 4.3
GES Bootloader Version: 7
Hardware Serial Number: 1002
MAC Address: 00:0B:D1:08:10:02
FDB Table Index: 984
IP Address[0]: 192.168.1.100
IP Mask[0]   : 255.255.255.0
IP Address[1]: 172.31.129.100
IP Mask[1]   : 255.255.255.0
Temperature:  35 C
```

The menu header is displayed above every menu. The serial number, MAC address and FDB table index are unique to each GES (these values are programmed at the factory and are not modifiable by the customer). The IP addresses and netmasks are configurable by the customer via the RS-232 interface.

6.3.3. Main Menu

```
  Main menu

d    display statistics
u    display UIP statistics
1    MAC port status
2    PHY port status
o    dump MIB counts
c    go to configuration menu
```

6.3.3.1. ‘d’ – display statistics

Display the counts of interrupts serviced by the management processor.

6.3.3.2. ‘u’ – display UIP statistics

Display the packet counts of various types that were sent and received by the management processor.

6.3.3.3. ‘1’ – MAC port status

Show the port status of the MAC ports. Shows link connection status, speed, duplex and other information. Note: Port 63 corresponds to the management CPU port.

6.3.3.4. ‘2’ – PHY port status

Show the port status of the phy ports. Shows link up/down, speed, duplex, and other information gleaned from the phy chips connected to each external port.

6.3.3.5. ‘o’ – dump MIB counts

Show the various packet and octet counts for data going into and out of every port. In addition counts going to and from the CPU port are shown.

6.3.3.6. ‘c’ – go to configuration menu

Change to the Configuration Menu (you can get back to the main menu by hitting ‘b’).

6.3.4. Configuration Menu

6.3.4.1. Menu Overview

```
  Configuration menu

c    show configuration
p    set primary IP address and netmask
s    set secondary IP address and netmask
d    set mirror destination
m    set port mirror details
u    set cpu mirror details
f    write out current config to flash
b    back to main menu
```

6.3.4.2. ‘c’ – show configuration

Display the contents of the configuration structure (Displayed below is the default configuration). This configuration is stored in flash memory and may be modified using the serial port and saved. This configuration survives power cycling of the GES unit.

```
IP_address[0]: 6401A8C0 (192.168.1.100)
IP_address[1]: 64811FAC (172.31.129.100)
IP_mask[0]: 00FFFFFF (255.255.255.0)
IP_mask[1]: 00FFFFFF (255.255.255.0)
mirror_destination: 2
switch_mirror[0..11]: N B N N N N N N N N N N
cpu_switch_mirror: N
crc32: 3875E0CC
```

The management CPU supports two IP addresses. This allows the GES management CPU to potentially participate in two distinct subnets. The primary IP and net mask are shown as **IP_address[0]** and **IP_mask[0]**. The secondary IP and net mask are shown as **IP_address[1]** and **IP_mask[1]**.

The GES supports port mirroring. This allows monitoring of traffic going in or out of any of the ports. The **mirror_destination** is the external port number where the mirrored traffic is directed. The **switch_mirror[0..11]** describes the mirroring state of each external port of the GES. An ‘N’ indicates no mirroring, an ‘I’ indicates ingress mirroring, an ‘E’ indicates egress mirroring, while a ‘B’ indicates both ingress and egress mirroring. The **cpu_switch_mirror** is much like the **switch_mirror[0..11]**, but it indicates the mirroring for data going to and from the CPU port.

NOTE: Port mirroring is enabled using a GES Status Command UDP packet with the GES Traffic Capture Mode bit set. Once enabled the mirroring can only be reset with a power cycle of the GES.

The crc32 is generated internally and is used to verify the stored values in flash. If the crc32 fails the GES reverts to the default values.

6.3.4.3. 'p' – set primary IP address and netmask

The GES will prompt for the new IP address (saved as **IP_address[0]**). It expects it in dotted notation followed by a carriage return. Any characters other than 0-9, a period or a carriage return cause the update to be aborted. After the IP address is entered, the GES prompts for the netmask (saved as **IP_mask[0]**). The netmask must also be entered in dotted notation. At the conclusion of a successful IP address and netmask input the GES writes the configuration to flash.

6.3.4.4. 's' – set secondary IP address and netmask

The GES will prompt for the new IP address (saved as **IP_address[1]**). It expects it in dotted notation followed by a carriage return. Any characters other than 0-9, a period or a carriage return cause the update to be aborted. After the IP address is entered, the GES prompts for the netmask (saved as **IP_mask[1]**). The netmask must also be entered in dotted notation. At the conclusion of a successful IP address and netmask input the GES writes the configuration to flash.

6.3.4.5. 'd' – set mirror destination

The GES prompts for an entry (0-9,a,b), where external ports 10 and 11 are represented by 'a' and 'b' respectively. At the conclusion of a successful mirror destination input the GES writes the configuration to flash.

6.3.4.6. 'm' – set mirror details

The GES prompts for each port in sequence, expecting 'I' (for ingress),'E' (for egress),'N' (neither ingress or egress),'B' (both ingress and egress). This updates the **switch_mirror[0..11]** field. At the conclusion of a successful mirror details input the GES writes the configuration to flash.

6.3.4.7. 'u' – set cpu mirror details

The GES prompts for the management CPU mirroring configuration, expecting 'I' (for ingress),'E' (for egress),'N' (neither ingress or egress),'B' (both ingress and egress). At the conclusion of a successful CPU mirror details input the GES writes the configuration to flash.

6.3.4.8. 'f' – write out current config to flash

Commands the GES to write out the current configuration to flash. This is useful if you want to burn the default configuration to flash. Normally any update of any of the configuration fields causes the configuration to be saved to flash.

6.3.4.9. 'b' – back to main menu

Return to the main menu.

6.4. Example

This is an example of the interaction with the GES command line interface.
The following actions are performed:

- Change to the configuration menu
- Show the current extra configuration
- Update the Primary IP
- Show the new configuration

Note: characters input by the user are in **bold**.

```
  Main Menu

Cmd   Description
 d    display statistics
 u    display UIP statistics
 1    MAC port status
 2    PHY port status
 o    dump MIB counts
 c    go to configuration menu

GES>c
GES Software Version: 4.3
GES Bootloader Version: 7
Hardware Serial Number: 1002
MAC Address: 00:0B:D1:08:10:02
FDB Table Index: 984
IP Address[0]: 192.168.1.100
IP Mask   [0]: 255.255.255.0
IP Address[1]: 172.31.129.100
IP Mask   [1]: 255.255.255.0
temperature: 43 C

  Configuration Menu

Cmd   Description
 c    show configuration
 p    set primary IP address and netmask
 s    set secondary IP address and netmask
 d    set mirror destination
 m    set port mirror details
 u    set cpu mirror details
 f    write out current config to flash
 b    back to main menu

GES>c
IP_address[0]: 6401A8C0 (192.168.1.100)
IP_address[1]: 64811FAC (172.31.129.100)
```

```
IP_mask[0]: 00FFFFFF (255.255.255.0)
IP_mask[1]: 00FFFFFF (255.255.255.0)
mirror_destination: 2
switch_mirror[0..11]: N B N N N N N N N N N N
cpu_switch_mirror: N
crc32: 3875E0CC

GES>p
Enter in primary IP address in dotted notation
192.168.1.101
you entered 192.168.1.101
Enter in primary IP mask in dotted notation
255.255.255.0

IP_address[0]: 6401A8C0 (192.168.1.100)
IP_address[1]: 64811FAC (172.31.129.100)
IP_mask[0]: 00FFFFFF (255.255.255.0)
IP_mask[1]: 00FFFFFF (255.255.255.0)
mirror_destination: 2
switch_mirror[0..11]: N B N N N N N N N N N N
cpu_switch_mirror: N
crc32: 3875E0CC

IP_address[0]: 6501A8C0 (192.168.1.101)
IP_address[1]: 64811FAC (172.31.129.100)
IP_mask[0]: 00FFFFFF (255.255.255.0)
IP_mask[1]: 00FFFFFF (255.255.255.0)
mirror_destination: 2
switch_mirror[0..11]: N B N N N N N N N N N N
cpu_switch_mirror: N
crc32: 3692081D
Disabling Write Protection on configuration sector
Erasing configuration sector
done erasing
Writing configuration structure

IP_address[0]: 6501A8C0 (192.168.1.101)
IP_address[1]: 64811FAC (172.31.129.100)
IP_mask[0]: 00FFFFFF (255.255.255.0)
IP_mask[1]: 00FFFFFF (255.255.255.0)
mirror_destination: 2
switch_mirror[0..11]: N B N N N N N N N N N N
cpu_switch_mirror: N
crc32: 3692081D

GES> c
IP_address[0]: 6401A8C0 (192.168.1.101)
```

```
IP_address[1]: 64811FAC (172.31.129.100)
IP_mask[0]: 00FFFFFF (255.255.255.0)
IP_mask[1]: 00FFFFFF (255.255.255.0)
mirror_destination: 2
switch_mirror[0..11]: N B N N N N N N N N N N
cpu_switch_mirror: N
crc32: 3692081D
```

7. Management Processor Ethernet Communications

7.1. Network Communications Supported

The GES management processor supports ARP, ICMP (ping), and UDP communications. UDP traffic is supported on port 3500. All fields are sent in network byte order. This means that fields larger than a byte will be read and written using standard access routines. These routines are host-to-network-short "htons()", host-to-network-long "htonl()", network-to-host-short "ntohs()" and network-to-host-long "ntohl()".

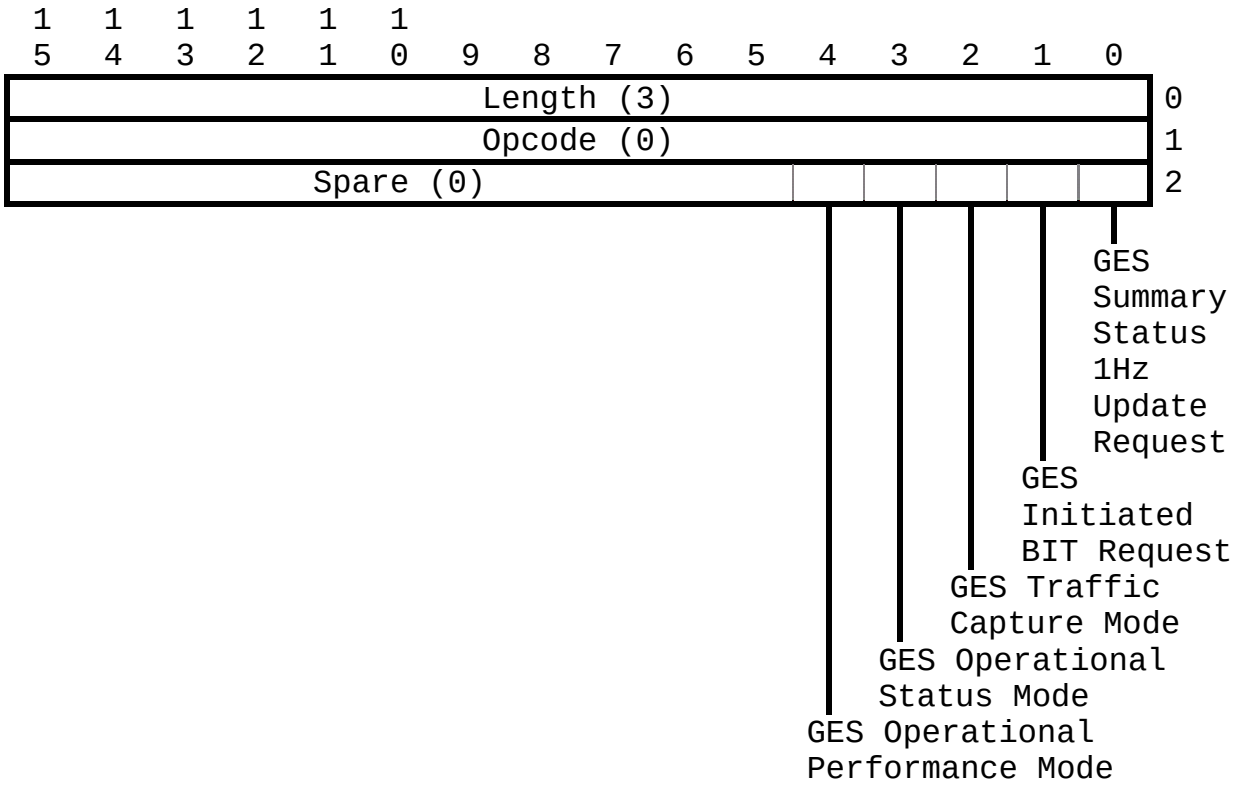
7.2. General Format of a GES UDP Packet

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Length (in words)															
Opcode															
Additional words (if required)															

Length – Length of the GES UDP Packet in words.
Opcode – Operation performed by this packet.

7.3. UDP Packets Accepted/Produced While GES Application is Active

7.3.1. GES Status Command (Opcode: 0)

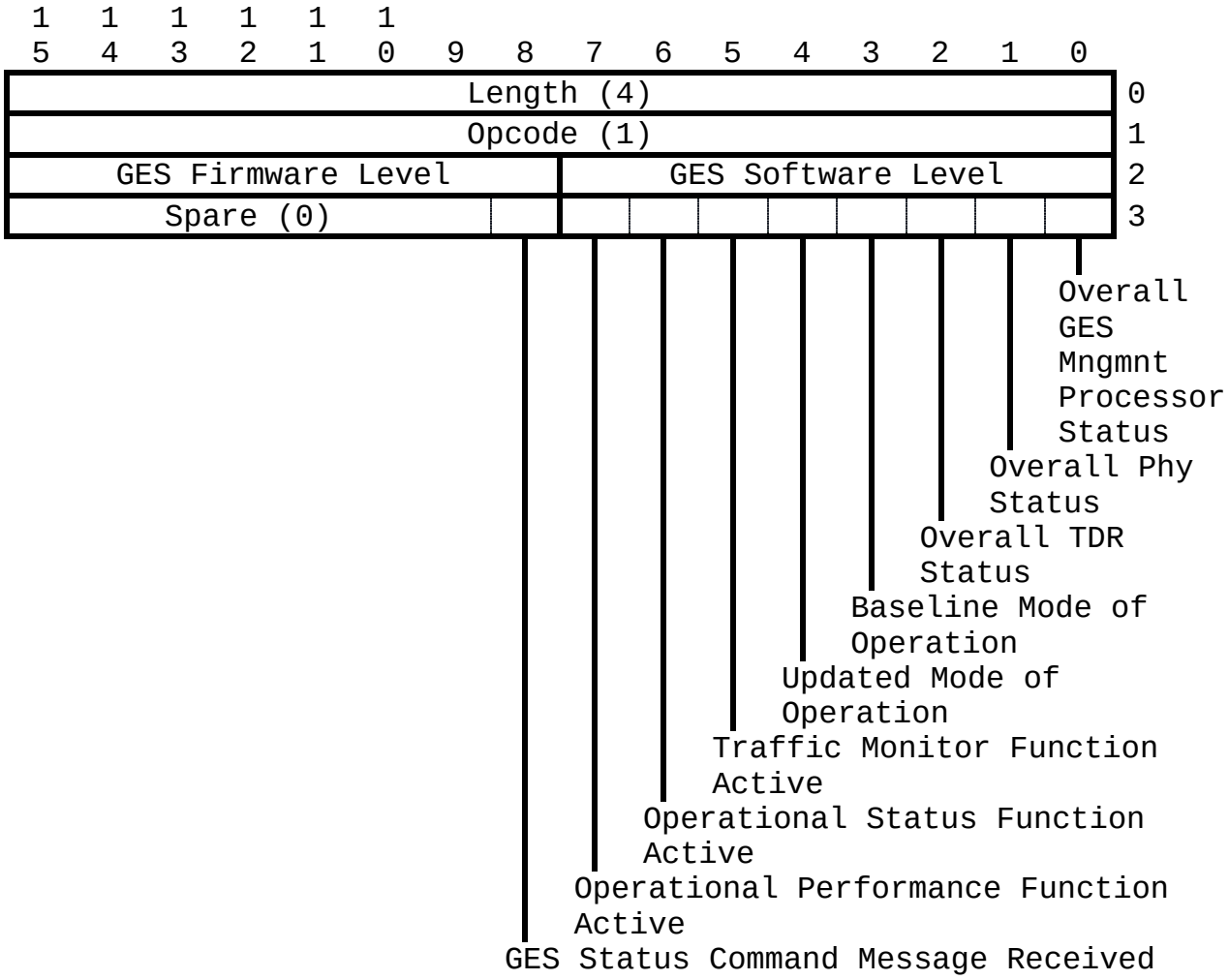


Direction: To GES.
Word 2, Bit 0 – GES Summary Status 1Hz Update Request (0 – OFF, 1 – Request 1Hz updates)
Word 2, Bit 1 – GES Initiated BIT Status Request (0 – OFF, 1 – Request IBIT status)
Word 2, Bit 2 – GES Traffic Capture Mode (0 – nothing, 1 – Begin Traffic Capture Mode)
Word 2, Bit 3 – GES Operational Status Mode (0 – OFF, 1 – Operational Status Mode Active)
Word 2, Bit 4 – GES Operational Performance Mode (0 – OFF, 1 – Operational Performance Mode Active)

When the GES receives a **GES Status Command** it will respond with a **GES Summary Status** packet.

The GES also supports up to two requests for 1Hz **GES Summary Status** updates. The first two requestors will receive **GES Summary Status** messages at approximately 1Hz intervals. If a request for 1Hz updates comes from the same IP address, but from a different port it will replace the previous 1Hz update request.

7.3.2. GES Summary Status (Opcode 1)



Direction: From GES

GES Firmware Level – This is the revision level of the bootloader code.

GES Software Level – This is the revision level of the GES application code.

Word 3, Bit 0 – Overall GES Management Processor Status (0 – good, 1 – degraded)

Word 3, Bit 1 – Overall Phy Status (0 – good, 1 – degraded)

Word 3, Bit 2 – Overall TDR Status (0 – good, 1 – degraded)

Word 3, Bit 3 – Baseline Mode of Operation (0 – not in Baseline Mode, 1 – Baseline Mode). Baseline mode of operation indicates that there are no configuration words applied to either of the two internal switches by the configuration.

Word 3, Bit 4 – Updated Mode of Operation (0 – not in Updated Mode, 1 – Updated Mode). Updated mode of operation indicates that at least one of the two internal switches has configuration words applied.

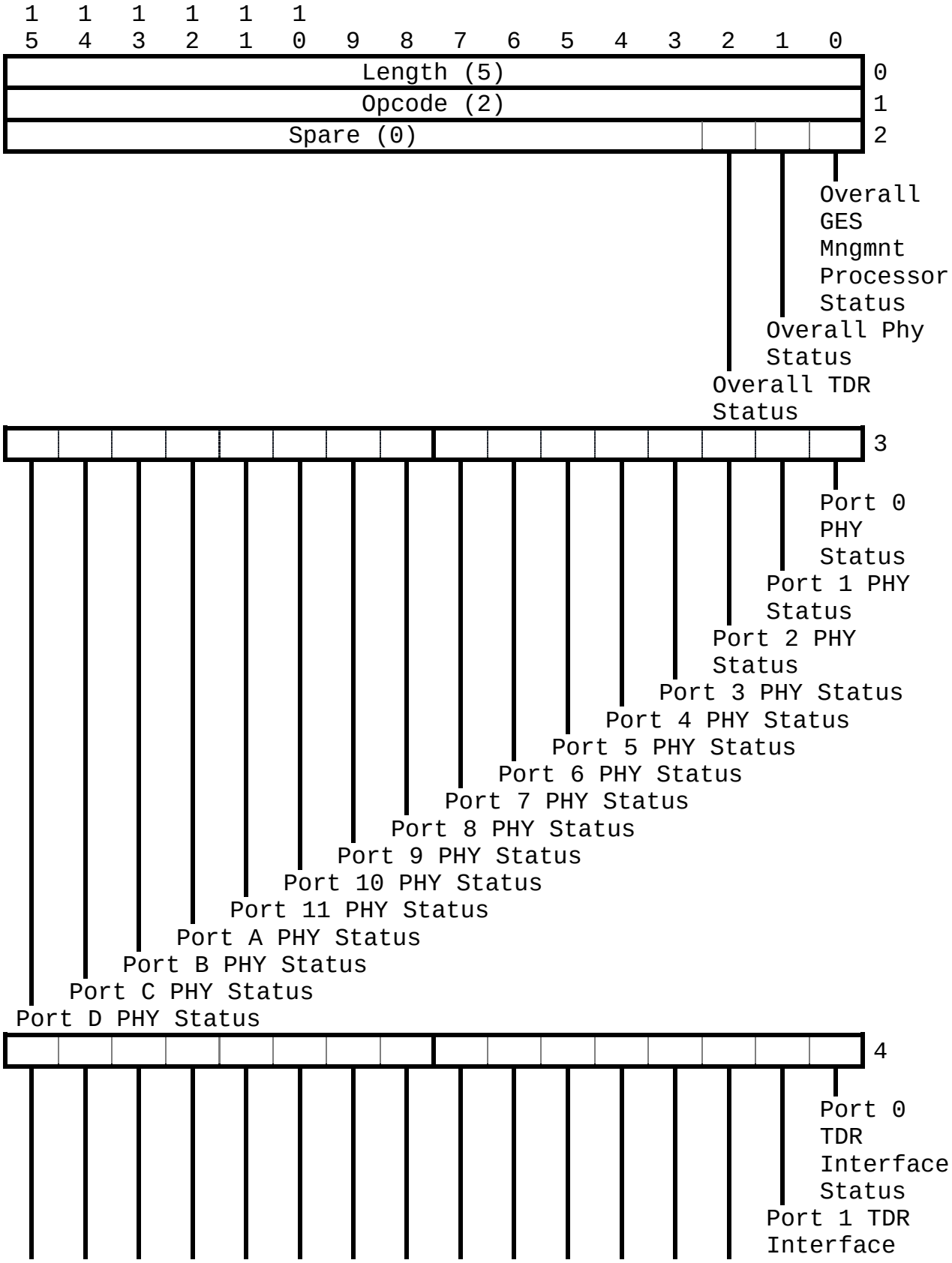
Word 3, Bit 5 – Traffic Monitor Function Active (0 – not Active, 1 – Active). The traffic monitor function is latched once enabled. A power cycle is required to reset.

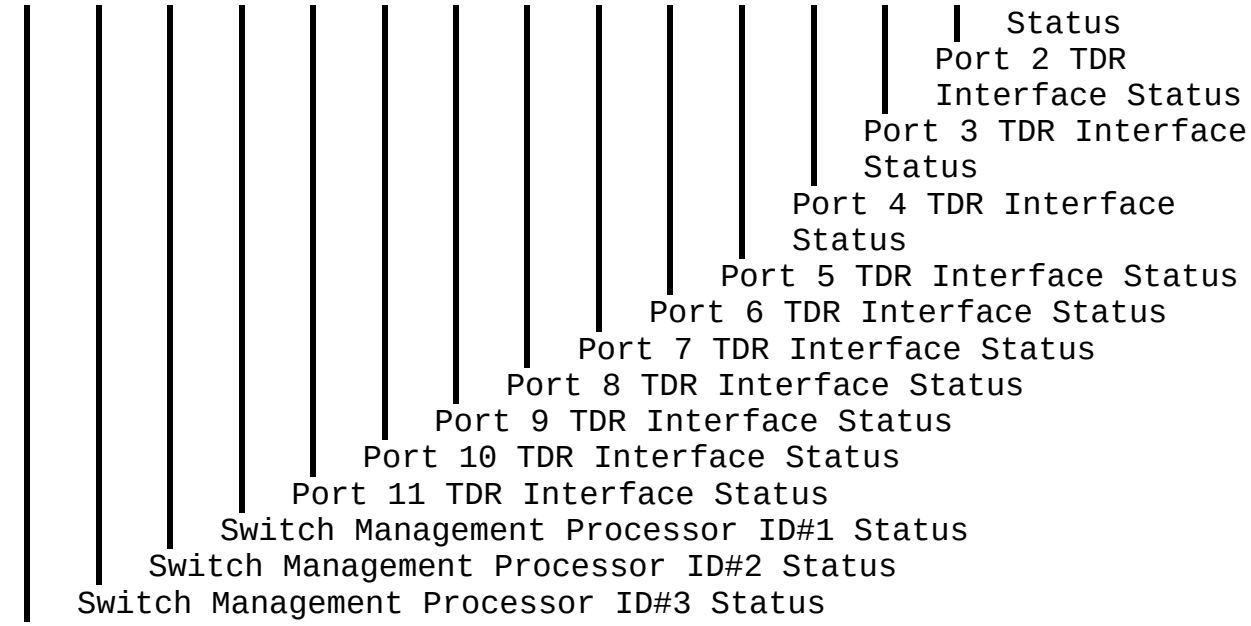
Word 3, Bit 6 – Operational Status Function Active (0 – not Active, 1 – Active)

Word 3, Bit 7 – Operational Performance Function Active (0 – not Active, 1 – Active)

Word 3, Bit 8 – GES Status Command Message Received (0 – not received, 1 – received). This bit indicates that a **GES Status Command** message was received by the GES.

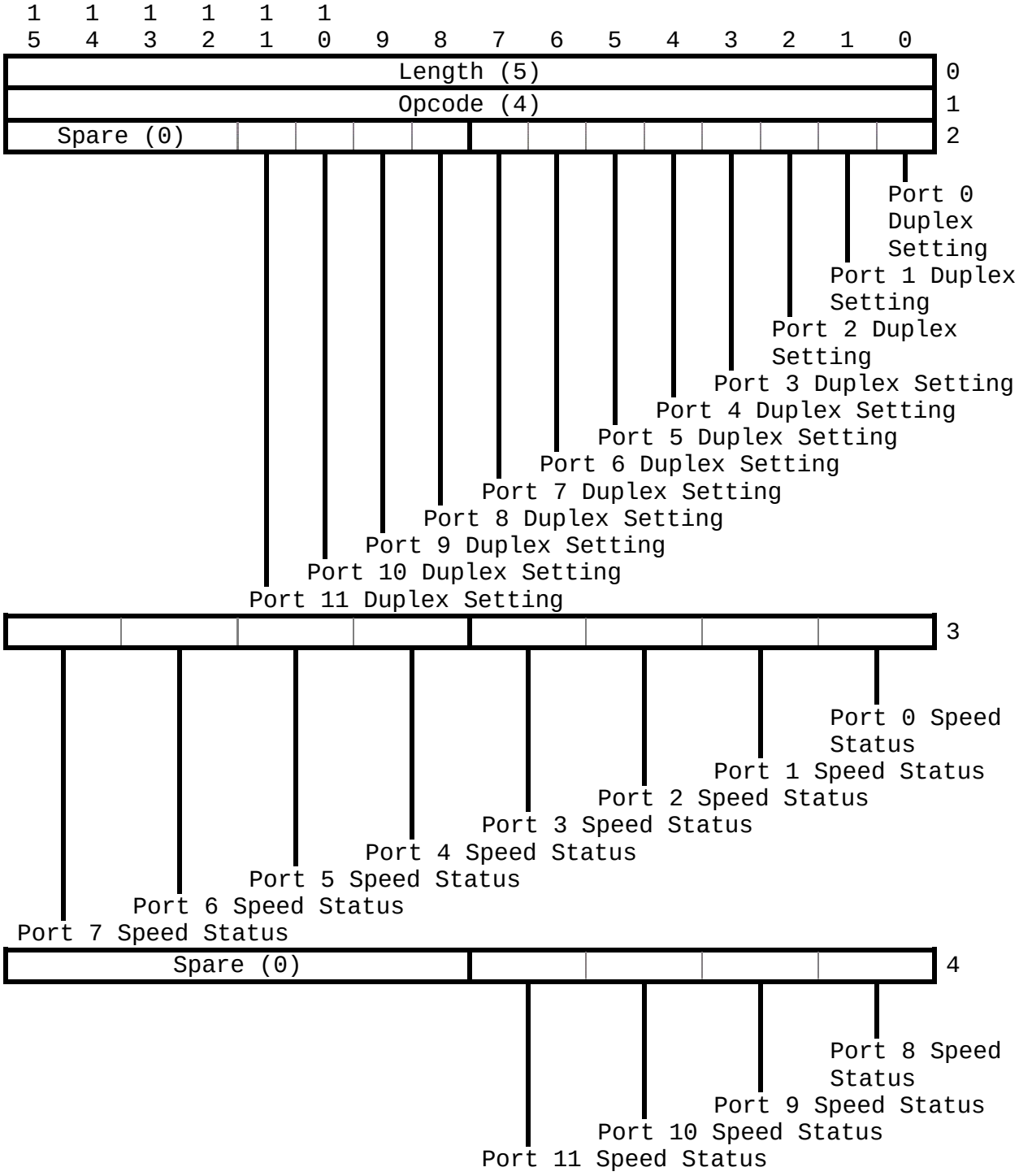
7.3.3. GES Initiated BIT Status (Opcode 2)





Direction: From GES

7.3.4. GES Operational Status (Opcode 4)



Direction: From GES.

7.3.5. GES Performance Status (Opcode 5)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (34)																0
Opcode (5)																1
Spare (0)								Port 0 Avg Bandwidth								2
Port 0 Dropped								Port 0 Collisions								3
Spare (0)								Port 1 Avg Bandwidth								4
Port 1 Dropped								Port 1 Collisions								5
Spare (0)								Port 2 Avg Bandwidth								6
Port 2 Dropped								Port 2 Collisions								7
Spare (0)								Port 3 Avg Bandwidth								8
Port 3 Dropped								Port 3 Collisions								9
Spare (0)								Port 4 Avg Bandwidth								10
Port 4 Dropped								Port 4 Collisions								11
Spare (0)								Port 5 Avg Bandwidth								12
Port 5 Dropped								Port 5 Collisions								13
Spare (0)								Port 6 Avg Bandwidth								14
Port 6 Dropped								Port 6 Collisions								15
Spare (0)								Port 7 Avg Bandwidth								16
Port 7 Dropped								Port 7 Collisions								17
Spare (0)								Port 8 Avg Bandwidth								18
Port 8 Dropped								Port 8 Collisions								19
Spare (0)								Port 9 Avg Bandwidth								20
Port 9 Dropped								Port 9 Collisions								21
Spare (0)								Port 10 Avg Bandwidth Percent								20
Port 10 Dropped								Port 10 Collisions								21
Spare (0)								Port 11 Avg BW								20
Port 11 Dropped								Port 11 Collisions								21
Spare (0)								Port A Avg BW								20
Port A Dropped								Port A Collisions								21
Spare (0)								Port B Avg BW								20
Port B Dropped								Port B Collisions								21
Spare (0)								Port C Avg BW								20
Port C Dropped								Port C Collisions								21
Spare (0)								Port D Avg BW								20
Port D Dropped								Port D Collisions								21

Direction: From GES.

7.3.6. GES Programming Command (Opcode 3)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (93)																0
Opcode (3)																1
Spare (0)													a	b	c	2
Spare (0)													Mirror Dest			3
Spare (0)						CPU		P11		P10		P9		P8		4
P7		P6		P5		P4		P3		P2		P1		P0		5
Primary IP Address (MSW)																6
Primary IP Address (LSW)																7
Primary Netmask (MSW)																8
Primary Netmask (LSW)																9
Secondary IP Address (MSW)																10
Secondary IP Address (LSW)																11
Secondary Netmask (MSW)																12
Secondary Netmask (LSW)																13

Direction: To GES.
Not yet supported.
This packet allows modification of the GES configuration stored in flash.
a – When set, this bit indicates that the Mirror Dest should be updated with the contents of this packet.
b – When set, this bit indicates that the P0-P11 and CPU port mirroring details will be updated with the contents of this packet.
c – When set, this bit indicates that the Network Parameters will be updated with the contents of this packet (Primary IP & Netmask, as well as Secondary IP & Netmask).
Primary IP Address – The GES management processor's primary IP address.
Primary Netmask – The GES management processor's primary network mask.
Secondary IP Address – The GES management processor's secondary IP address.
Secondary Netmask – The GES management processor's secondary network mask.
Mirror dest – External port used as destination for data mirrored from other ports on this switch.
P0-P11, and CPU – Each port has two bits indicating the mirroring for the particular port.

00 – monitor no ingress or egress traffic.
01 – monitor ingress traffic only
10 – monitor egress traffic only
11 – monitor both ingress and egress traffic

7.3.7. GES Programming Response (Opcode 6)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (93)																0
Opcode (3)																1
Spare (0)													a	b	c	2
Spare (0)													Mirror Dest			3
Spare (0)						CPU		P11		P10		P9		P8		4
P7		P6		P5		P4		P3		P2		P1		P0		5
Primary IP Address (MSW)																6
Primary IP Address (LSW)																7
Primary Netmask (MSW)																8
Primary Netmask (LSW)																9
Secondary IP Address (MSW)																10
Secondary IP Address (LSW)																11
Secondary Netmask (MSW)																12
Secondary Netmask (LSW)																13

Direction: From GES.

Not yet supported.
This packet is generated in response to a GES Programming Command (Opcode 3). By sending a GES Programming Command (Opcode 3) with the ‘a’, ‘b’, and ‘c’ bits all reset, the current GES configuration can be queried without effecting the current configuration.
a – always 0.
b – always 0.
c – always 0.
Primary IP Address – The GES management processor’s primary IP address.
Primary Netmask – The GES management processor’s primary network mask.
Secondary IP Address – The GES management processor’s secondary IP address.
Secondary Netmask – The GES management processor’s secondary network mask.
Mirror dest – External port used as destination for data mirrored from other ports on this switch.
P0-P11, and CPU – Each port has two bits indicating the mirroring for the particular port.
00 – monitor no ingress or egress traffic.
01 – monitor ingress traffic only
10 – monitor egress traffic only
11 – monitor both ingress and egress traffic

7.3.8. GES Reboot

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (2)																0
Opcode (102)																1

Direction: To GES.
GES software doesn't support GES Reboot. In order to do a GES application update the unit must be power cycled to cause the bootloader to listen for the UDP packets necessary to program a new GES application into the 2048K flash bank.

7.3.9. GES Reboot Acknowledge

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (2)																0
Opcode (103)																1

Direction: From GES.
Version 3.0 software doesn't support GES Reboot. In order to do a GES application update the unit must be power cycled to cause the bootloader to listen for the UDP packets necessary to program a new GES application into the 512K flash bank.

7.3.10. Opcode Unrecognized By Application

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (2)																0
Opcode (101)																1

Direction: From GES.
This opcode is generated by the GES when it receives

7.4. UDP Packets Accepted/Produced While Bootloader is Active

7.4.1. Opcode Unrecognized By Bootloader

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (2)																0
Opcode (100)																1

Direction: From bootloader.
This opcode is generated by the GES while the bootloader is active and an opcode that the bootloader doesn't support is received.

7.4.2. Erase Non-Boot-Bank (NBB) Flash

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	
Length (2)	0
Opcode (104)	1

Direction: To bootloader.
This message halts the 9-second countdown and the boot process. It causes the bootloader to immediately send back an **Erase NBB Flash Acknowledge** UDP message. Next the bootloader erases the contents of the larger bank of flash (the Non-Boot Bank or NBB). After the GES completes the erase, the bootloader sends an **Erase NBB Flash Complete** UDP message. This last message indicates to the loader that it may begin sending **Program NBB Data** UDP messages containing the contents of the new GES Application to program into the NBB flash.

7.4.3. Erase NBB Flash Acknowledge

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	
Length (2)	0
Opcode (105)	1

Direction: From bootloader.
This is the first GES response by the bootloader to an **Erase NBB Flash** UDP message. It lets the loader know that the bootloader has received the message and the loader must wait for the **Erase NBB Flash Completed** message before it can proceed. The erase procedure can take several seconds.

7.4.4. Erase NBB Flash Completed

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	
Length (2)	0
Opcode (106)	1

Direction: From bootloader.
This is the second GES response by the bootloader to an **Erase NBB Flash** UDP message. It lets the loader know that the bootloader has completely erased the NBB flash and the bootloader is now ready to receive data to program into the NBB flash.

7.4.5. Program NBB Data

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	
Length (5 to 516)	0
Opcode (107)	1
Offset (MSW)	2
Offset (LSW)	3
Data (1 to 512 words)	4 to 515

Direction: To bootloader.
The loader sends between 1 and 512 words at a time to the bootloader to program into the NBB flash. The Offset is the byte offset into the NBB flash of the first data word of this packet. The GES only supports writing words at a time so this offset should always be even.

7.4.6. Program NBB Data Acknowledge

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	
Length (2)	0
Opcode (108)	1

Direction: From bootloader.
The bootloader immediately responds with this message when the bootloader receives a **Program NBB Data** UDP message. The bootloader then writes the data words to NBB flash. Next the bootloader sends a **Program NBB Data Completed** UDP message to indicate to the loader that another data packet may be sent.

7.4.7. Program NBB Data Completed

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	
Length (2)	0
Opcode (109)	1

Direction: From bootloader.
This packet is sent by the bootloader once the data has been written to the NBB flash.

7.4.8. Finished Programming

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (2)																0
Opcode (110)																1

Direction: To bootloader.
This packet is sent by loader to let bootloader know that all data words have been programmed. This causes the bootloader to perform a CRC32 of the GES application in the NBB flash. If it verifies the bootloader will send a **Finished Programming Acknowledge** UDP message and then launches the GES application from the NBB flash. If the image fails CRC32, the bootloader sends a **Bad CRC** UDP message.

7.4.9. Finished Programming Acknowledge

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (2)																0
Opcode (111)																1

Direction: From bootloader.
The bootloader indicates that the CRC32 has passed verification and the GES application will be launched from NBB flash.

7.4.10. Bad CRC

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Length (2)																0
Opcode (112)																1

Direction: From bootloader.
The bootloader indicates that the CRC32 has failed verification after receiving a **Finished Programming** UDP message from the loader. The GES application will not be launched from NBB flash. The bootloader will sit there waiting for another application load to be performed.

8. Switch Management Capabilities

The GES is based on a Marvell Prestera DX-167 sixteen port 10/100/1000 QoS Ethernet Switch IC. The data sheet for the Marvell parts can be accessed at www.marvell.com. Access to the data sheet requires creating an account on the Marvell web site. Aeronix cannot supply data sheets as they are proprietary to Marvell.

The following list is a sub-set of the capabilities of the Switch IC:

- Egress tagging/untagging - selectable per port or by 802.1Q VLAN ID
- Port Based VLANs - supported in any combination or 802.1 VLAN support for 4096 VIDs
- Port States and BPDU handling for spanning tree
- 802.1X Source MAC address authentication
- Quality of Service - switch architecture provides non-blocking switching in all traffic environments
- Link Aggregation (802.3ad) - allows two or more links to be trunked to increase the total bandwidth and provide a fail safe if one of the links fails
- A high speed, non-blocking, QoS switch fabric with support for four traffic classes based on:
    - Port
    - IEEE 802.1p
    - IPv4's TOS or Diff-Serv
    - IPv6's Traffic Class
    - 802.1Q VID
    - DA MAC address
    - SA MAC Address
- Back-pressure flow control on half-duplex ports
- Pause-frame flow control on full-duplex ports
- Lookup engine supports 16384 MAC address entries with learning and aging
- Auto-MDI/MDIX and polarity correction

The Management Processor in the GES is an ARM9 running at 96 MHz. It is directly connected to a dedicated Ethernet port on the Switch IC. It is capable of running a TCP/IP stack so that it can be an active participant on a network serviced by the GES. Aeronix can create custom loads for this processor that will allow increased GES management functionality and/or customer defined custom applications that would be hosted on this processor.

9. Hardware Mounting

The GES weighs less than 3 pounds and is mounted via its four 10-32 captive screws.

The minimum required clearance for the mounting hardware below the mounting surface is 0.75 inches.

The rectangular mounting pattern for the attachment points is 3.55” x 7.71” as shown in Figure 10-1.

The overall external dimensions of the GES are 8.25” L x 5.15” W x 1.38” H.

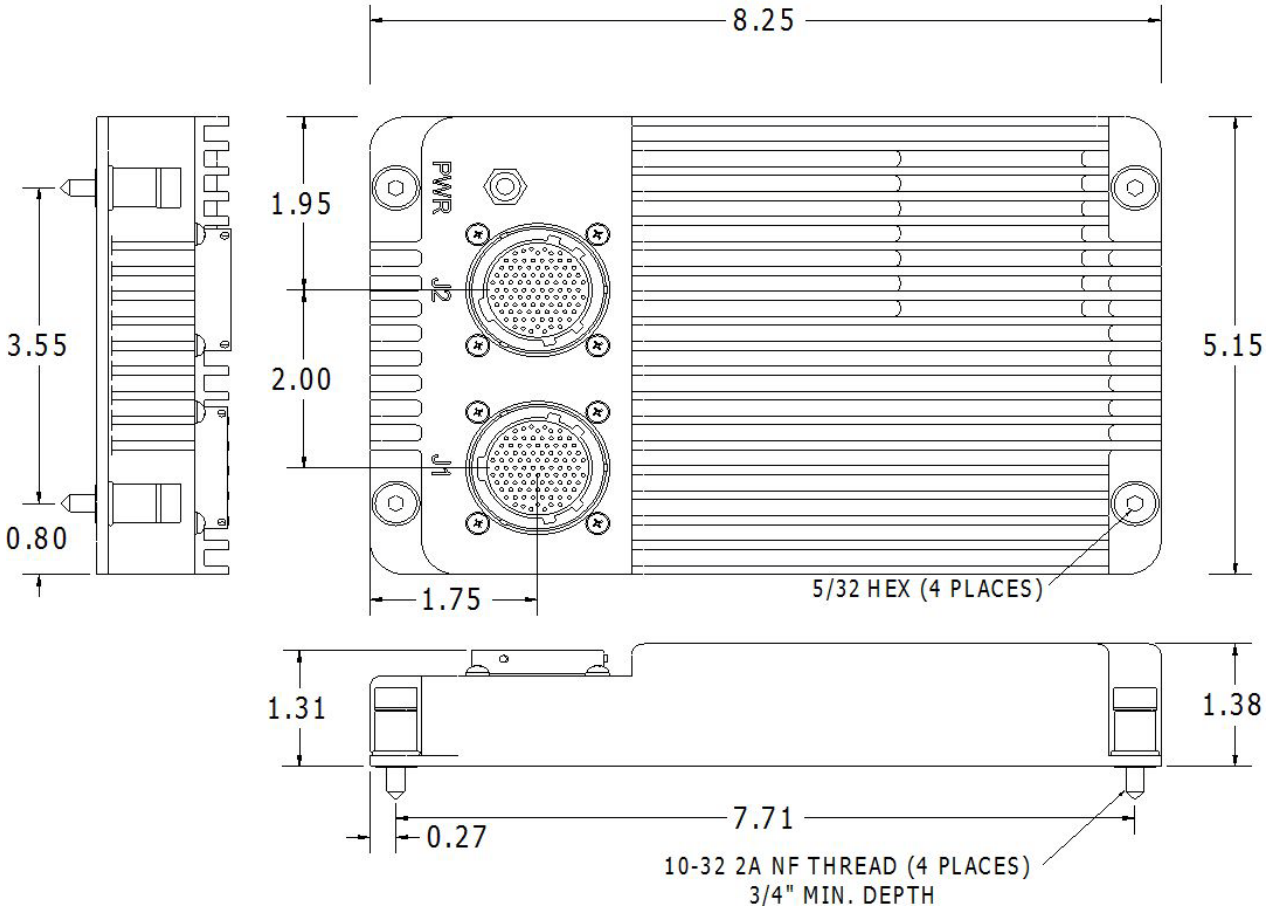


Figure 10-1: External Dimensions

10. Indicators

The GES has one green LED on the front panel labeled PWR.
This LED is illuminated when input power is applied to the GES.

11. Qualifications

MIL-STD-810	Environmental Test Description
Altitude	Method 500.4, Proc. I & II
Low Temperature	Method 502.4, Proc. I & II
High Temperature	Method 501.4, Proc. I & II
Vibration	Method 514.5 Performance per A10 Req's
Vibration	Method 514.5 Endurance A10 Req's
Vibration	Method 519.5 Gunfire per A10 Req's
Shock	Method 516.5, Proc. I – 20g 11ms
Shock	Method 516.5, Proc. V – 40g 11ms
Shock	Method 516.5, Proc. VI – Bench
Salt Fog	Method 509.4, Proc. I
Rain	Method 506.4, Proc. III
Explosive Atmosphere	Method 511.4, Proc. I
Temperature Shock	Method 503.4, Proc. I
Acoustic Noise	Method 515.5, Proc. I
Acceleration	Method 513.5, Proc. I

MIL-STD-704A
28-volt DC source as specified in MIL-STD-704A aircraft 28V DC, Category B.
Curve 2 and Curve 3 of Figure 9 of MIL-STD-704A. (Includes 50mSec total power dropout)

MIL-STD-461E	EMI / EMC Test Description
CE102	Conducted Emissions, Power Leads (10KHz-10MHz) Figure CE102-1, Basic Curve
CS101	Conducted Susceptibility, Power Leads (30Hz-150KHz) Figure CS101-1, Curve #2
CS114	Conducted Susceptibility, Bulk Cable Injection, Table VI, Air Force Aircraft Internal (10KHz-200MHz Curve #3)
CS115	Conducted Susceptibility, Bulk Cable Injection, Impulse Excitation, Figure CS115-1
	Cables: J1, J2, 28VDC, 28VDC and Return
CS116	Conducted Susceptibility, Damped Sinusoidal Transients, Cables and Power Leads (10KHz-100MHz) Imax = 10 Amps
RE102	Radiated Emissions, Electric Field (10KHz-18GHz) Figure RE102-3 (<25 meters Nose to Tail)
RS103	Radiated Susceptibility, Electric Field (2MHz-1GHz 20V/m and 1-18GHz 60 V/m)

12. Performance Parameters

Dimensions	8.25" x 5.1" x 1.38"
Operating Temperature	-40°C to +71°C
Non-Operating Temperature	-57°C to +85°C
Cooling	Radiant Cooling (Requires only ambient air)
Weight	2 Lb 13 Oz (1.2 kg)
Power Requirements	< 22 watts operating
Input Voltage	12VDC to 33VDC (28VDC Nominal)
Operating Altitude	40,000 Ft

13. Warranty

a. Seller expressly warrants that all goods and services shall be free from defects, shall be of good materials and workmanship, and shall conform to applicable specifications, drawings, samples, and performance specifications.

b. The Seller warranty shall remain in effect for a period of one year after the item is shipped, or the service is completed, from or by the Seller.

c. In the event Seller is required to replace or correct any component of any item, the running of the warranty period for the items of which the defective component is a part shall be suspended from the date Seller receives the item until the date the item is replaced or corrected, and this warranty shall apply to such replacement or corrected items furnished for the unexpired portion of the warranty period.

d. Seller shall not be responsible for any liabilities, loss, costs, damages, and/or expense resulting from any breach of any, or all, of Seller's warranties, express, or implied. Seller shall not be responsible for any cost of removing such items from property, equipment, or products, and/or any additional costs of disassembly, fault isolation, failure analysis, reinstallation, reinspection, retesting in which such items have been incorporated and/or transportation to or from the Seller.

The GES does not contain any user serviceable parts. Any modification or use other than consistent with the intended design shall void the warranty. Owner must contact Aeronix at (321) 984-1671 and be issued a Return Material Authorization (RMA) number before returning a unit for warranty repair.

14. Products and Services

Aeronix offers an extensive line of Engineering Services including the creation and implementation of custom management configurations for the GES.

Visit the Aeronix web site at www.Aeronix.com for additional information about our products and services.

1775 West Hibiscus Blvd, Suite 200
Melbourne, FL 32901
(321) 984-1671
www.Aeronix.com