

Delta AFB0912DH Fan Datasheet

Reverse Engineered from Bench Testing

GENERAL SPECIFICATIONS

Manufacturer: Delta Electronics Inc.

Model Number: AFB0912DH

Application: HP ProLiant ML350 G6 Server (HP P/N: 511774-001 / 508110-001)

Fan Type: DC Brushless Axial Flow Fan

Bearing Type: Dual Ball Bearing

MECHANICAL SPECIFICATIONS

Parameter	Value
Dimensions	92mm × 92mm × 25mm
Mounting Holes	Standard 92mm pattern
Weight	~150g (estimated)
Frame Material	Plastic with integrated shroud
Airflow Direction	Standard axial (marked on housing)

ELECTRICAL SPECIFICATIONS

Power Requirements

Parameter	Value	Notes
Rated Voltage	12V DC	
Voltage Range	10.8V - 13.2V	Typical ±10% tolerance
Rated Current	2.5A	Label specification
Actual Maximum Current	1.67A	Measured at full speed
Maximum Power	20W	Measured at full speed

Performance

Parameter	Value	Notes
Rated Speed	8,600 RPM	At full power
Speed Control Range	Variable	Via PWM (see control specs)
Estimated Airflow	110-120 CFM	At full speed
Noise Level	50-55 dBA	Estimated at full speed
Life Expectancy	50,000-70,000 hours	Dual ball bearing spec

CONNECTOR & PINOUT

Physical Connector

- **Type:** Proprietary HP 5-pin housing (4 wires populated)
- **Pitch:** 2.54mm (0.1")
- **Keying:** Mechanical polarization via housing design

Pin Configuration & Wire Colors

WARNING: CRITICAL: This fan uses NON-STANDARD wire color coding!

Pin	Wire Color	Function	Signal Type
1	BLACK	Ground (GND)	Power ground
2	RED	+12V DC Power	DC power input
3	YELLOW	Tachometer Output	Open collector, 2 pulses/rev
4	GREEN	PWM Control Input	25 kHz square wave
5	Empty	Not connected	N/A

Note: Pin 5 physically exists in the connector housing but has no wire.

PWM CONTROL SPECIFICATIONS

PWM Input Signal (Green Wire)

Parameter	Value	Notes
Frequency	25 kHz \pm 10%	Standard Intel 4-wire spec
Acceptable Range	21 kHz - 28 kHz	
Signal Voltage	0V to 5V	TTL logic level
Logic Low	0V - 0.8V	
Logic High	3.5V - 5V	Internally pulled up
Input Impedance	High-Z	

PWM Control Characteristics

WARNING: INVERTED PWM LOGIC - NON-STANDARD!

Duty Cycle	Fan Speed	Power Level
1%	MAXIMUM	FULL POWER
25%	High	~75% power
50%	Medium	~50% power
75%	Low	~25% power
99%	MINIMUM	LOWEST POWER

IMPORTANT: This fan uses inverted PWM logic where: - **LOW** duty cycle = **HIGH** speed/power - **HIGH** duty cycle = **LOW** speed/power

This is opposite of most standard PC fans!

TACHOMETER OUTPUT SPECIFICATIONS

Tach Signal (Yellow Wire)

Parameter	Specification	Measured (Failed Fan)
Signal Type	Open collector/drain	Same
Pulses per Revolution	2	Confirmed
Normal Output Voltage	3V - 5V peak	200mV (FAILED)
Output Frequency	~286 Hz at 8,600 RPM	Varies with speed
Pull-up Required	Yes (on motherboard)	Yes

Normal Operation:

- Signal toggles between 0V and ~5V - 2 pulses per revolution - Clean square wave - At 8,600 RPM:
 $8,600 \div 60 \times 2 = 286.7 \text{ Hz}$

Failure Mode Observed:

- Weak signal: ~200mV peak instead of 3-5V - Server reports “Fan Failed” even though motor runs - Indicates failing Hall sensor or output driver circuit

WIRING DIAGRAM

Fan Connector (Orange Housing - HP Proprietary 5-pin)

Looking at connector from wire side:

```
Pin Layout:  1    2    3    4    5
              |    |    |    |    (empty)
              |    |    |    |
              |    |    |    +--- GREEN  - PWM Input (25kHz, 0-5V)
              |    |    +----- YELLOW - Tach Output (2 pulses/rev)
              |    +----- RED      - +12V DC Power
              +----- BLACK      - Ground
```

Pin 5: Physical position exists but no wire connected

POWER SUPPLY CONNECTION

Bench Testing Setup

Power Supply:

```
(+) ----- RED wire    (12V DC)
(-) ----- BLACK wire   (Ground)
```

Function Generator (for PWM control):

Output --- GREEN wire (25kHz square wave, 0-5V)

Ground --- BLACK wire (common ground)

Oscilloscope (to monitor tach):

Ch1 ----- YELLOW wire (tach output)

Ground ---- BLACK wire

Minimum Connections for Operation

- **RED** to +12V
- **BLACK** to Ground
- **GREEN** to PWM signal (or leave floating for ~50% speed)

Fan will NOT start reliably without valid PWM signal on healthy units.

FAILURE MODES & DIAGNOSTICS

Common Failure: Motor Controller Starting Circuit

Symptoms: - Fan will NOT self-start at any PWM duty cycle (1% to 99%) - Requires manual spin to initiate rotation - Runs smoothly once started - Responds to PWM speed control after manual start - Weak tachometer signal (~200mV instead of 3-5V)

Root Cause: - Internal brushless motor controller IC failure - Starting circuit cannot generate initial commutation - Tach output circuit also degraded

Diagnosis Method: 1. Apply 12V DC to RED/BLACK wires 2. Apply 25kHz PWM signal at various duty cycles to GREEN wire 3. Observe if fan self-starts 4. Measure tach signal on YELLOW wire with oscilloscope

Expected Results (Healthy Fan): - Self-starts at any duty cycle 1-99% - Tach output: 3-5V peak, ~286Hz at full speed - Clean square wave on tach output

Failed Fan Results: - No self-start at any duty cycle - Manual spin required to start - Tach output: <1V peak (typically 200mV observed) - Weak/degraded square wave

Conclusion: Replace fan - internal electronics failure

REPLACEMENT PARTS

HP Part Numbers

- **HP Spare:** 511774-001
- **HP Assembly:** 508110-001

Delta Model Variants

- AFB0912DH (standard model)
- AFB0912DH-A (variant)

Compatible Applications

- HP ProLiant ML350 G6
 - HP ProLiant ML330 G6
 - Other HP G6 series tower servers
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SAFETY & COMPLIANCE

Certifications: UL Listed

Operating Temperature: 0°C to +70°C

Storage Temperature: -40°C to +85°C

Humidity: 5% to 95% RH, non-condensing

IMPORTANT NOTES

CRITICAL WARNINGS

1. NON-STANDARD WIRE COLORS

This fan does NOT follow typical PC fan color coding!

- RED = Power (usually YELLOW on PC fans)
- YELLOW = Tach (usually GREEN on PC fans)
- GREEN = PWM (usually BLUE on PC fans)

2. INVERTED PWM LOGIC

Low duty cycle = HIGH speed (opposite of most fans!)

3. NOT HOT-SWAPPABLE

Power down server before replacing

4. PROPRIETARY CONNECTOR

5-pin HP connector - not compatible with standard 4-pin PC fan headers without adapter

5. SERVER THERMAL PROTECTION

Do not operate server with failed fan - risk of overheating and component damage

BENCH TESTING RESULTS

Test Equipment Used: - Rigol DP832 Power Supply - Rigol Oscilloscope - Function Generator (25kHz) - Fluke Multimeter

Test Date: January 27, 2025

Test Engineer: Lonnie Domnitz / LANgineers Inc.

Lab Technician: Albert C.

Test Location: Field diagnostic bench

Findings: - Fan exhibits starting circuit failure - Tach output degraded to ~200mV (normal: 3-5V)
- Motor and bearings mechanically sound - PWM speed control functional once manually started -
Maximum power draw: 20W at full speed - Inverted PWM logic confirmed (1% = full speed)

Recommendation: Replace fan assembly due to internal motor controller failure

ADDITIONAL RESOURCES

Purchase Links

Available from: - Amazon (search: HP 511774-001 or Delta AFB0912DH) - eBay (search: HP ML350 G6 fan or 511774-001) - Server parts suppliers (ServerWorlds, Buffalo Computer Parts, etc.)

Typical Price Range: \$26 - \$55 USD (refurbished/used)

Online Documentation

- HP ML350 G6 Service Guide
 - Delta Electronics official website
 - Pinout diagrams: pinoutguide.com
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REVISION HISTORY

Version 1.0 - January 27, 2025 - Initial reverse-engineered datasheet - Based on bench testing and physical inspection - Confirmed pinout, PWM characteristics, and failure modes

DISCLAIMER

This datasheet was created through reverse engineering and bench testing. While every effort has been made to ensure accuracy, this is NOT an official Delta Electronics or HP document. Use this information at your own risk.

For official specifications, contact: - Delta Electronics Inc. - HP Enterprise Support

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