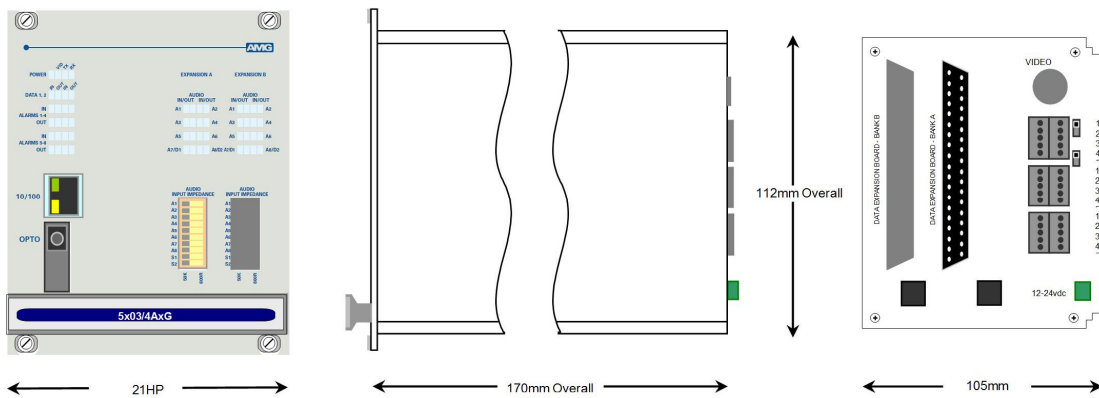


## Data Receive Unit with 2 Bi-directional Data Channels, 6 Bi-directional Audio Channels, 2 Echelon FTT-10A Data Channels and 8 Bi-directional Alarms plus Ethernet for a Singlemode Fibre Link with High Power Optical Transceivers



The **AMG5904A966HPG** is a rackmount data receive unit designed to transmit and receive 2 data channels, 6 audio channels, 2 Echelon FTT-10A data channels and 8 bi-directional alarms over one Singlemode optical fibre. It also provides full duplex 100Base-T Ethernet connectivity. The HP suffix in the partno. indicates High Power optical transceivers.

The **AMG5904A966HPG** is designed to be powered using an **AMG2003** standalone or equivalent power supply. The G suffix in the partno. indicates a 3rd party subrack mounting configuration.

The **AMG5904A966HPG** is designed to operate with an **AMG5903A966HP** standalone or **AMG5903A966HPG** rackmount data transmit unit in a point to point configuration.

# Contents

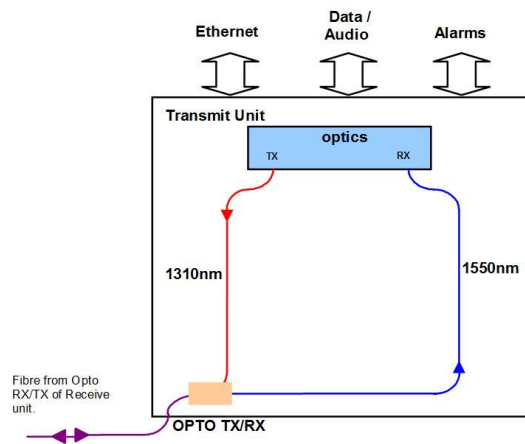
<b>Introduction</b>	<b>3</b>
Unit Functional Schematic.....	3
Optical Connection .....	3
<b>Connections</b>	<b>4</b>
Optical Connection Singlemode .....	4
Power Connection .....	4
Data and Alarm Channel Connections .....	4
Audio Connections .....	4
Echelon FTT-10A Data Channel Connection .....	5
Ethernet Connection .....	5
<b>Ethernet Operation</b>	<b>5</b>
<b>Front Panel Indicators</b>	<b>6</b>
Power LED.....	6
Low Speed Data LEDs .....	6
Audio LEDs.....	6
Alarm LEDs.....	7
Echelon FTT-10A Data LEDs .....	7
Ethernet Data LEDs.....	7
<b>Data and Alarm Channel Configuration</b>	<b>8</b>
Data Channel Configuration .....	8
Data Interface Connections .....	8
Data Channel Termination.....	8
Alarm Channel Configuration .....	9
Alarm Channel Circuit.....	9
Alarm Interface Connections .....	10
Audio Channel Configuration.....	10
Echelon FTT-10A Data Channel Configuration.....	10
Data and Audio Connections.....	11
<b>Physical Information</b>	<b>12</b>
Dimensions .....	12
Mounting Details.....	12
<b>Safety</b>	<b>12</b>
<b>Maintenance and Repair</b>	<b>12</b>

## Introduction

### Unit Functional Schematic

The **AMG5904A966HPG** transmits and receives 2 data channels, 2 Echelon FTT-10A data channels, 6 bi-directional audio signals and 8 bi-directional alarm signals to/from the **AMG5903A966HP** transmit unit.

Ethernet connectivity is also provided between the two units.



### Optical Connection

The **AMG5904A966HPG** connections are illustrated in the following example which shows an **AMG5903A966HPG** data transmit unit together with an **AMG5904A966HPG** rackmount data receive unit configured as a point to point system.



## Connections

---

### Optical Connection Singlemode

Optical Fibre ..... Singlemode  
Connector ..... SC/PC

Primary Optical Launch Power ..... 0dBm  
Transmit Wavelength ..... 1550nm

Primary Optical Sensitivity ..... -34dBm  
Receive Wavelength ..... 1310nm

Minimum Optical Dynamic Range ..... 34dB.

### Power Connection

Connector Type ..... Removable 2-pin, 3.81mm, Screw Terminal  
Connector Partno. .... Phoenix 1803578  
Supply Voltage ..... +12 to +15 Volts DC  
Maximum Power ..... 10 Watts

### Data and Alarm Channel Connections

No. of Data Channels ..... 2  
No. of Alarms ..... 8

Connectors ..... Removable 5-pin, 3.5mm, Spring Terminal  
Connector Partnos. .... Phoenix 1952296

Data Interfaces ..... RS-232 / 422 / 485. Selected by external slide switches D1-D2

RS-232 – Switch Position - Top  
RS-422 – Switch Position - Middle  
RS-485 – Switch Position - Bottom

Internal 120 $\Omega$  termination resistors may be applied to RS-422 or RS-485 inputs as required by internal DIL switches inside the enclosure. \*See appropriate section on how to remove the case for access to the DIL switches.

Alarm inputs ..... Input is via a series 10k resistor with 47k $\Omega$  pull-up to +3V3.  
Alarm outputs ..... Output is NPN open collector, maximum load 500mA @ 24Vdc

### Audio Connections

Data/Audio Channels – BANK A ..... 6 Audio channels  
Data/Audio Channels – BANK B ..... Not Used

Connector ..... 37-way D-Type female connector - shielded.  
Connections ..... See below for connection and configuration

Input level ..... -40dBm to 0dBm  
Input overload level ..... +6dBm  
Input impedance ..... 56k $\Omega$  / 600 $\Omega$ . Each channel individually selected using DIL switch on front panel

Output impedance ..... 600 $\Omega$   
Frequency response ..... 10Hz to 20KHz

**Echelon FTT-10A Data Channel Connection**

No. of Echelon FTT-10A Data Channels            2

Echelon FTT-10A – BANK A ..... Channels 7 and 8

Echelon FTT-10A – BANK B ..... None

Connector ..... 37-way D-Type female connectors - shielded.

Connections..... See appropriate section for full details

**Ethernet Connection**

Ethernet Data Connector ..... RJ45

Interface..... Auto MDI/MDIX 100BASE-TX

Ethernet Data Rate..... Maximum 100Mb/s full duplex

**Ethernet Operation**

---

The Ethernet interface supports 100Mbit/s full duplex operation only. Data is transmitted from one port the other port with minimum delay or buffering.

The port implements "Auto MDI/MDIX" i.e. it may be connected with either a straight-though or cross-over cable to an appropriate device such as external switch, PC or other DCE/DTE.

Two LED indicators are provided adjacent to the RJ-45 port: Green indicates Link / Data transfer and Yellow indicates no Ethernet connection.

## Front Panel Indicators

---

### Power LED

POWER .....	Green	-	Power is present
	Off	-	Power is not present
VIDEO .....	Off	-	Not used
OPTO TX .....	Green	-	Tx opto. present
	Off	-	Tx opto. is not present
OPTO RX.....	Green	-	Rx opto. sync.
	Off	-	Rx opto. is not sync.

### Low Speed Data LEDs

Data Present IN (RS485 or RS422) ....	Green	-	logic zero (+V, -V) present on IN+, IN-
	Red	-	logic one (-V,+V) present on IN+, IN-
	Off	-	tri-state off or no connection on IN+, IN-
Data Present IN (RS232).....	Green	-	logic zero (+V) present on input IN+
	Red	-	logic transitions present on input IN+
	Off	-	logic one (-V) present on input IN+

IN corresponds to the data signals being transmitted onto the optical fibre.

Data Present OUT (RS485 or RS422)	Green	-	logic zero (+V,-V) present on OUT+, OUT-
	Red	-	logic one (-V,+V) present on OUT+, OUT-
	Off	-	tri-state off or no connection on OUT+, OUT-
Data Present OUT (RS232).....	Green	-	logic zero (+V) present on OUT+
	Red	-	logic transitions present on OUT+
	Off	-	logic one (-V) present on OUT+

OUT corresponds to the data signals being received from the optical fibre.

### Audio LEDs

#### Channels 1-6

Audio Present TX.....	Green	-	audio present > -40dBm
	Red	-	audio present > 0dBm (overload at +6dBm)
	Off	-	audio not present or < -40dBm

This represents the audio signals being transmitted on the optical fibre

Audio Present RX .....	Green	-	audio present > -40dBm
	Red	-	audio present > 0dBm (overload at +6dBm)
	Off	-	audio not present or < -40dBm

This represents the audio signals being received from the optical fibre.

### **Alarm LEDs**

#### **Channels 1-8**

ALARM IN.....	Green	-	Alarm ON / Contacts closed.
	Off	-	Alarm OFF / Contacts open.
ALARM OUT.....	Green	-	Alarm ON / Contacts closed.
	Off	-	Alarm OFF / Contacts open.

### **Echelon FTT-10A Data LEDs**

Data type depends on AMG system: RS-232, RS-422, RS-485, 20mA,TTL, or FTT-10A

Data Present IN .....	Green	-	Data channel present but not transmitting
	R/G	-	Data channel transmitting
	Off	-	Data channel not present or no connection

IN corresponds to the data signals being transmitted onto the optical fibre.

Data Present OUT .....	Green	-	Data channel present but not transmitting
	R/G	-	Data channel receiving
	Off	-	Data channel not present or no connection

OUT corresponds to the data signals being received from the optical fibre.

### **Ethernet Data LEDs**

Link not Present .....	Yellow	-	Link not present
	Off	-	Link is present
Link Integrity .....	Green	-	Link integrity is good, Idle state
	GBlink	-	Data transfer
	Off	-	Link not present

## Data and Alarm Channel Configuration

The **AMG5904A966HPG** receive unit sends and receives data to/from an **AMG5903A966HP** or rackmount equivalent **AMG5903A966HPG** transmit unit. The 2 physical data interfaces RS-485, RS-422 or RS-232 are individually selectable by the user with the slide switch mounted from the rear panel.

There are also 8 bi-directional alarm inputs provided, each alarm input is typically connected to a contact closure switch. Each alarm output can receive an on/off signal from an **AMG5903A966HP** and is typically used to convey contact closure status.

### Data Channel Configuration

Each low speed data channel provides an RS-232, RS-422 (full duplex, four wire) or RS-485 (half duplex, two wire) interface defined by the corresponding mode switch inside the enclosure. Every data channel as shipped from the factory is set up for RS-485 operation unless otherwise requested.

The data input for both the RS-485 and the RS-422 modes detects a tri-state input condition by monitoring the differential voltage level across the input. A differential level below 600mV positive or negative will be detected as a tri-state condition. A level above 600mV positive or negative will be detected as a logic 1 or logic 0 respectively. It is important therefore to terminate the RS-485 bus or the RS-422 input bus using 120Ω if a pre-bias is present on the RS-485 or RS-422 bus.

A large number of third party equipment manufacturers apply a pre-bias on their RS-485 bus. This pre-bias is applied by pulling one arm of the RS-485 bus high (+5 volts) and the other arm low (0 volts) using high value resistors within the third party equipment. In order to ensure that the AMG equipment detects a tri-state condition, then these resistors should have a value above 5kΩ. If the third party bias resistors are less than the 750Ω the bus can be multiple terminated as required to ensure that a tri-state level is detected.

The system detects a tri-state input condition on the data channel bus when in RS-485 or RS-422 mode.

### Data Interface Connections

Connector Pin No.	Data Channel		
	RS-485 [switch bottom]	RS-422 [switch middle]	RS-232 [switch top]
1	IN/OUT - (B)	OUT - (B)	OUT
2	IN/OUT + (A)	OUT + (A)	
3	GND	GND	GND
4		IN - (B)	
5		IN + (A)	IN

Note: (A) or (B) in brackets in the above table refers to RS-485 / RS-422 data specification.

### Data Channel Termination

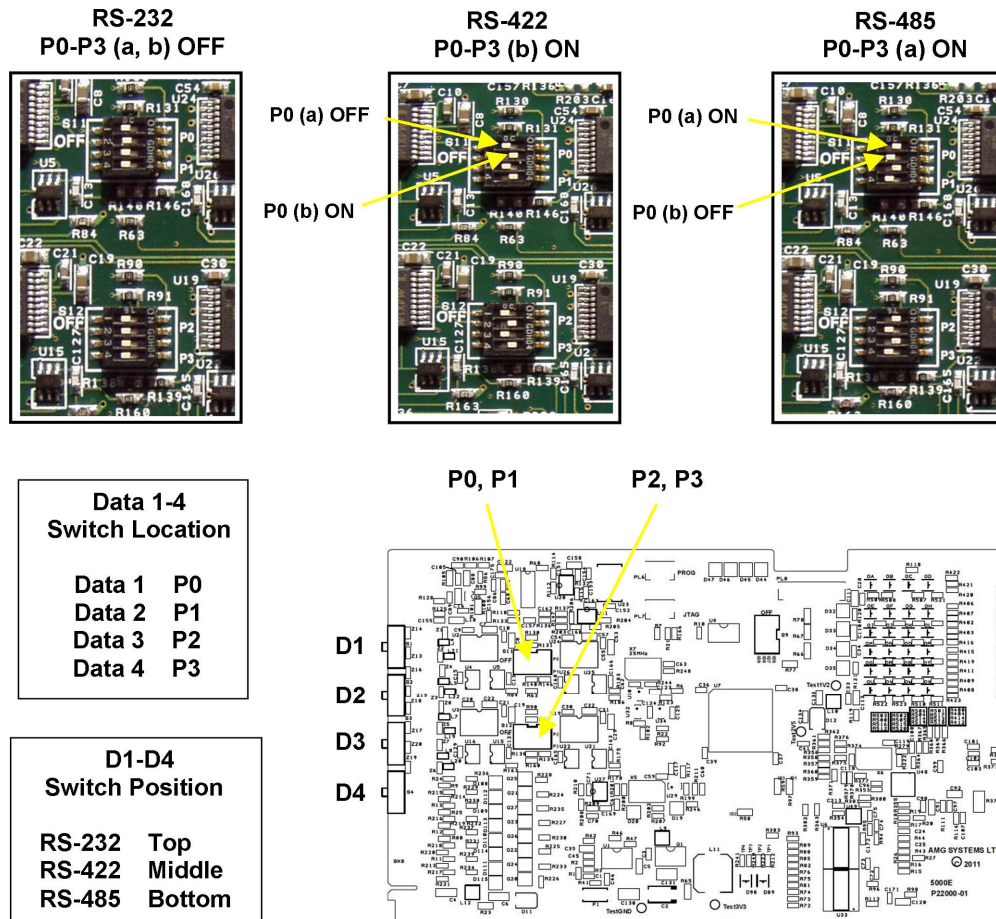
The interface mode RS-232, RS-422 or RS-485 of each data port Data 1-4, is selected with the corresponding external slide switch D1-D4. The actual number of data channels provided on the unit depends upon the AMG model.

Internal 120Ω termination resistors across IN+ and IN- inputs may also be applied when in RS-422 or RS-485 mode using internal DIP switches P0-P3 on the main PCB inside the enclosure. P0-P3 may



be accessed by removing the 2 fixing screws in the rear panel and sliding the PCB out of the enclosure.

For clarity, in the 3 examples shown below all 4 data ports D1-D4 are terminated the same, but each data channel may be configured & terminated independently as required. The 3 examples shown are RS-232 (no termination), RS-422 (120Ω) or RS-485 (120Ω).



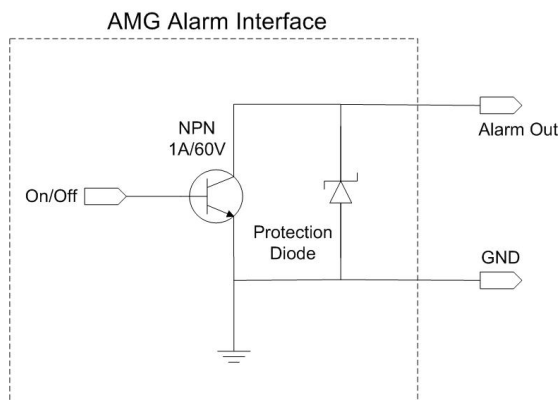
### Alarm Channel Configuration

The **AMG5904A966HPG** provides 8 bi-directional contact closure inputs / alarm outputs. Each ALARM IN input is via an internal 10kΩ series resistor with a 47kΩ pull-up resistor to the internal +3V3 supply.

Each ALARM OUT output can receive an on/off signal from an **AMG5903A966HP** and is typically used to convey contact closure status. Each alarm output is NPN open collector, maximum load 50mA / 24Vdc.

### Alarm Channel Circuit

The output of each alarm channel is an NPN open collector transistor circuit, with an absolute maximum rating of 1A / 60V. There is a common GND for all alarm channels.



The alarm output circuit is designed for low dc voltage / low current operation and has minimal internal protection. If an alarm output is used to drive an external relay circuit, the external circuit MUST include a protection (flyback) diode connected across the relay to prevent the high voltage generated from a back EMF causing damage due to the AMG output transistor.

### Alarm Interface Connections

Connector Pin No.	Alarm Interfaces	
	Alarm IN 1-4, 5-8	Alarm OUT 1-4, 5-8
1	ALARM 1/5 IN	ALARM 1/5 OUT
2	ALARM 2/6 IN	ALARM 2/6 OUT
3	GND	GND
4	ALARM 3/7 IN	ALARM 3/7 OUT
5	ALARM 4/8 IN	ALARM 4/8 OUT

### Audio Channel Configuration

The **AMG5904A966HPG** provides six bi-directional audio channels.

Each audio channel input is a balanced pair and the impedance can be configured as 56kΩ or 600Ω. The input impedance of each audio channel is individually selected using the DIL switch on the front panel.

If an audio input is single ended or ground referenced input rather than a differential (balanced) input pair, the Audio IN- signal should be connected to one of the GND pins available on the 37way D-type connector. These GND inputs are common to all audio channels.

### Echelon FTT-10A Data Channel Configuration

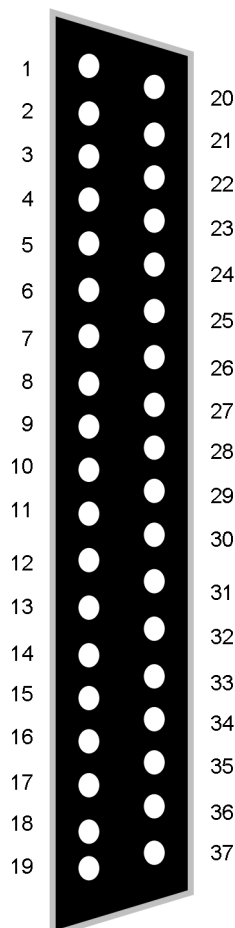
The **AMG5904A966HPG** provides 2 Echelon FTT-10A Data channels.

The GND connection associated with any Data signal signal should be connected to one of the GND pins available on the 37way D-type connector. These GND inputs are common to all audio / data channels.

### Data and Audio Connections

The Bank A audio channels and FTT10-A data channels pin connections on the rear panel connectors are as follows:

Pin No.	Description	Bank
1	Audio CH1 IN +	A
2	Audio CH1 IN -	A
3	Audio CH2 IN +	A
4	Audio CH2 IN -	A
5	Audio CH3 IN +	A
6	Audio CH3 IN -	A
7	Audio CH4 IN +	A
8	Audio CH4 IN -	A
9	GND	A
10	GND	A
11	GND	A
12	Audio CH5 IN +	A
13	Audio CH5 IN -	A
14	Audio CH6 IN +	A
15	Audio CH6 IN -	A
16	FTT-10A CH7 NET_B	A
17	FTT-10A CH7 NET_A	A
18	FTT-10A CH8 NET_B	A
19	FTT-10A CH8 NET_A	A



Pin No.	Description	Bank
20	Audio CH1 OUT +	A/B
21	Audio CH1 OUT -	A/B
22	Audio CH2 OUT +	A/B
23	Audio CH2 OUT -	A/B
24	Audio CH3 OUT +	A/B
25	Audio CH3 OUT -	A/B
26	Audio CH4 OUT +	A/B
27	Audio CH4 OUT -	A/B
28	GND	A/B
29	GND	A/B
30	GND	A/B
31	Audio CH5 OUT +	A/B
32	Audio CH5 OUT -	A/B
33	Audio CH6 OUT +	A/B
34	Audio CH6 OUT -	A/B
35	FTT-10A CH7 NET_B	A
36	FTT-10A CH7 NET_A	A
37	FTT-10A CH8 NET_B	A
	FTT-10A CH8 NET_A	A

#### Notes:

Bank A : Channels 1-6 are Audio and Channels 7 & 8 are FTT-10A Data.  
Bank B : Not Fitted

## **Physical Information**

---

### **Dimensions**

Height.....3U Plug-in  
Width.....21HP  
Depth .....170mm excluding connectors  
Weight.....1000grams

### **Mounting Details**

The unit is designed to be mounted within a non AMG Subrack on standard card guides.

## **Safety**

---

AMG Optical Fibre Products use Class 1 laser systems in accordance with EN 60825-2:2000.

It is always advisable to follow good practice when working with optical fibre systems. This includes:

- Do not stare with unprotected eyes or with any unapproved collimating device at fibre ends or connector faces, or point them at other people.
- Use only approved filtered or attenuating viewing aids

For other safety issues and advice on good practice associated with optical fibre systems, please see EN 60825-2:2000 or your local safety officer.

## **Maintenance and Repair**

---

There are no user serviceable parts within AMG products. See unit data sheet for full specification.

In case of problem or failure, please call your local support centre or contact: **AMG Systems Ltd.** at 3 The Omega Centre, Stratton Business Park, Biggleswade, Beds., SG18 8QB, UK.

Phone	+44 (0) 1767 600 777
Technical Support	+44 (0) 1767 604 491
Email	techsupport@amgsystems.com