

# **EFIS Horizon Cable Description**

Dual Display Unit EFIS System  
Dual AHRS/Air Data Computer

March 1, 2004  
Rev A

**Grand Rapids Technologies, Inc.**

## Revision History

Rev A - 3/1/04 Initial Release

## Overview

This document describes the cable assembly for a dual display unit EFIS system, with dual AHRS/Air Data Computers.

Display Unit 1 provides the control input to AHRS1 via a serial input. This control input is used for various user calibration inputs, such as for the altimeter, magnetometer calibration, etc. Normally no inputs is required from the display unit for the AHRS to start-up and operate, as the AHRS will go into align mode automatically at power-up, and will start normal operation at the completion of alignment.

Display Unit 2 provides the control input to AHRS2. Thus display unit 2 must be used for various user calibration inputs, such as for the altimeter, magnetometer calibration, etc.

Inputs to the AHRS are provided to allow user-entered calibration of the AHRS altimeter, calibration of the magnetometer, and to allow uploading new software into the AHRS.

This cable assembly provides both display units with serial data from the AHRS and EIS engine monitor. It also provides an inter-display unit serial connections to allow the two display units to share user-entries.

## Using this Document

The tables below show all connections to the various components that make up the EFIS. The table lists the following information:

**Pin** - The d-sub pin number.

**Function** - The usage for this pin.

**Color** - The wire color we have assigned for this input.

**Length** - The length, or length code for this wire.

**Install** - Indicates if wire is installed in the connector or not. The factory will install only wires which we know you will be using, and provide prepared wires (wires with d-sub contacts attached), for all other wires. Three codes are used here:

X = wire is installed. The other end of this wire is a cut lead (not installed in another connector by the factory).

→ = wire is installed, and connects to another factory installed connector.

← = wire is installed from another factory installed connector

BLANK = Wire not installed, and is left to the user to be installed.

**Connects to:**

MAG = to magnetometer. Wires have male d-sub pins installed, but are not inserted into the magnetometer's d-sub connector.

DU = to display unit 1. This wire is pre-installed into the female d-sub connector for the display unit.

DU-2 = to display unit 2. This wire is pre-installed into the female d-sub connector for the display unit.

Unconnected = The wire is installed in the connector, but the other end of this wire is a cut lead, and is installed by the user. A note may be included here to describe the intended use.

Length Codes. Customer may specify A, B, and C lengths. Standard lengths are A=4', B=20', C=2' if not specified.

Your Cable Lengths A= \_\_\_\_\_ B= \_\_\_\_\_ C= \_\_\_\_\_

**Display Unit 1 - Connector A Description**

Mating Connector: 25-pin Female D-sub (Instrument has 25-pin Male D-sub)

Pin	Function	Color	Length	Install	Connects to:
1	Serial Out 6 – RS232 Altitude Encoder Output *				
2	Serial Out 1 – Spare – Also connects to expansion port for ARINC 429 or internal GPS* (Available if expansion port not used.)				
3	Serial Out 5 – RS232 Autopilot Serial Data Output (Emulates NMEA0183)*	Blue	A		Autopilot NMEA0183 Input
4	Serial Out 2 – RS232 – Primary AHRS Output Data	Brown		←	AHRS1
5	Serial Out 4 – RS232 Out – Spare*				
6	Localizer Deviation + Left Input	Orange/Black	A		

7	Localizer Deviation + Right Input	Orange	A		
8	Glideslope Deviation + Down Input	Gray/Black	A		
9	Glideslope Deviation + Up Input	Gray	A		
10	Localizer Valid – Input	White/Brown	A		
11	Localizer Valid + Input	Brown	A		
12	Glideslope Valid – Input	White/Green	A		
13	Glideslope Valid + Input	Green	A		
14	Primary Power Input	Red	A	X	Unconnected
15	Secondary Power Input	Red/Blue	A		
16	Third Power Input	Red/Green	A		
17	Ground	Black	A	X	Unconnected
18	+12-40V Clock Power – Connect to aircraft power via a 0.1 amp inline fuse or 10k ohm resistor	Red/White	A	X	Unconnected
19	Serial Input 2 – RS232 Primary AHRS Input*	Yellow		←	AHRS1
20	Serial Input 1 – Spare – Also connects to expansion port for ARINC 429 or internal GPS* (Available if expansion port not used.)				
21	Serial Input 4 – RS232 EIS Engine Monitor Serial Data Input*	Green/Black	2'	→	EIS Serial Out
22	Serial Input 5 – RS232 GPS Data In (NMEA0183 or Aviation Format) *	Gray/Red	A	X	GPS NMEA 0183 or Aviation data output
23	Serial Input 3 – RS232 Inter-Display Unit Input	White	C	→	DU-2
24	Serial Input 6 – RS232 Input – Spare – Secondary AHRS Input (Future Growth for weather or traffic.)				
25	Serial Out 3 – RS232 Inter-Display Unit Output	Black/Yellow	C	→	DU-2

→ indicates this wire connects as shown

X = wire is installed

### Display Unit 1 - Connector B Description

Mating Connector: 25-pin Male D-sub (Instrument has 25-pin Female D-sub)

Pin	Function	Color	Length	Install	Connects to
25	Future Growth – Discrete Output Open/Ground				
24	Audio Output – Growth for connection				

	to Intercom Auxiliary Input				
23	Reserved for future growth				
22	Reserved for future growth				
21	Analog Input 1 – ILS Tuned Input/Spare				
20	Analog Input 2 –GPS Flag In/Spare				
19	Analog Input 3 – Nav Flag In/Spare				
18	Analog Input 4 – Reserved for future growth				
17	Analog Input 5 – Reserved for future growth				
16	Analog Input 6 – Reserved for future growth				
15	Analog Input 7 – Reserved for future growth				
14	Analog Input 8 – Reserved for future growth				
13	A1 Alt Encoder Output/Future Growth Discrete Output Option**				
12	A2 Alt Encoder Output/Future Growth Discrete Output Option**				
11	A4 Alt Encoder Output/Future Growth Discrete Output Option**				
10	B1 Alt Encoder Output/Future Growth Discrete Output Option**				
9	B2 Alt Encoder Output/Future Growth Discrete Output Option**				
8	B4 Alt Encoder Output/Future Growth Discrete Output Option**				
7	C1 Alt Encoder Output/Future Growth Discrete Output Option**				
6	C2 Alt Encoder Output/Future Growth Discrete Output Option**				
5	C4 Alt Encoder Output/Future Growth Discrete Output Option**				
4	D4 Alt Encoder Output/Future Growth Discrete Output Option**				
3	Future Growth Discrete Output **				
2	Future Growth Discrete Output**				
1	Warning Light Output - Open/Ground – Ground = Warning Light On	White/Blue	2'	X	Warning Light (other side of warning light connects to power.)

\*\* These outputs are open/ground, max input voltage = 50V, max sink current per input = 0.5 amp for any one input, 2.0 amps total for all of these discrete inputs combined.

## Display Unit 2 - Connector A Description

Mating Connector: 25-pin Female D-sub (Instrument has 25-pin Male D-sub)

Pin	Function	Color	Length	Install	Connects to:
1	Serial Out 6 – RS232 Altitude Encoder Output *				
2	Serial Out 1 – Spare – Also connects to expansion port for ARINC 429 or internal GPS* (Available if expansion port not used.)				
3	Serial Out 5 – RS232 Autopilot Serial Data Output (Emulates NMEA0183)*	Blue	A		
4	Serial Out 2 – RS232 – Primary AHRS Output Data	Brown	A	←	AHRS2
5	Serial Out 4 – RS232 Out – Spare*				
6	Localizer Deviation + Left Input	Orange/Black	A		
7	Localizer Deviation + Right Input	Orange	A		
8	Glideslope Deviation + Down Input	Gray/Black	A		
9	Glideslope Deviation + Up Input	Gray	A		
10	Localizer Valid – Input	White/Brown	A		
11	Localizer Valid + Input	Brown	A		
12	Glideslope Valid – Input	White/Green	A		
13	Glideslope Valid + Input	Green	A		
14	Primary Power Input	Red	A	X	Unconnected
15	Secondary Power Input	Red/Blue	A		
16	Third Power Input	Red/Green	A		
17	Ground	Black	A	X	Unconnected
18	+12-40V Clock Power – Connect to aircraft power via a 0.1 amp inline fuse or 10k ohm resistor	Red/White	A	X	Unconnected
19	Serial Input 2 – RS232 Primary AHRS Input*	Yellow		←	AHRS2
20	Serial Input 1 – Spare – Also connects to expansion port for ARINC 429 or internal GPS* (Available if expansion port not used.)				
21	Serial Input 4 – RS232 EIS Engine Monitor Serial Data Input*	Green/Black	2'	→	EIS Serial Out
22	Serial Input 5 – RS232 GPS Data In (NMEA0183 or Aviation Format) *	Gray/Red	A	X	Connects to GPS NMEA0183

					output)
23	Serial Input 3 – RS232 Inter-Display Unit Input	Black/Yellow		←	DU1
24	Serial Input 6 – RS232 Input – Spare – Secondary AHRS Input (Future Growth for weather or traffic.)				
25	Serial Out 3 – RS232 Inter-Display Unit Output	White		←	DU1

### Display Unit 2 - Connector B Description

Mating Connector: 25-pin Male D-sub (Instrument has 25-pin Female D-sub)

Pin	Function	Color	Length	Install	Connects to
25	Future Growth – Discrete Output Open/Ground				
24	Audio Output – Growth for connection to Intercom Auxiliary Input				
23	Reserved for future growth				
22	Reserved for future growth				
21	Analog Input 1 – ILS Tuned Input/Spare				
20	Analog Input 2 – GPS Flag In /Spare				
19	Analog Input 3 – Nav Flag In/ Spare				
18	Analog Input 4 – Reserved for future growth				
17	Analog Input 5 – Reserved for future growth				
16	Analog Input 6 – Reserved for future growth				
15	Analog Input 7 – Reserved for future growth				
14	Analog Input 8 – Reserved for future growth				
13	A1 Alt Encoder Output/Future Growth Discrete Output Option**				
12	A2 Alt Encoder Output/Future Growth Discrete Output Option**				
11	A4 Alt Encoder Output/Future Growth Discrete Output Option**				
10	B1 Alt Encoder Output/Future Growth Discrete Output Option**				
9	B2 Alt Encoder Output/Future Growth Discrete Output Option**				
8	B4 Alt Encoder Output/Future Growth				

	Discrete Output Option**				
7	C1 Alt Encoder Output/Future Growth Discrete Output Option**				
6	C2 Alt Encoder Output/Future Growth Discrete Output Option**				
5	C4 Alt Encoder Output/Future Growth Discrete Output Option**				
4	D4 Alt Encoder Output/Future Growth Discrete Output Option**				
3	Future Growth Discrete Output **				
2	Future Growth Discrete Output**				
1	Warning Light Output - Open/Ground – Ground = Warning Light On	White/Blue	2'	X	Warning Light (other side of warning light connects to power.)

\*\* These outputs are open/ground, max input voltage = 50V, max sink current per input = 0.5 amp for any one input, 2.0 amps total for all of these discrete inputs combined.



**AHRS Connector (AHRS 1)**

Mating Connector: 25-pin Male D-sub (AHRS has 25-pin Female D-sub)

Pin	Function	Wire Color	Length	Installed	Connects to:
1	Serial Out 1	Yellow	A	→	DU1
2	Serial Out 1				
3	Serial Out 2	Yellow	A		
4	Serial Out 2				
5	Serial In 1	Brown	A	→	DU1
6	Serial In 2				
7	Magnetometer Z Input	White	B	→	MAG1
8	Magnetometer Y Input	White/Brown	B	→	MAG1
9	Magnetometer X Input	White/Green	B	→	MAG1
10	Outside Air Temperature Input	Gray	8'		
11					
12					
13	Ground	Black	A	X	Unconnected
14	Magnetometer Gnd	Black	B	→	MAG1
15	Not Used				
16	Not Used				
17	Built-In-Test Status Output (Open/Ground) Ground state has 1k ohm resistance to ground. Ground = Operation Normal				
18	Magnetometer Control Output	White/Blue	B	→	MAG1
19	Reserved – Do Not Connect				
20	Not Used				
21					
22	Magnetometer Power Out	White/Red	B	→	MAG1
23	Aircraft Power Input A	Red	A	X	Unconnected
24	Aircraft Power Input B	Red/Blue	A		
25	Aircraft Power Input C	Red/Green	A		

\* Power Inputs A,B, and C are identical, diode-isolated inputs.

### **Magnetometer Connector (MAG1)**

Mating Connector: 9-pin Male D-sub (Magnetometer has 9-pin female D-sub)

All electrical connections for the magnetometer are made to the AHRS/Air Data Computer. The AHRS connector has these wires pre-installed. Route these wires through the airplane, and then insert the wires into the indicated hole in the magnetometer d-sub connector. Be sure to inspect the d-sub pin on the end of this wire for any damage that may occur when pulling these wires through the airplane. It is preferable to install these wires into the d-sub connector before pulling the wire through the airplane, although this requires larger passages to allow for the size of the d-sub connector.

<b>Pin</b>	<b>Function</b>	<b>Color</b>	<b>Length</b>	<b>Installed</b>	<b>Connects to:</b>
1	Magnetometer Y Output	White/Brown		←	AHRS1
2	Magnetometer Z Output	White		←	AHRS1
3	Magnetometer X Output	White/Green		←	AHRS1
4	Power (Power to be supplied only by AHRS Magnetometer Power Output)	White/Red		←	AHRS1
5	Ground	Black		←	AHRS1
6	Control	White/Blue		←	AHRS1
7	No Connection				
8	No Connection				
9	No Connection				

**AHRS Connector (AHRS 2)**

Mating Connector: 25-pin Male D-sub (AHRS has 25-pin Female D-sub)

Pin	Function	Wire Color	Length	Installed	Connects to:
1	Serial Out 1	Yellow	A	→	DU2
2	Serial Out 1				
3	Serial Out 2	Yellow	A		
4	Serial Out 2				
5	Serial In 1	Brown	A	→	DU2
6	Serial In 2				
7	Magnetometer Z Input	White	B	→	MAG2
8	Magnetometer Y Input	White/Brown	B	→	MAG2
9	Magnetometer X Input	White/Green	B	→	MAG2
10	Outside Air Temperature Input	Gray	8'		
11					
12					
13	Ground	Black	A	X	Unconnected
14	Magnetometer Gnd	Black	B	→	MAG2
15	Not Used				
16	Not Used				
17	Built-In-Test Status Output (Open/Ground) Ground state has 1k ohm resistance to ground. Ground = Operation Normal				
18	Magnetometer Control Output	White/Blue	B	→	MAG2
19	Reserved – Do Not Connect				
20	Not Used				
21					
22	Magnetometer Power Out	White/Red	B	→	MAG2
23	Aircraft Power Input A	Red	A	X	Unconnected
24	Aircraft Power Input B	Red/Blue	A		
25	Aircraft Power Input C	Red/Green	A		

\* Power Inputs A,B, and C are identical, diode-isolated inputs.

## Magnetometer Connector (MAG2)

Mating Connector: 9-pin Male D-sub (Magnetometer has 9-pin female D-sub)

All electrical connections for the magnetometer are made to the AHRS/Air Data Computer. The AHRS connector has these wires pre-installed. Route these wires through the airplane, and then insert the wires into the indicated hole in the magnetometer d-sub connector. Be sure to inspect the d-sub pin on the end of this wire for any damage that may occur when pulling these wires through the airplane. It is preferable to install these wires into the d-sub connector before pulling the wire through the airplane, although this requires larger passages to allow for the size of the d-sub connector.

Pin	Function	Color	Length	Installed	Connects to:
1	Magnetometer Y Output	White/Brown		←	AHRS2
2	Magnetometer Z Output	White		←	AHRS2
3	Magnetometer X Output	White/Green		←	AHRS2
4	Power (Power to be supplied only by AHRS Magnetometer Power Output)	White/Red		←	AHRS2
5	Ground	Black		←	AHRS2
6	Control	White/Blue		←	AHRS2
7	No Connection				
8	No Connection				
9	No Connection				