

# **EFIS Horizon Cable Description**

Triple Display Unit EFIS System  
Dual AHRS/Air Data Computer

May 10, 2004  
Rev A

Grand Rapids Technologies, Inc.

## Revision History

Rev A - 5/10/04 Initial Release

## Overview

This document describes the cable assembly for a triple-display unit EFIS system, with a dual AHRS.

Display Unit 1 provides the control input to the AHRS 1 via a serial input. Display Unit 2 provides the control input to the AHRS 2 via a serial input. Normally no input is required from the display unit for the AHRS to operate, as the AHRS will go into align mode automatically at power-up, and will start normal operation at the completion of alignment. Thus, the AHRS will start-up and operate normally without any serial data input to it.

Inputs to the AHRS are provided to allow user-entered calibration of the AHRS altimeter, and to allow uploading new software into the AHRS. Therefore, display unit 1 is used to calibrate the AHRS magnetometer and enter altimeter adjustments to AHRS 1, and display unit 2 for AHRS 2.

This cable assembly provides all display units with serial data from both AHRS and EIS engine monitor. It also provides an inter-display unit serial connections to allow the three 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/Black	C	→	DU-3
24	Serial Input 6 – RS232 Input – Spare – Secondary AHRS Input (Future Growth for weather or traffic.)	Yellow		←	AHRS2
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.)			←	AHRS1
25	Serial Out 3 – RS232 Inter-Display Unit Output	White	C	←	DU3

## 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.

### Display Unit 3 - 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		
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		←	AHRS-1
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	White		←	DU2
24	Serial Input 6 – RS232 Input – Spare – Secondary AHRS Input (Future Growth for weather or traffic.)	Yellow		←	AHRS-2
25	Serial Out 3 – RS232 Inter-Display Unit Output	White/Black		←	DU1

### Display Unit 3 - 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	Yellow	A	→	DU3
3	Serial Out 2	Yellow	A	→	DU2
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	Yellow	A	→	DU3
3	Serial Out 2	Yellow	A	→	DU1
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				