GARMIN

GEA 71

Installation Manual

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RECORD OF REVISIONS

Revision	Revision Date	Description
A	03/16/04	Production Release
B	09/19/06	Revised to conform to standard, updated manual
C	12/03/07	Updated Mod Level Table
D	06/25/08	Added caution regarding handle screw torque
E	03/11/09	Corrected listed unit and rack weights
F	6/1/10	Changed pins to RESERVED

CURRENT REVISION DESCRIPTION

Revision	Page Number(s)	Section Number	Description of Change
F	1-1	1.3	Changed number of Discrete Annunciator Outputs to “4”
	1-6	1.7	Updated warranty statement
	2-1	2.1	Updated AC reference
	4-3	4.1.2	Changed pins to RESERVED

DOCUMENT PAGINATION

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This manual reflects the operation of software version 2.07. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

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WARNING

This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This Notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our web site at www.garmin.com/prop65.

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GEA 71 HARDWARE MOD LEVEL HISTORY

The following table identifies hardware modification (Mod) Levels for the GEA 71 LRU. Mod Levels are listed with the associated service bulletin number, service bulletin date, and the purpose of the modification. The table is current at the time of publication of this manual (see date on front cover) and is subject to change without notice. Authorized Garmin Sales and Service Centers are encouraged to access the most up-to-date bulletin and advisory information on the Garmin Dealer Resource web site at www.garmin.com using their Garmin-provided user name and password.

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION
1	N/A	N/A	Improve ability to interface with ungrounded thermocouples
2	N/A	N/A	Improve performance when 5 or more constant current source outputs are enabled

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1 GENERAL DESCRIPTION

1.1 Introduction

This manual presents mechanical and electrical installation requirements for installing the GEA 71 as part of the Garmin Integrated Flight Deck. The GEA 71 can be integrated into a variety of airframes under an appropriate TC or STC. Each installation may vary. Use only approved (type or supplemental type) data for specific installation instructions in a particular aircraft.

1.2 Equipment Description

The GEA 71 is a micro-processor based input/output Line Replaceable Unit (LRU) used to monitor sensor inputs and drive annunciator outputs for aircraft airframe and engine systems. The GEA 71 interfaces with various sensors on the aircraft and communicates airframe and engine information via RS-485 digital interface to GIA 63(W) Integrated Avionics Units or IAUs. The GIAs then interface with the GDU Primary Flight Display(s) (PFD) and Multi-Function Display (MFD). Typically, the MFD shows engine instrumentation while the PFD normally shows airframe alerts provided by the GEA 71. Engine/airframe instrumentation is also displayed on the PFD and/or MFD while the system is in reversionary mode. The PFD and MFD displays serve as the user interface for the GEA 71. All configuration settings are controlled via software settings accessed by the MFD and PFD displays.

The GEA 71 uses a configuration module temperature sensor and a thermocouple sensor housed in a backshell assembly to monitor backshell junction temperatures. This capability is only needed in the event thermocouple engine temperature sensors are used.

1.3 Interface Summary

The following list is an interface summary for the GEA 71 unit:

- 18 Analog Inputs (all differential inputs; 4 inputs are current monitor capable, see Section 4)
- 12 Engine Temperature Analog Inputs (differential inputs)
- 23 Discrete Inputs
- 12 Digital Inputs*
- 4 Discrete Annunciate Outputs
- 2 RS-485 channels that interface to GIA 63 IAUs
- Software & Configuration data input from a Garmin Integrated Flight Deck
- Aircraft Power Input (Power-on controlled by aircraft avionics power bus)

*Note that all digital inputs can also be configured as discrete inputs if desired.

1.4 Technical Specifications

It is the responsibility of the installing agency to obtain the latest revision of the GEA 71 Environmental Qualification Form. This form is available directly from Garmin under the following part number:

GEA 71 Environmental Qualification Form, Garmin part number 005-00147-02

To obtain a copy of this form, see the dealer/OEM portion of the Garmin web site (www.garmin.com).

1.4.1 Physical Characteristics

Characteristic	Specification
Width (w/ Rack)	1.23 inches (3.12 cm)
Height (w/ Rack)	6.30 inches (16.0 cm)
Depth (Rack w/ Connectors)	8.73 inches (22.17 cm)
Unit Weight	1.75 lbs (0.79 kg)
Rack, Nutplate, & Connector Kit Weight	0.83 lbs (0.38 kg)

1.4.2 Power Requirements

Characteristic	Specification
Input Voltage	14/28 Vdc See the Environmental Qualification Form for details on surge ratings and minimum/maximum operating voltages.

Unit Status	Max Current @ 28 Vdc	Max Current @ 14 Vdc (Optional)
Off	0.01 A	0.01 A
On	0.15 A	0.30 A
On*	0.50 A	1.00 A

*Full Load On Transducer Power Outputs.

NOTE

During the first five seconds of unit power-up, current is slightly higher due to backup capacitors being charged. Estimate initial power-up current to be ~50 mA @ 28 Vdc higher or ~100 mA @ 14 Vdc higher than the above figures.

1.5 Reference Documents

The following publications are sources of additional information for installing the GEA 71. Before installing the GEA 71, the technician should read all referenced materials along with this manual.

Part Number	Document
190-00303-00	G1000 System Installation Manual
190-00303-04	G1000 Line Maintenance and Configuration Manual

1.6 Certification

The conditions and test required for the TSO approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval installation in an aircraft. The article may be installed only if performed under 14 CFR part 43 or the applicable airworthiness requirements.

At the time of publication, installations of this TSO approved article are only approved when installed in an aircraft as part of a Garmin Integrated Flight Deck.

1.6.1 TSO/ETSO Compliance

Function	TSO/ETSO	Category	Applicable LRU Software Part Numbers
Fuel Flow Meters	TSO-C44b ETSO-C44b	Type I	006-B0193-()
Temperature Instruments	TSO-C43c ETSO-C43c	Class IIa	006-B0193-()
Manifold Pressure Instruments	TSO-C45a ETSO-C45a	Type II	006-B0193-()
Pressure Instruments-Fuel, Oil, and Hydraulic	TSO-C47 ETSO-C47	Type II	006-B0193-()
Electric Tachometer	TSO-C49b ETSO-C49b	N/A	006-B0193-()
Fuel and Oil Quantity Instruments	TSO-C55 ETSO-C55	Types I & II	006-B0193-()

1.6.2 TSO/ETSO Deviations

TSO/ETSO	Deviation
TSO-C43c	1. Garmin was granted a deviation from TSO-C43c to use SAE AS 8005A in place of SAE AS 8005 to demonstrate compliance for Temperature Instruments. 2. Garmin was granted a deviation from TSO-C43c section a.2 to use RTCA DO-160D in place of RTCA DO-160C for the Environmental Standard.
ETSO-C43c	1. Garmin was granted a deviation from ETSO-C43c to use SAE AS 8005A in place of SAE AS 8005 to demonstrate compliance for Temperature Instruments. 2. Garmin was granted a deviation from ETSO-C43c section a.2 to use RTCA DO-160D in place of RTCA DO-160C for the Environmental Standard.
TSO-C44b	1. Garmin was granted a deviation from TSO-C44b section a.3 to use RTCA DO-160D in place of SAE AS 407B for the Environmental Standard. 2. Garmin was granted a deviation from TSO-C44b section b.1 to not display the software part number on the outside of the unit. Notice 8110.49 paragraph 5-4.d states, "For airborne equipment having separate part numbers for hardware and software, the software part number need not be displayed on the outside of the unit, as long as it can be verified through some kind of electronic query." 3. Garmin was granted a deviation from TSO-C44b to use SAE AS 407C in place of SAE AS 407B to demonstrate compliance for Fuel Flowmeters.
ETSO-C44b	1. Garmin was granted a deviation from ETSO-C44b section a.3 to use RTCA DO-160D in place of SAE AS 407B for the Environmental Standard. 2. Garmin was granted a deviation from ETSO-C44b section b.1 to not display the software part number on the outside of the unit. Notice 8110.49 paragraph 5-4.d states, "For airborne equipment having separate part numbers for hardware and software, the software part number need not be displayed on the outside of the unit, as long as it can be verified through some kind of electronic query." 3. Garmin was granted a deviation from ETSO-C44b to use SAE AS 407C in place of SAE AS 407B to demonstrate compliance for Fuel Flowmeters.
TSO-C45a	1. Garmin was granted a deviation from TSO-C45a section a.4 to use RTCA DO-160D in place of RTCA DO-160C for the Environmental Standard.
ETSO-C45a	1. Garmin was granted a deviation from ETSO-C45a section a.4 to use RTCA DO-160D in place of RTCA DO-160C for the Environmental Standard.
TSO-C47	1. Garmin was granted a deviation from TSO-C47 to use SAE AS 408C in place of SAE AS 408A to demonstrate compliance for Pressure Instruments, Fuel Oil and Hydraulic. 2. Garmin was granted a deviation from TSO-C47 to use the environmental standards set forth in RTCA DO-160D in place of the environmental standards set forth in SAE AS 408C.
ETSO-C47	1. Garmin was granted a deviation from ETSO-C47 to use SAE AS 408C in place of SAE AS 408A to demonstrate compliance for Pressure Instruments, Fuel Oil and Hydraulic. 2. Garmin was granted a deviation from ETSO-C47 to use the environmental standards set forth in RTCA DO-160D in place of the environmental standards set forth in SAE AS 408C.
TSO-C49b	1. Garmin was granted a deviation from TSO-C49b to use SAE AS 404C in place of SAE AS 404B to demonstrate compliance for Electric Tachometer Instruments. 2. Garmin was granted a deviation from TSO-C49b section a.3 to use RTCA DO-160D in place of SAE AS 407B for the Environmental Standard.
ETSO-C49b	1. Garmin was granted a deviation from ETSO-C49b to use SAE AS 404C in place of SAE AS 404B to demonstrate compliance for Electric Tachometer Instruments. 2. Garmin was granted a deviation from ETSO-C49b section a.3 to use RTCA DO-160D in place of SAE AS 407B for the Environmental Standard.

TSO/ETSO Deviations, continued	
TSO/ETSO	**Deviation**
TSO-C55	1. Garmin was granted a deviation from TSO-C55 to use SAE AS 405C in place of SAE AS 405B to demonstrate compliance for Fuel and Oil Quantity Instruments for Reciprocating Engine Aircraft. 2. Garmin was granted a deviation from TSO-C55 to use the environmental standards set forth in RTCA DO-160D in place of environmental standards set forth in SAE AS 405C.
ETSO-C55	1. Garmin was granted a deviation from ETSO-C55 to use SAE AS 405C in place of SAE AS 405B to demonstrate compliance for Fuel and Oil Quantity Instruments for Reciprocating Engine Aircraft. 2. Garmin was granted a deviation from ETSO-C55 to use the environmental standards set forth in RTCA DO-160D in place of environmental standards set forth in SAE AS 405C.

1.7 Limited Warranty

All Garmin avionics products are warranted to be free from defects in materials or workmanship for: two years from the date of purchase for new Remote-Mount and Panel-Mount products; one year from the date of purchase for new portable products and any purchased newly-overhauled products; six months for newly-overhauled products exchanged through a Garmin Authorized Service Center; and 90 days for factory repaired or newly-overhauled products exchanged at Garmin in lieu of repair. Within the applicable period, Garmin will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost. This warranty does not apply to: (i) cosmetic damage, such as scratches, nicks and dents; (ii) consumable parts, such as batteries, unless product damage has occurred due to a defect in materials or workmanship; (iii) damage caused by accident, abuse, misuse, water, flood, fire, or other acts of nature or external causes; (iv) damage caused by service performed by anyone who is not an authorized service provider of Garmin; or (v) damage to a product that has been modified or altered without the written permission of Garmin. In addition, Garmin reserves the right to refuse warranty claims against products or services that are obtained and/or used in contravention of the laws of any country.

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2 INSTALLATION OVERVIEW

2.1 Introduction

This section provides hardware equipment information for installing the GEA 71 and related hardware. Installation of the GEA 71 must follow the aircraft TC or STC requirements. Cabling is fabricated by the installing agency to fit each particular aircraft. The guidance of FAA advisory circulars AC 43.13-1B and AC 43.13-2B, where applicable, may be found useful for making retro-fit installations that comply with FAA regulations.

Refer to the G1000 System Installation Manual, Garmin part number 190-00303-00 for further details on the mechanical aspects of the Garmin Integrated Flight Deck.

2.2 Installation Materials

The GEA 71 is available only as a single unit under the following part number:

Item	Garmin Catalog Part Number
GEA 71 Unit (011-00831-00)	010-00283-00

2.2.1 Equipment Available

Each of the following accessories are provided separately for the GEA 71:

Item	Garmin Catalog Part Number
GEA 71 Unit Rack	115-00411-00
G1000 Rack Nutplate Kit	011-00915-00 (preferred) or 011-01148-00
GEA 71 Back Plate (‘A’ Keyplate)	011-00796-00
GEA 71 Connector Kit (Spider)	011-00797-01
GEA 71 Connector Kit (Shield Block)	011-00797-03
Configuration Module Kit	011-00979-00
Thermocouple Kit	011-00981-00

2.3 Interface Considerations

The GEA 71 interfaces with the GIA 63(W) IAU and with various sensors on the aircraft. Fabrication of a wiring harness is required.

2.3.1 Airframe/Engine Sensor Considerations

There are several sensors that are normally found on single- and twin-engine aircraft. The GEA 71 is designed to interface with such sensors, giving the unit complete configurability for different applications. Table 2-1 shows typical engine/airframe sensors that can be connected with the GEA 71. Note that this table is not an all-inclusive list of sensors that can be used.

Table 2-1. Typical Engine/Airframe Sensors

Exhaust Gas Temperature (EGT)	Cylinder Head Temperature (CHT)
Oil Pressure	Oil Temperature
Fuel Flow	Fuel Level (L/R)
Manifold Air Pressure (MAP)	Engine RPM
Alternator/Volts Meter	Amps
Door Open/Closed Annunciation	Pitot Heat Annunciation
Low/High Compressor RPM (N1, N2)	Generator Power

2.3.2 Engine/Airframe Sensor Installation

Engine/airframe sensors to be used must be approved by the aircraft manufacturer and Garmin. Follow the sensor manufacturer recommended installation procedures. Wires routed too close to spark plugs, plug wires, or magnetos may result in erratic readings. Ensure that EGT, CHT, and other sensor wires do not come in contact with exhaust manifolds or any other extreme heat sources. Give proper attention to each sensor's requirements for polarity, voltage, wire type, and mounting.

2.4 Cabling and Wiring

Use AWG #24 or larger wire for all connections unless otherwise specified by the aircraft manufacturer or Garmin. The standard pin contacts supplied in the connector kit are compatible with up to AWG #22 wire. In cases where some installations have more than one unit sharing a common circuit breaker, sizing and wire gauge is based on aircraft circuit breaker layout, length of wiring, current draw of units, and internal unit protection characteristics. Do not attempt to combine more than one unit on the same circuit breaker unless it is specified on aircraft manufacturer approved drawings.

In some cases, a larger gauge wire such as AWG #16, #18, or #20 may be needed for power connections. Special thin-wall heat shrink tubing is also provided to insulate the extended barrels inside the backshell. If using #16 or #18 barrel contacts, ensure that no two contacts are mounted directly adjacent to each other. This minimizes the risk of contacts touching and shorting to adjacent pins and to ground.

Ensure that routing of the wiring does not come in contact with sources of heat, RF or EMI interference. Check that there is ample space for the cabling and mating connectors. Avoid sharp bends in cabling and routing near aircraft control cables.

2.5 Cooling Air

Refer to the G1000 System Installation Manual, Garmin part number 190-00303-00, for information on cooling requirements.

2.6 Mounting Requirements

The GEA 71 mounting surface should be capable of providing a sufficient electrical bond to the aircraft to minimize radiated EMI and provide protection from High-Intensity Radiation Fields (HIRF). The GEA 71 can be mounted using the G1000 main system rack, or the unit may be mounted remotely if desired. Figure 2-1 shows the GEA 71 unit rack.

The unit rack is fastened to the main system rack using the nutplate kit listed in Section 2.2.1. Refer to the Figure A-2 GEA 71 Installation Drawing, for nutplate placement locations.

The installer must provide any additional remote mounting equipment.

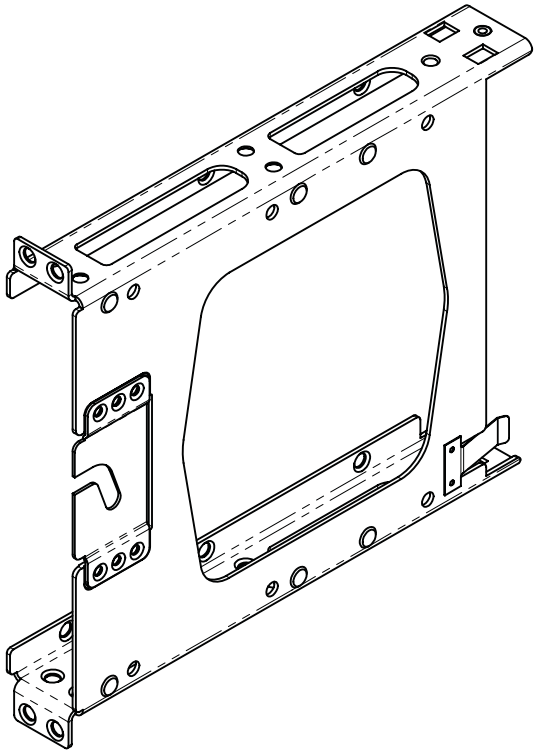

Figure 2-1. GEA 71 Unit Rack

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3 INSTALLATION PROCEDURE

3.1 Unpacking Unit

Carefully unpack the equipment and make a visual inspection of the unit for evidence of damage incurred during shipment. If the unit is damaged, notify the carrier and file a claim. To justify a claim, save the original shipping container and all packing materials. Do not return the unit to Garmin until the carrier has authorized the claim.

Retain the original shipping containers for storage. If the original containers are not available, a separate cardboard container should be prepared that is large enough to accommodate sufficient packing material to prevent movement.

3.2 Wiring Harness Installation

Allow adequate space for installation of cables and connectors. The installer shall supply and fabricate all of the cables. All electrical connections are made through two 78-pin D-Subminiature connectors provided by Garmin.

Section 4 defines the electrical characteristics of all input and output signals. Required connectors and associated hardware are supplied with the connector kit (Refer to Section 2.2.1). See Appendix B for examples of interconnect wiring diagrams. Construct the actual harnesses in accordance with aircraft specific approved interconnect diagrams.

Table 3-1. Pin Contact Part Numbers

Manufacturer	78 pin D-Subminiature connector (P701, 702)		
	16 AWG (Power Only)	18-20 AWG (Power Only)	22-28 AWG
Garmin P/N	336-00044-01	336-00044-00	336-00021-00
Military P/N	N/A	N/A	M39029/58-360
AMP	N/A	N/A	204370-2
Positronic	N/A	N/A	MC8522D
ITT Cannon	N/A	N/A	030-2042-000

Table 3-2. Recommended Crimp Tools

Manufacturer	Hand Crimping Tool	18-20 AWG		22-28 AWG	
		Positioner	Insertion/ Extraction Tool (note 2)	Positioner	Insertion/ Extraction Tool
Military P/N	M22520/2-01	N/A	M81969/1-04	M22520/2-09	M81969/1-04
Positronic	9507	9502-11	M81969/1-04	9502-4	M81969/1-04
ITT Cannon	995-0001-584	N/A	N/A	M22520/2-09	274-7048-000
AMP	601966-1	N/A	91067-1	601966-6	91067-1
Daniels	AFM8	K774	M81969/1-04	K42	M81969/1-04
Astro	615717	N/A	M81969/1-04	615725	M81969/1-04

NOTES

1. Non-Garmin part numbers shown are not maintained by Garmin and consequently are subject to change without notice.
2. Extracting the #16, #18 and #20 contact requires that the expanded wire barrel be cut off from the contact. It may also be necessary to push the pin out from the face of the connector when using an extractor due to the absence of the wire. A new contact must be used when reassembling the connector.
3. For applications using 16 AWG wire, contact Garmin for information regarding connector crimp positioner tooling.

3.3 Backshell Assembly and Installation

The GEA 71 connector kit includes two Garmin backshell assemblies. The backshell assemblies house the configuration module/temperature sensor. Garmin's backshell also gives the installer the ability to easily terminate shield grounds at the backshell housing using one of two methods available (SPIDER or Shield Block). To assemble the backshell and configuration module refer to instructions provided in Table 3-3. The documents listed in Table 3-3 are available via the Dealer portion of the Garmin website (www.garmin.com).

Table 3-3. Backshell Installation Instruction Documents

Document	Garmin Part Number
G1000 System Installation Manual	190-00303-00
G1000 Configuration Module Instructions into a Backshell	190-00313-02
G1000 SPIDER Installation Instructions	190-00313-03
G1000 Shield Block Installation Instructions	190-00313-09

NOTE

Information about the SPIDER grounding system is provided in support of existing installations. All new installations shall use the SHIELD BLOCK grounding system.

3.4 Thermocouple Installation

The backshell assembly also houses a thermocouple reference junction (needed only if the GEA 71 is to monitor temperatures using thermocouple sensors). The thermocouple kit is available separately as Garmin part number 011-00981-00. Refer to the Thermocouple Installation into a Backshell document (190-00313-01) available via the Dealer portion of the Garmin website (www.garmin.com) for thermocouple installation instructions.

3.5 Final Installation

For final installation and assembly, refer to the outline and installation drawings shown in Appendix A of this manual.

1. Assemble the connector backshells as described in Sections 3.3 and 3.4.
2. Connect both connectors to the rear plate using the screws provided in the connector kit.
3. Mount the unit rack to the main system rack or other suitable mounting location using the provided nutplates.
4. Assemble the rear plate into the GEA 71 unit rack.
5. Insert the GEA 71 into the rack, noting proper orientation as shown on the installation drawing in Appendix B.

CAUTION

Do not use excessive force when inserting the GEA 71 into the rack. This may cause damage to occur to the connectors, unit, and/or unit rack. If heavy resistance is felt during installation, stop! Remove the GEA 71 and identify the source of resistance. The rear plate is designed to float in the unit rack. Check to ensure the rear plate is not bound by the connector harness.

6. Lock the GEA 71 in place using the lever-locking handle. Fasten the handle to the GEA 71 body using the provided Phillips screw. (Note that some early GEA 71s use D-ring ¼-turn fastener)

CAUTION

Start the handle screw into the hole carefully, to avoid cross-threading. Do not apply torque in excess of 14 in-lbs to the handle screw. The application of torque exceeding 14 in-lbs to this screw will damage the LRU case and/or retaining hardware.

3.6 Post Installation Configuration and Checkout

NOTE

The GEA 71 does not provide valid outputs until the aircraft post installation configuration procedures are completed.

The GEA71 must be installed with a Garmin Integrated Flight Deck and have FAA approved configuration data. Configuration data is loaded to the GEA 71 from an aircraft-specific SW Loader Card. GEA settings are predetermined for a specific aircraft and are typically contained within the file named 'GEA1'.

The PFD serves as the graphics user interface to the installer configuring the system. For basic configuration information, refer to the G1000 Line Maintenance and Configuration Manual, Garmin part number 190-00303-04. For actual aircraft installation/checkout, use only aircraft manufacturer approved checkout procedures.

3.7 Continued Airworthiness

Maintenance of the GEA 71 is "on condition" only. For regulatory periodic functional checks, refer to approved aircraft maintenance manuals or manual supplements for actual aircraft maintenance requirements.

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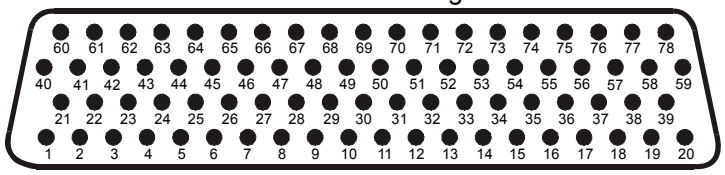
4 SYSTEM INTERCONNECTS

4.1 Pin Function List

4.1.1 P701 Connector

View of P701 connector looking at rear of unit.

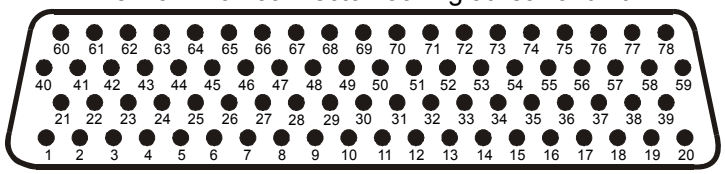


Pin	Pin Name	I/O
1	CONFIG MODULE GROUND	--
2	DIGITAL IN* 1	In
3	DIGITAL IN* 2	In
4	SIGNAL GROUND	--
5	RS 485 1 A	I/O
6	RS 485 1 B	I/O
7	RS 485 2 A	I/O
8	RS 485 2 B	I/O
9	GEA SYSTEM ID PROGRAM* 1	In
10	GEA SYSTEM ID PROGRAM* 2	In
11	TRANSDUCER POWER OUT LO (GROUND)	--
12	TRANSDUCER POWER OUT LO (GROUND)	--
13	TRANSDUCER POWER OUT LO (GROUND)	--
14	+10 VDC TRANSDUCER POWER OUT	Out
15	+5 VDC TRANSDUCER POWER OUT	Out
16	+12 VDC TRANSDUCER POWER OUT	Out
17	ENGINE TEMP ANALOG IN 6 HI	In
18	ENGINE TEMP ANALOG IN 6 LO	In
19	SIGNAL GROUND	--
20	POWER GROUND	--
21	CONFIG MODULE POWER	Out
22	ANALOG IN 1 HI	In
23	ANALOG IN 1 LO	In
24	ANALOG IN 2 HI	In
25	ANALOG IN 2 LO	In
26	ENGINE TEMP ANALOG IN 1 HI	In
27	ENGINE TEMP ANALOG IN 1 LO	In
28	ENGINE TEMP ANALOG IN 2 HI	In
29	ENGINE TEMP ANALOG IN 2 LO	In
30	ENGINE TEMP ANALOG IN 3 HI	In
31	ENGINE TEMP ANALOG IN 3 LO	In
32	SIGNAL GROUND	--
33	ENGINE TEMP ANALOG IN 4 HI	In
34	ENGINE TEMP ANALOG IN 4 LO	In
35	AIRCRAFT POWER 1	In
36	ENGINE TEMP ANALOG IN 5 HI	In
37	AIRCRAFT POWER 2	In
38	ENGINE TEMP ANALOG IN 5 LO	In

Connector P701, continued		
Pin	**Pin Name**	**I/O**
39	SIGNAL GROUND	--
40	CONFIG MODULE DATA	I/O
41	DIGITAL IN* 3	In
42	ANALOG IN 3 HI	In
43	ANALOG IN 3 LO	In
44	ANALOG IN 4 HI	In
45	ANALOG IN 4 LO	In
46	ANALOG IN 5 HI	In
47	ANALOG IN 5 LO	In
48	ENGINE TEMP ANALOG IN 7 HI	In
49	ENGINE TEMP ANALOG IN 7 LO	In
50	ENGINE TEMP ANALOG IN 8 HI	In
51	ENGINE TEMP ANALOG IN 8 LO	In
52	ENGINE TEMP ANALOG IN 9 HI	In
53	ENGINE TEMP ANALOG IN 9 LO	In
54	ENGINE TEMP ANALOG IN 10 HI	In
55	ENGINE TEMP ANALOG IN 10 LO	In
56	ENGINE TEMP ANALOG IN 11 HI	In
57	ENGINE TEMP ANALOG IN 11 LO	In
58	ENGINE TEMP ANALOG IN 12 HI	In
59	ENGINE TEMP ANALOG IN 12 LO	In
60	CONFIG MODULE CLOCK	Out
61	DIGITAL IN* 4	In
62	ANALOG IN 6 HI	In
63	ANALOG IN 6 LO	In
64	ANALOG IN 7 HI	In
65	ANALOG IN 7 LO	In
66	ANALOG IN 8 HI	In
67	ANALOG IN 8 LO	In
68	THERMOCOUPLE REF IN HI	In
69	THERMOCOUPLE REF IN LO	In
70	DISCRETE IN* 1	In
71	DISCRETE IN* 2	In
72	ANALOG IN 9 HI	In
73	ANALOG IN 9 LO	In
74	ANALOG IN 10 HI	In
75	ANALOG IN 10 LO	In
76	DISCRETE IN* 3	In
77	GEA REMOTE POWER OFF	In
78	POWER GROUND	--

4.1.2 P702 Connector

View of P702 connector looking at rear of unit.



Pin	Pin Name	I/O
1	ANNUNCIATE* 1A	Out
2	ANNUNCIATE* 2A	Out
3	ANNUNCIATE* 3A	Out
4	ANNUNCIATE* 4A	Out
5	RESERVED	--
6	RESERVED	--
7	RESERVED	--
8	RESERVED	--
9	RESERVED	--
10	RESERVED	--
11	TRANSDUCER POWER OUT LO (GROUND)	--
12	TRANSDUCER POWER OUT LO (GROUND)	--
13	TRANSDUCER POWER OUT LO (GROUND)	--
14	+10 VDC TRANSDUCER POWER OUT A	Out
15	+5 VDC TRANSDUCER POWER OUT A	Out
16	+12 VDC TRANSDUCER POWER OUT A	Out
17	RESERVED	--
18	RESERVED	--
19	RESERVED	--
20	RESERVED	--
21	RESERVED	--
22	RESERVED	--
23	RESERVED	--
24	RESERVED	--
25	DISCRETE IN* 11A	In
26	DISCRETE IN* 12A	In
27	DISCRETE IN* 13A	In
28	DISCRETE IN* 14A	In
29	DISCRETE IN* 15A	In
30	DISCRETE IN* 16A	In
31	SIGNAL GROUND	--
32	SIGNAL GROUND	--
33	SIGNAL GROUND	--
34	SIGNAL GROUND	--
35	SIGNAL GROUND	--
36	SIGNAL GROUND	--
37	SIGNAL GROUND	--
38	SIGNAL GROUND	--
39	SIGNAL GROUND	--

Connector P702, continued		
Pin	**Pin Name**	**I/O**
40	DISCRETE IN* 17A	In
41	DISCRETE IN* 18A	In
42	DISCRETE IN* 19A	In
43	DISCRETE IN* 20A	In
44	ANALOG/CURRENT MONITOR IN 1A HI	In
45	ANALOG/CURRENT MONITOR IN 1A LO	In
46	ANALOG/CURRENT MONITOR IN 2A HI	In
47	ANALOG/CURRENT MONITOR IN 2A LO	In
48	ANALOG/CURRENT MONITOR IN 3A HI	In
49	ANALOG/CURRENT MONITOR IN 3A LO	In
50	ANALOG/CURRENT MONITOR IN 4A HI	In
51	ANALOG/CURRENT MONITOR IN 4A LO	In
52	ANALOG IN 1A HI	In
53	ANALOG IN 1A LO	In
54	ANALOG IN 2A HI	In
55	ANALOG IN 2A LO	In
56	ANALOG IN 3A HI	In
57	ANALOG IN 3A LO	In
58	ANALOG IN 4A HI	In
59	ANALOG IN 4A LO	In
60	DISCRETE IN* 1A	In
61	DISCRETE IN* 2A	In
62	DISCRETE IN* 3A	In
63	DISCRETE IN* 4A	In
64	DISCRETE IN* 5A	In
65	DISCRETE IN* 6A	In
66	DISCRETE IN* 7A	In
67	DIGITAL IN* 5A	In
68	DIGITAL IN* 6A	In
69	DIGITAL IN* 7A	In
70	DIGITAL IN* 8A	In
71	DISCRETE IN* 8A	In
72	DISCRETE IN* 9A	In
73	DISCRETE IN* 10A	In
74	DIGITAL IN* 1A	In
75	DIGITAL IN* 2A	In
76	DIGITAL IN* 3A	In
77	DIGITAL IN* 4A	In
78	SIGNAL GROUND	--

4.2 Electrical Characteristics

4.2.1 Analog Input Configuration

All analog inputs, except those discussed in Section 4.2.3 are multi-purpose capable and have several configuration options. Table 4-1 summarizes the configuration options.

Table 4-1. Analog Input Configuration Summary

Configurable Parameter	Description/Characteristic
Resistive Divider	Resistive Divider can be enabled or disabled for each analog input. Enabling & Disabling is achieved via software configuration. See Section 3.6. *When Disabled*: Hardware scaling is 1:1 and input impedance is greater than 10 MΩ. *When Enabled*: Hardware scaling is 50:1 and input impedance is approximately 100 kΩ.
Voltage Measurement Ranges	There are six voltage measurement ranges for analog inputs: • 25 mV, 55 mV, 100 mV, 1 Vdc, 2.5 Vdc, and 5.0 Vdc (Applies to both 1:1 and 50:1 scaling). Effective voltage range in 50:1 mode: • 1.25 Vdc, 2.75 Vdc, 5.0 Vdc, and 50 Vdc.
Bipolar/Unipolar	Each analog input can be configured to measure Bi-Polar (positive and negative) or Uni-Polar (positive only) voltages. All analog inputs are differential.
Constant Current Source	Each analog input can be configured to supply a 250 µA constant current source (CCS) from the positive differential input used to measure resistive sensors.
Miscellaneous Sensor Configuration Parameters	• Update Rate • High Side Current Monitor Feature Enabled/Disabled • Voltage Translation Equations • Minimum/Maximum Values for Sensors • Hysteresis Value • Digital Filtering Value

NOTE

If installing an ungrounded thermocouple to an Analog In input, a dc reference must be added to the LO input. This can be accomplished by adding a resistance of 1 MΩ or less between ground and the Analog In LO input that the ungrounded thermocouple is installed on.

4.2.2 Transducer Output Power

The GEA 71 supplies output power for engine/airframe sensors that may require supply voltage excitation. The GEA 71 outputs three different voltage levels:

- +5 Vdc
- +10 Vdc
- +12 Vdc.

Transducer output current is limited to 125 mA for the +5 and +10 Vdc outputs, and 300 mA for the +12 Vdc output. The three voltage outputs are temporarily disabled during power-up for ~2 seconds.

4.2.3 Engine Temperature Analog In

Aircraft engine temperature sensors are usually one of two types: Thermocouple or Resistive Temperature Detector (RTD). The GEA 71 is designed to utilize either sensor for EGT and CHT temperature measurements. Engine Temp Analog inputs are only available with the resistive divider disabled (1:1 scaling). The maximum differential voltage and the maximum voltage with respect to ground that can be measured on any Engine Temp Analog Input is 2.5 Vdc.

The GEA 71 can be used with Type K or J thermocouples. Some thermocouples have a ground reference built into their design while others do not. The GEA 71 works with either setup. Figure B-1 provides an example interconnect showing thermocouples.

The GEA 71 uses an additional backshell thermocouple to determine the reference junction temperature at the thermocouple wire-to-copper crimp pin junction. Refer to Section 3.4 for backshell thermocouple installation.

RTD sensors are generally only used for CHT measurement, as most are not capable of extreme temperatures found in EGT measurements. RTD sensors require a constant current source. RTD sensors must be 'daisy-chained' in series, providing a current path to ground. See Figure 4-1 for a RTD interconnect example. Constant current source is 250 μA.

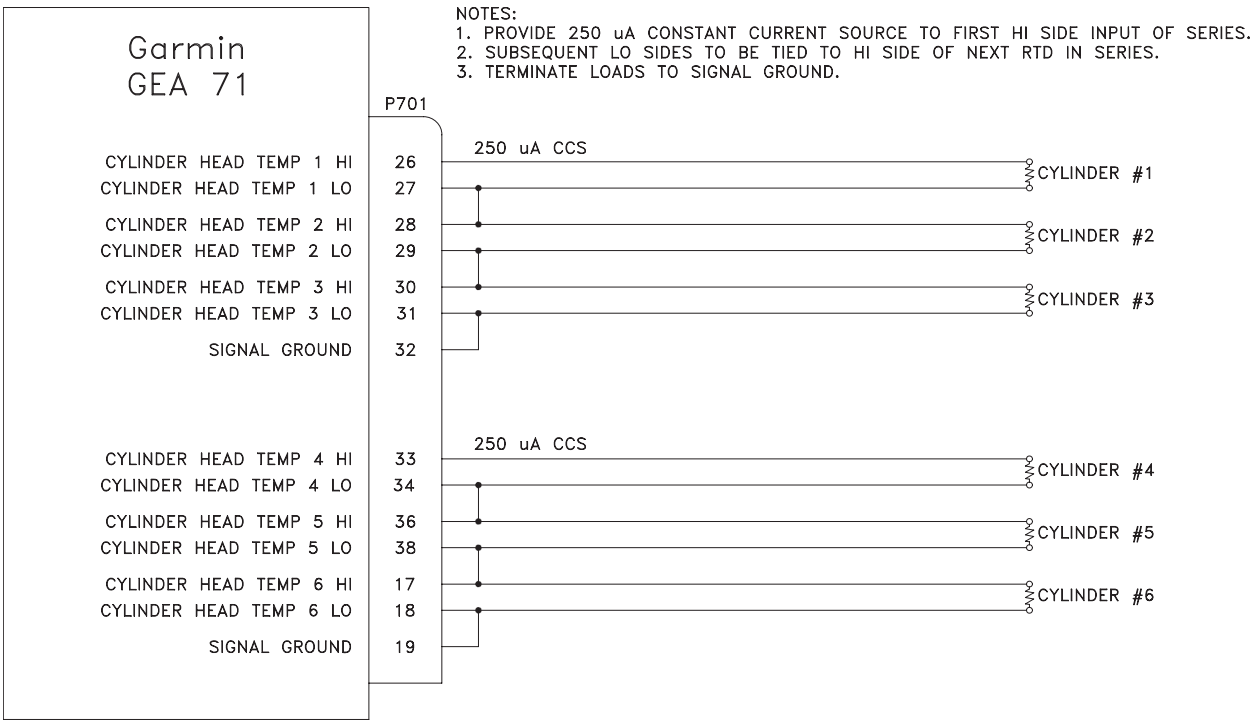


Figure 4-1. RTD Daisy-Chain Interconnect Example

4.2.4 High Side Current Monitor

The GEA 71 offers high side current monitor capability (HSCM) in 4 analog inputs. This allows aircraft bus power to be monitored. HSCM can be enabled or disabled via unit configuration settings (see Section 3.6).

4.2.5 Discrete Signals

Discrete In signals are active low by design. However, software configuration allows the active low state to be interpreted as active high or active low. Discrete data is updated two times per second (2 Hz) and outputs discrete data in RS-485 serial format to the GIA 63(W).

INACTIVE: $10 \leq$ Vin ≤ 33VDC or Rin ≥ 100kΩ
ACTIVE: Vin ≤ 1.9VDC with ≥ 75 uA sink current, or Rin ≤ 375Ω
Sink current is internally limited to 200 uA max for a grounded input

4.2.6 Digital In Signals

Digital input minimum frequency is 1 Hz and maximum frequency is 100 kHz. Digital signals are updated 10 times per second (10 Hz). Maximum output high/low and low/high transition period is 5.0 µS. Digital inputs can also be configured as discrete inputs.

INACTIVE: $10 \leq$ Vin ≤ 33VDC or Rin ≥ 100kΩ
ACTIVE: Vin ≤ 1.9VDC with ≥ 75 uA sink current, or Rin ≤ 375Ω
Sink current is internally limited to 200 uA max for a grounded input

4.2.7 GEA System ID Program

The GEA SYSTEM ID PROGRAM 1 (P701, Pin 9) and GEA SYSTEM ID PROGRAM 2 (P701, Pin 10) should be left open.

4.2.8 Remote Power Off

The GEA 71 powers down upon receiving the remote power-off signal. Power-off occurs when the input is active. Remote power-off input is connector P701, pin 77.

INACTIVE: Vin <= 1Vdc
ACTIVE: Vin >= 10.0 Vdc

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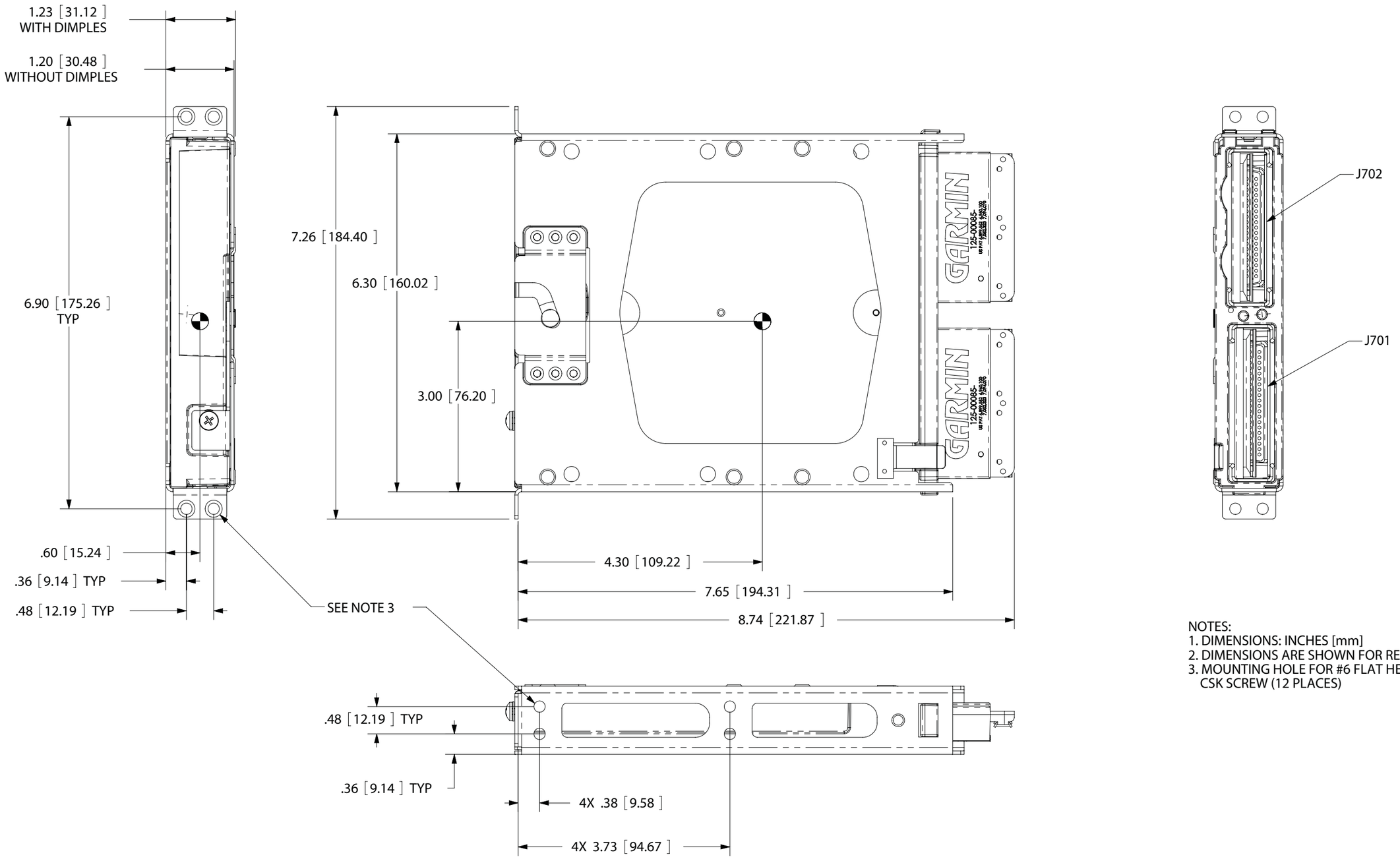


NOTES:
1. DIMENSIONS: INCHES [mm]
2. DIMENSIONS ARE SHOWN FOR REFERENCE ONLY.
3. MOUNTING HOLE FOR #6 FLAT HEAD 100° CSK SCREW (12 PLACES)

Figure A-1. GEA 71 Outline Drawing

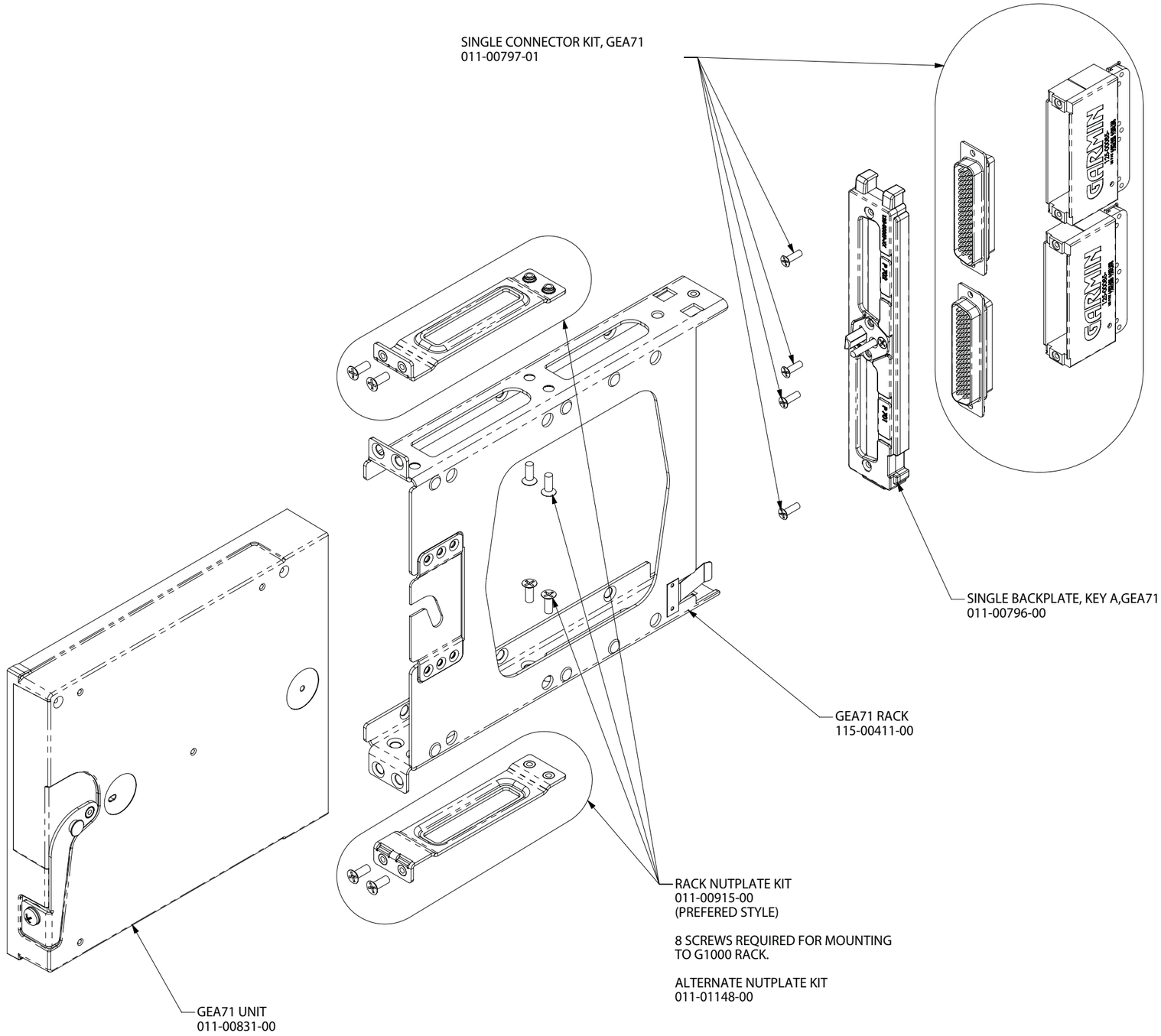
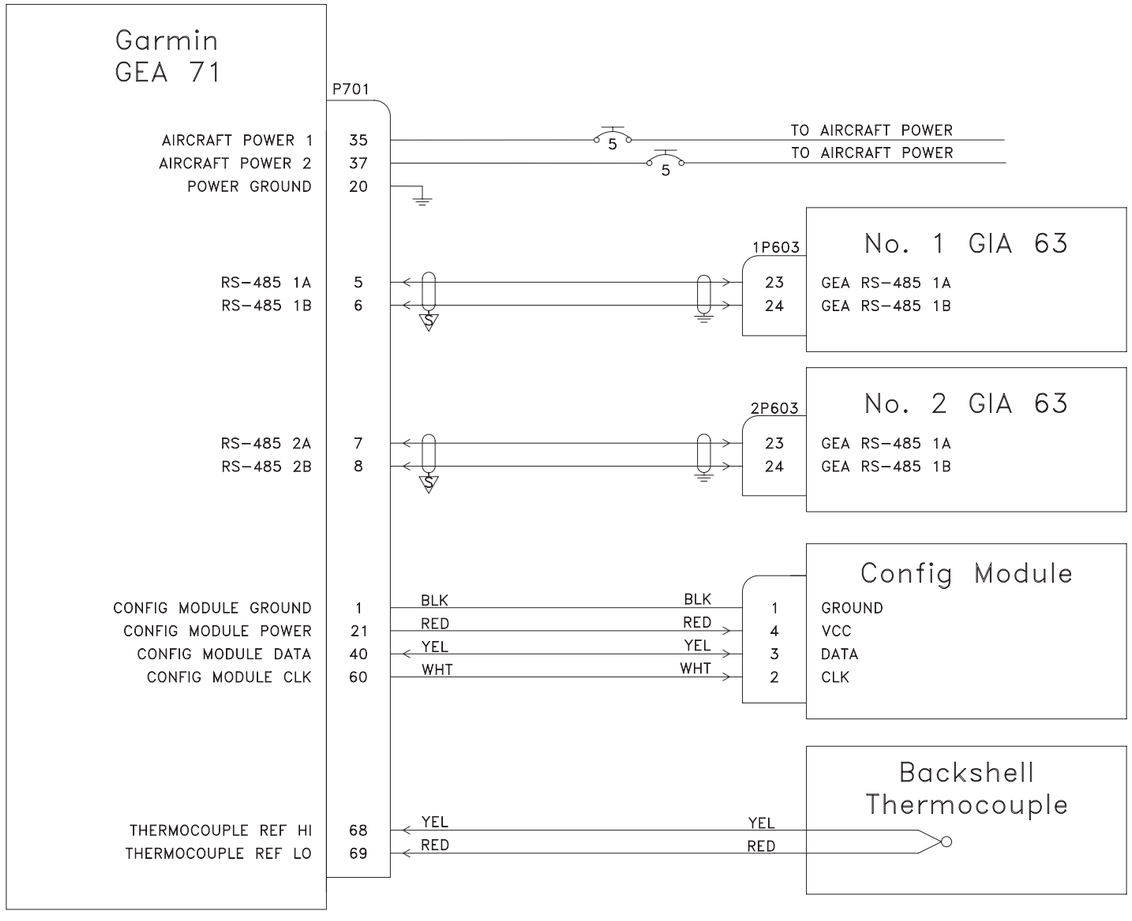


Figure A-2. GEA 71 Installation Drawing

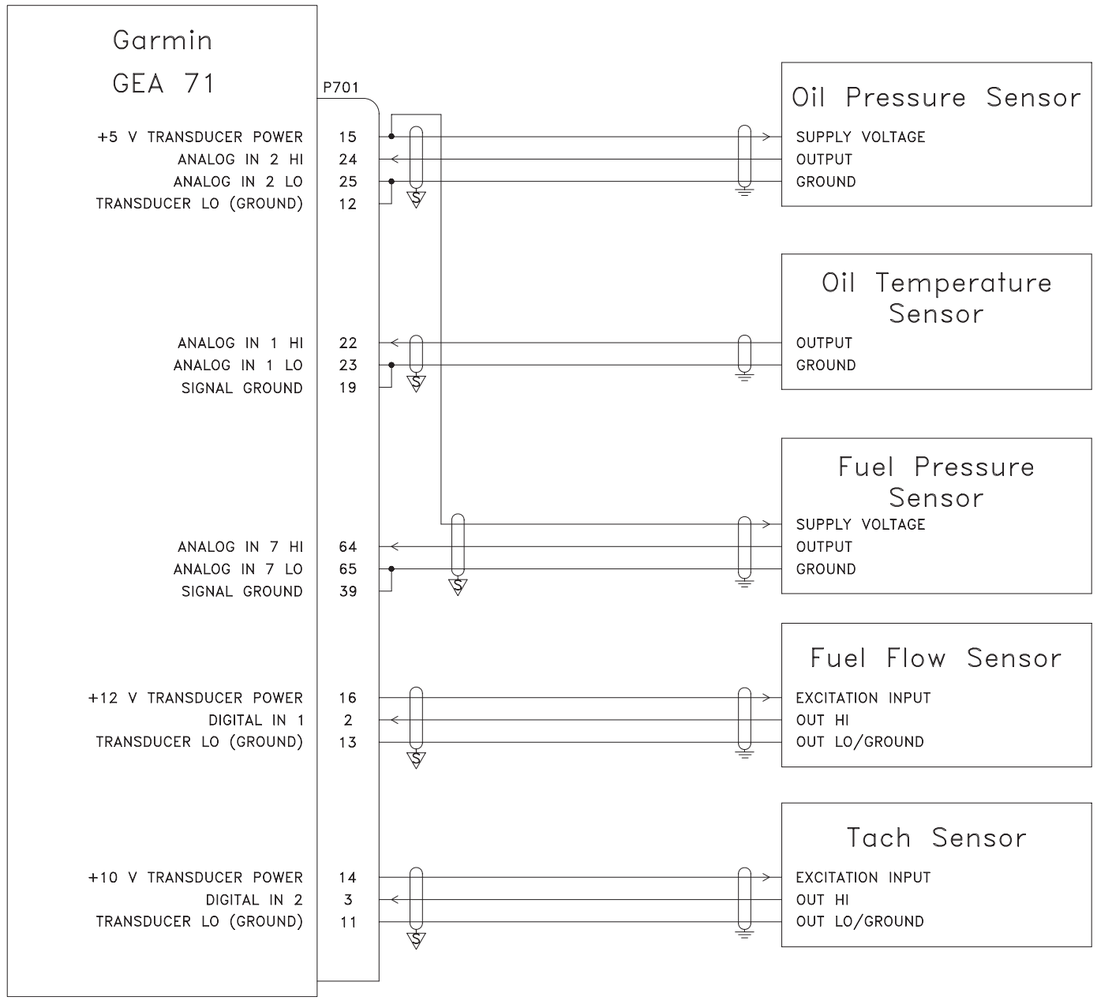


NOTES
1. UNLESS OTHERWISE NOTED, ALL STRANDED WIRE MUST CONFORM TO MIL-W-22759/16.
2. UNLESS OTHERWISE NOTED, ALL SHIELDED WIRE MUST CONFORM TO MIL-C-27500.
3. UNLESS OTHERWISE NOTED, ALL WIRES ARE 24 GAUGE OR LARGER.
4. SYMBOL DESIGNATIONS

AIRCRAFT GROUND
CIRCUIT BREAKER
TWISTED SHIELDED 2 CONDUCTOR SHEILD TERMINATED TO GROUND
WIRE SPLICE CONNECTION
TWISTED SHIELDED 3 CONDUCTOR SHEILD TERMINATED TO GROUND
GARMIN (SHIELD BLOCK) GROUND REFER TO 190-00313-09

5. UNLESS OTHERWISE NOTED, ALL SHIELD GROUNDS MUST BE MADE TO THE RESPECTIVE UNIT BACKSHELLS. ALL OTHER GROUNDS SHOULD BE TERMINATED TO AIRCRAFT GROUND AS CLOSE TO THE RESPECTIVE UNIT AS POSSIBLE.
6. FOR CONFIG MODULE INSTALLATION, REFER TO G1000 SYSTEM INSTALLATION MANUAL P/N 190-00303-00

Figure B-1. GEA 71 Example Interconnect (Sheet 1 of 2)



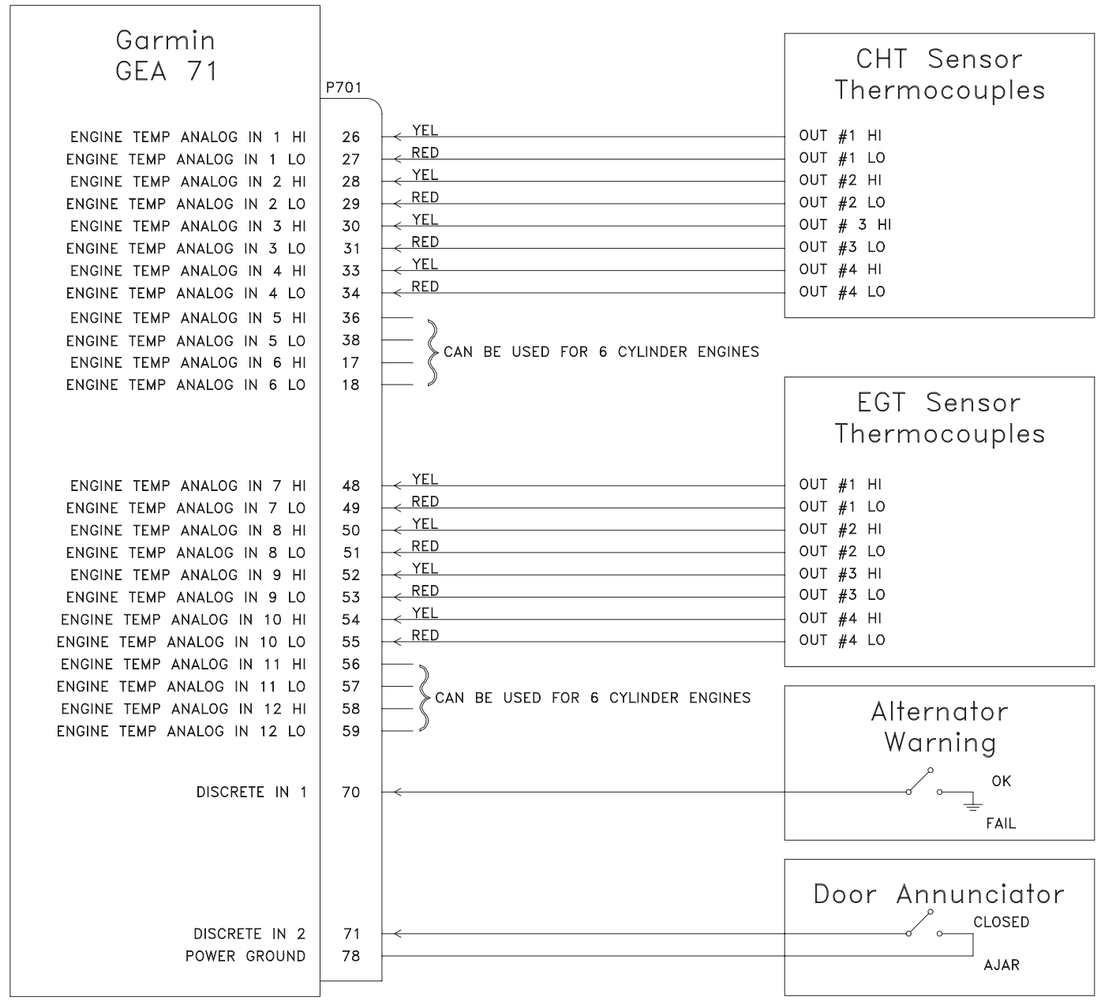


Figure B-1. GEA 71 Example Interconnect (Sheet 2 of 2)