

CHECK WIRING HARNESS BEFORE INSTALLATION

Easier/cheaper to check and recheck all harness's and connections than repairing them later!

INSTALLATION MANUAL

FOR GEM P/N 610C-001
and P/N 1200C-001

Models G1, G2, G3 and G4

DOCUMENT No. 070906

READ THESE INSTRUCTIONS COMPLETELY
BEFORE PROCEEDING WITH INSTALLATION

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If You Read Nothing Else Read This!

Follow these recommendations to minimize installation related problems.

USE CAUTION when crimping the terminals onto the end of the GEM harness. Test each crimp by tugging on it sharply. It is almost impossible to pull off a properly crimped terminal.

KEEP the GEM harness at least 1 inch away from the ignition harness, P-leads, and alternator wiring.

Some aircraft produce electrical noise, which will cause erratic indications.

These displays are designed for rugged use. However, since they are constructed of computer-type components, standard precautions for electronic equipment are required;

- Do not expose to rain or water.
- Handle with care - DO NOT DROP.
- Ensure that all electrical connections are correct and properly made.
- Observe electro-static discharge precautions.

The GEM can only do its job of performing accurate engine monitoring if the engine and airframe have a good, solid, low-resistance electrical connection between them. Check for this with a careful visual inspection of the aircraft's ground connections. A measurement with an Ohmmeter will reveal a gross fault but a better test is to measure between the engine case and the airframe with a voltmeter with the engine running and the electrical system under normal load. The voltage difference should be very small (millivolts). Overlooking this important step can lead to a lot of unnecessary troubleshooting later.

Insight Instrument Corp. supports GEM installations with Insight thermocouple probes and harness. GEM installations with probes and harnesses from other manufacturers are not supported.

NOTE!

Do not use a LED flashlight for the display brightness test! Use a flashlight with an incandescent bulb!

GEM Installation Location Cautionary Notice

The G-series GEM graphic engine monitors have EGT, CHT and TIT primary STC. The GEM display must be mounted so as to be clearly visible to the pilot. The GEM display should be mounted within the pilot's subpanel or the center panel and not on the copilots subpanel unless the GEM can be canted towards the pilot.

GEM Configuration

All G-series GEM's require configuration of important instrument parameters relating to the aircraft, engine, fuel system, etc.

G1 GEM's are **NOT** field-configurable so it is essential to supply all the essential aircraft engine data to Insight at the time of placing the GEM sales order.

G2, G3 and G4 GEM models may be configured in the field but if all the necessary data is supplied to Insight at the time of placing the sales order, the GEM can be pre-configured at the factory. Installation will go quicker and easier if Insight does the configuration for you.

Read This Too!

GEM Fuel Totalizer Cautionary Notice

Please note that not all GEM models provide fuel data. The Fuel Remaining display on the GEM is very useful but is not without limitations. Understand first that the factory fuel quantity gauges are the only instruments in the panel that physically measure fuel level. They are still the primary indication of fuel level in the airplane.

The GEM doesn't measure level, but instead measures only fuel flow rate. The GEM totalizes the rate information to account for fuel used. If you know how much fuel you started with and how much you have used you can figure fuel remaining by simple subtraction. The pilot must supply an accurate starting fuel level for this subtraction to produce the correct fuel remaining result. Should the pilot overstate the fuel quantity on board, the GEM will dangerously overstate the fuel remaining and the endurance time as well. The pilot must be careful and diligent when setting the fuel on board. (Cont'd)

When the aircraft is filled prior to takeoff, the number is the total available on board. If partially filled to a known configuration (ex. tips empty) then the total is easy to calculate.

However if tanks are partially filled on top of a poorly known original value - errors will abound. Unaccounted fuel loss from leakage, fuel vent overflow or theft will of course produce erroneous results.

Be careful and the GEM will deliver safe, reliable, and convenient fuel information. But be sure to cross reference the information on the primary fuel quantity gauges. Never trust a single source of fuel information when you have two on board. Fuel exhaustion still ranks highly among accident causes.

Don't let your engine stop until you're parked.

GEM Engine Temperature Limits (Redlines) Cautionary Notice

Most air-cooled aircraft engines have a maximum allowable Cylinder Head Temperature (CHT) limit specified by the engine or aircraft manufacturer. Similarly if the engine is Turbo-charger equipped a maximum allowable Turbo-charger Inlet Temperature (TIT) limit will be specified (may be labeled as EGT). Most GEM's have 460 F and 1650 F internally set as the CHT and TIT limits as these are the most common values, but there are aircraft that require different values. Be sure to follow the instructions in this document to install the correct Insight P/N so that the GEM's Redlines match the aircraft's specified maximum engine temperatures.

Warranty policy

The Insight Instrument Corp.'s Graphic Engine Monitor temperature display unit is warranted against defects in materials and workmanship for two years from date of purchase. Insight Instrument Corp.'s temperature probes are warranted for one year from date of purchase or 100 hours whichever comes first.

Insight will, at its option, repair or replace, without charge, those products that it finds defective. Material returned for repair or replacement will be returned prepaid by second day freight. Insight will not be responsible for repairs that result from improper installation, unauthorized maintenance or abuse. Insight is not liable for consequential damages or any labor costs, either directly or indirectly. No other warranty is expressed or implied.

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INTRODUCTION

This Installation Manual will acquaint you with the installation requirements, operational functions and some of the powerful features of the Insight G-series Graphic Engine Monitors (GEM). Please read it carefully and completely before starting.

Insight Instrument Corp.'s Graphic Engine Monitors provides simultaneous analog and digital display of engine temperatures for nearly all makes and models of piston-powered aircraft.

The Insight G-series graphic engine monitors are manufactured with models ranging from basic EGT/CHT monitor to full-featured with data-logging and advanced vibration measurement.

GEM Models and Available Features Table:

GEM Model Name	G4 Single	G4 Twin	G3	G2	G1
Bezel Size	3.125	3.125	2.25	2.25	2.25
EGT	YES	YES	YES	YES	YES
CHT	YES	YES	YES	YES	YES
TIT	YES	YES	YES	YES	YES
FUELFLOW	YES	YES	YES	YES	
OAT	YES	YES	YES	YES	
BUSS VOLTAGE	YES	YES	YES	YES	
TACHOMETER	YES	YES	YES		
MANIFOLD PRESSURE	YES	YES	YES		
OIL TEMPERATURE	YES	YES	YES		
OIL PRESSURE	YES	YES	YES		
ACCELEROMETER	YES	YES	YES		
CARBURETOR TEMP.	YES	YES	YES	YES	YES
Data Logging	YES	YES	YES	YES	
Probe Diagnostics	YES	YES	YES	YES	YES
RS-232 Comm. to GPS	YES	YES	YES		
VIBRATION	YES	YES	YES		

Installation Planning

Plan the location of the GEM display such that it is not positioned near any source of high electrical current and is easily visible by the pilot. If the GEM is to be used as a primary engine instrument it is essential to locate it high in the instrument panel and within the pilot's normal instrument scan.

The GEM's wiring harnesses should be positioned away from sources of high energy, such as ignition harnesses, P-leads, alternator wiring and high frequency radio wiring and antennas.

Some thought about the steps needed may save hours of installation time and trouble-shooting.

Steps to a successful installation

1. Check the GEM's STC Approved Model List for aircraft model eligibility.
2. Check the engines temperature limits (CHT/TIT) as specified in the engine Type Certificate, aircraft Type Certificate or Flight Manual. GEM's are normally supplied with 460 degrees (CHT) and 1650 degrees (TIT) Fahrenheit redlines but others are available. GEM instruments with other redlines are indicated by a suffix in brackets after the instrument Part Number.
 - Eg. P/N 610C-001 - indicates normal Redlines
 - P/N 610C-001(X) - indicates other RedlinesConsult with Insight for available temperature limits.
3. Select which new G-series GEM model is to be installed. High-performance aircraft strongly benefit from the advanced features of the G3 or G4 models. The G1 model is designed for small aircraft with low-horsepower engines, it is NOT recommended for complex or high-performance aircraft
 - a) Single engine aircraft may have any one of G1, G2, G3 or G4 models installed.
 - b) Twin engine aircraft normally have a pair of G3 or G4-001 models installed where sufficient instrument panel space is available, or a G4-002 (Twin) instrument may be installed otherwise.
4. Review the features and requirements of the selected GEM model to ensure compatibility with existing and planned aircraft equipment.
5. Identify whether or not the installation is an upgrade from a legacy GEM system or a first-time GEM installation. In the case of an upgrade, see the "Upgrade Installation" section.
6. GEM installation kits contain much of what is required for installation except for the materials listed in the "Tools and Materials Required" section. The installer must supply all the materials listed in the "Tools and Materials Required" section.

Upgrade Installations

GEM upgrade kits are designed to utilize existing Insight Instrument Corp. EGT/CHT/TIT/OAT wiring and probes that are already installed in the aircraft. Prior to ordering an upgrade kit, inspect the aircrafts existing GEM wiring and probes for condition, suitability, and length for use with the new GEM. If an existing harness is not suitable for upgrade use, new replacement harnesses are available from Insight.

Legacy GEMs were typically installed as supplemental (non-primary) EGT/CHT/TIT instruments. New G-series GEMs may be used as primary EGT/CHT/TIT instruments. Check the GEM STC for eligibility.

Check the existing GEM instrument-panel location for compliance with the new GEM's location requirements. Primary instruments require clear and easy visibility for the pilot which may not have been required for existing non-primary instrument installations.

Upgrading from legacy GEM models

Upgrading from GEM 602 or 603

Many aircraft have been equipped with GEM 602 or GEM 603 systems. Model 602 systems supported four or six cylinder engines, and 603 systems supported four or six cylinder engines with turbo-chargers. Any 602 or 603 equipped aircraft can be easily upgraded to a G-series GEM system.

New G-series GEMs are plug-compatible with legacy wiring and EGT/CHT/TIT probes from a GEM 602 or 603 system with one difference, the instrument ground wire (black) may have been attached to the engine case and should be moved to an airframe or avionics ground. See wiring drawing 1200-018. The new GEM housings are shorter than old GEM housings, check that the harness length is sufficient to reach the new GEM housing.

The G1, G2 and G3 models have a top control knob or push-button that requires a clearance hole in the instrument panel, check GEM display drawing 610C-001 and outline drawing #930309 for hole sizes and locations.

The G1 GEM is a functional direct replacement for a 602 or 603. Specify four or six cylinder, and turbo-charged or non-turbo at time of ordering. The G1 GEM is not field-configurable and must be returned to Insight if a configuration change is needed.

The G2, G3 and G4 models have an additional interface connector (P2) to provide connections to supplemental features such as fuel flow sensors, tachometer ,etc. Upgrade kits contain much of the wiring and sensors to accomplish installation, contact Insight for details. See the following sections of this manual for installation details of the new sensors and wiring.

The G4 models are available in single engine and twin configurations. The G4 displays fit into a standard 3.125 inch panel hole. See drawing #930309.

Upgrading from GEM 610 or GEMINI 1200

Upgrading from models 610 or 1200 is similar to upgrading from 602 or 603 with a few differences.

Previous 610 installations will already have all holes drilled for panel mounting a G1, G2 or G3. G4 models require a 3.125 inch hole.

Previous installations of 610 and 1200 models may already have an Insight OAT probe and wiring that can be retained and connected to a G-series GEM. See wiring drawing 610C-315.

Upgrading to G4 Single

The single engine G4 display (3.125 inch) is plug compatible with the G3 display (2.25 inch). Refer to 610C-315 and 1200-018 wiring diagrams.

Upgrading to G4 Twin

The twin engine G4 display is plug compatible with the EGT/CHT/TIT wiring harnesses of legacy GEMINI 1200 installations. The G4 twin display has an additional interface connector (P2) to provide connections to additional sensors such as fuel flow and tachometer, etc. Refer to G4-315 and 1200-018 wiring diagrams.

Upgrading GEM installations in twin-engine aircraft

Twin engine aircraft may be equipped with two single-engine GEM displays or a twin engine GEM display. Check the ground wire configuration if upgrading from older GEMs. Wire the thermocouple harnesses according to wiring diagram #1200-018. Install the supplementary feature wiring according to wiring diagram 610C-315 for 25-pin D-sub connectors and diagram G4-315 for 37-pin D-sub connectors.

Tools and Materials Required (NOT included in GEM kit - Installer supplied)

- Proper wire stripping tools.
- Proper crimping tools, Insight recommends;
M22520/2-01 Crimping tool and M22520/2-08 Positioner or equivalent.
- Insertion/extraction tool for Amp pin #205089-1.
- Trip-free, re-settable Circuit-breaker(1 AMP).
- Hardware for mounting and plumbing of the Oil Pressure Sensor, the plumbing for the Fuel Flow sensor, and the plumbing for the Manifold Pressure port.

Unpacking the Graphic Engine Monitor Display

- Carefully inspect the contents of this package for damage. If damage is found, save all packaging so that a claim can be made against the carrier.
- Inspect the contents of the shipment to ensure that all component parts and materials have been supplied.
- Visually inspect all components for proper identification or damage.
- Immediately report any discrepancies to the Insight Customer Service Department.

INSTALLING THE GRAPHIC ENGINE MONITOR DISPLAY

Models G1, G2 and G3 displays mount in a 2.25 inch diameter panel cutout. A new GEM installation will require four mounting holes and two holes for the control knobs in addition to the 2.25 inch hole. See Drawing #610C-001 for a display outline. Insight can supply an adapter plate (P/N 610C-033) to allow mounting a 2.25 inch GEM in a 3.125 inch hole. Beware of third-party adapter plates that may not provide correctly sized or tapped holes.

The G1, G2 and G3 will fit directly into the holes from a previously installed GEM Model 610. Upgrading from GEM 602 or 603 will require a single new hole for the upper control knob.

G4 models fit into a 3.125 inch diameter hole.

See Insight drawing 930309 for 2.25 and 3.125 inch panel mounting holes.

Connections to the GEM G-series displays shall be made in accordance with Drawing No's. 610C-315 and 1200-018. Care should be given to provide sufficient depth allowance for harness and cable routing at the rear of the display. Plan for service loops in all the wiring to ease service or adjustments after the installation.

NOTE: Check for the possible existence of a "double" ground, particularly if the GEM is a replacement for a previously installed GEM display. The GEM must have only one ground connection.

Installing The Exhaust Gas Temperature Probes

The Exhaust Gas Temperature (EGT) probe is designed fit into a hole in each exhaust stack and be secured with an integral stainless steel clamp.

It is important that each probe is mounted a uniform distance from the exhaust stack flange. For normally aspirated engines, a nominal distance of 2 to 3 inches from the flange is recommended.

For turbo-charged engines, a nominal distance of 4 to 5 inches is recommended. See Drawing No. 8254.

If the recommended distance is impractical because of obstructions, slip joints, or bends in the exhaust system, position all the probes a uniform distance from the flange as space permits.

It is more important that all probes be positioned at a uniform distance from the flange rather than meeting the preferred dimension. Probe locations closer to the flange may result in slightly higher (inconsequential) temperature indications. (Careful matching of probe position will provide best temperature readings.)

If the probe must be positioned in a slip joint the inner tube must have a clearance hole of at least 1/4" diameter to prevent it from shearing the probe. Be certain to locate all holes to allow straight-in insertion of the probe without bending or stressing the probe tip.

Before drilling, ensure that nothing interferes with the probe, clamp, clamp screw or wire. Center punch and pilot drill each hole in the exhaust stack with a No. 28 or 9/64" drill bit. Use caution while drilling perpendicular to the stack to prevent an elongated hole. NOTE: Tighten the clamp screw with hand-torqued nut driver only.

A right angle drill extension may be necessary in some locations. The probe will slip into a carefully drilled hole and make a tight seal.

Installing The Cylinder Head Temperature Probes

There are three types of Cylinder Head Temperature (CHT) probes:

- Spring Probe (Part Number 2852)
- Spark Plug Gasket Probe (Part Number 2853)
- Adapter Probes (Part Numbers 2855 Bayonet Adapter, and 2856 Threaded Adapter)

The Spring Probe (Part Number 2852) is equivalent to the "old style" Bayonet Probe and screws into threaded thermo-wells in the cylinder head next to the lower spark plug (on top in some engines).

The Spark Plug Gasket Probe (Part Number 2853) replaces the copper 18 mm diameter spark plug gasket.

The Bayonet Adapter Probe (Part Number 2855) screws directly into the temperature well and replaces the standard bayonet adapter to allow simultaneous utilization of the factory-installed Bayonet Probe.

The Threaded Adapter Probe (Part Number 2856) is similar to the 2855 except it is threaded on the inside to allow simultaneous utilization of the factory-installed Threaded CHT Probe.

CHT Probe Characteristics

The Spring Probe (2852) has a probe bushing with a screwdriver slot to facilitate tightening into place. A drop of anti-seizing lubricant on the threads before installation will ease installation, and subsequent removal. When installing Spring Probes be sure you have correctly identified the standard thermo-well. Some aircraft have fuel primer ports with the same thread size.

Many factory-installed CHT displays utilize a single threaded or bayonet-style resistive type probe that occupies one of the thermo-wells. This probe is not electrically compatible with the thermocouple probes required for the Graphic Engine Monitor.

A Spark Plug Gasket Probe (2853) may be used on this cylinder for the GEM series Display, so as to allow the factory-installed display to remain functional.

The Spark Plug Gasket Probe replaces the standard copper spark plug gasket on one spark plug in the selected cylinder. The spark plug chosen should be the one that provides the best correlation with the other temperature probes. On common downdraft-cooled engines the selected cylinder will be the upper plug. Allow enough wire length to move the probe to the other plug if necessary.

The Spark Plug Gasket must be removed and replaced by the Gasket Probe. Annealing of the Gasket Probe is not required or recommended, and the Gasket Probe Does Not require replacement when the spark plugs are changed.

Alternatively, an Adapter Probe may be used instead of a Gasket Probe. An adapter probe will allow both displays to derive their CHT readings from the same thermo-well. For this reason, use of the Adapter Probe is recommended instead of a Gasket Probe.

If the factory-installed CHT display has a bayonet-style probe, the Insight Bayonet Adapter Probe (2855) may be used instead of the Gasket Probe.

The Bayonet Adapter Probe replaces the original bayonet adapter. It has a screwdriver slot to facilitate tightening in place, and placing a drop of non-seizing lubricant on the threads before installation will ease installation and subsequent removal.

Once the Bayonet Adapter Probe has been installed, the original bayonet probe maybe locked in place with a push and a twist.

If the factory-installed CHT display has a threaded probe located in the thermo-well, the Insight Threaded Adapter Probe (2856) may be used. The Threaded Adapter Probe is installed in the thermo-well between the cylinder head and the original CHT probe.

Installing the Carburetor Temperature Probe

The GEM is supplementary for carburetor temperature. Install the Insight Carburetor Temperature probe (Insight P/N 610C-021) into a 1/4-28 tapped hole in the carburetor. Many carburetors have an existing hole for this purpose but it may be plugged and require drilling or tapping. Consult with the engine or carburetor manufacturer to determine the probe-hole location. Ensure the probe does not interfere with any internal carburetor components.

For G2, G3 and G4 GEMs refer to Drawing 610C-315 or G4-315 for electrical connections. The G1 GEM uses pin numbers "A" and "1" on the P1 Edge-Connector. In the case of upgrading from an older GEM system to a G1 GEM check for the possibility of existing wiring to the "A" or "1" pins on the P1 connector. Remove any existing connections to these pins and only connect the Insight Carburetor Probe. See Wiring Diagram Drawing 1200-018 Rev. E or later.

Installing The Turbine Inlet Temperature Probes

There are several types of Turbine Inlet Temperature (TIT) probes that can be used with the GEM system.

- Clamp-Type TIT Probe (P/N 2871) or Dual TIT Probe (P/N 4871) - is identical to the EGT probe except that the clamp diameter is larger.
- Threaded-Type, (7/16-20) TIT Probe, including a weld-on boss (P/N 2872) or Dual TIT Probe (P/N 4872).
- Threaded-Type, (1/4 NPT) TIT Probe (P/N 2873) or Dual TIT Probe (P/N 4873).

The dual-type probes have two thermocouples, with separate signal outputs to drive two instruments.

For aircraft with a threaded fitting boss already welded to the turbine inlet, the two threaded type probes are used - part number 2872 (7/16"-20 Thread) and part number 2873 (1/4 NPT Thread), as applicable. The 2872 Threaded fitting can be installed on any aircraft when a more permanent installation is desired, or when space for the clamp-type probe is limited.

The Probe Type 2872 Boss fits in a 1/2" inch hole and should be welded by an approved exhaust repair facility. Locate and drill the probe hole as described in Section "INSTALLING THE EXHAUST GAS TEMPERATURE PROBES", and refer to Drawing No. 8254 for the recommended location.

NOTE: If you have questions as to the correct type or location of TIT probes, call Insight Product Support for technical assistance.

Installing The Manifold Pressure Tee

The GEM is supplementary for manifold pressure. The GEM's manifold pressure sensor(s) are located internally inside the GEM display. The installer must supply the tubing and a "Tee" fitting to connect the GEM to the existing manifold pressure indicator.

For single-engine aircraft refer to Drawing 610C-315 for the location of the G3 Manifold Pressure port (5/16"-24 #2 Flare fitting) or Drawing G4-315 for the G4 GEM (use port #4).

For twin-engine aircraft the G4 twin GEM (G4-002) has two manifold pressure ports, refer to Drawing G4-315, use port #1 (top) for the left engine, and port #4 (bottom) for the right engine.

Installing The Oil Temperature Probe

The GEM is supplementary for oil temperature. Install the Insight Oil Temperature probe into an existing tapped hole in an oil gallery in the engine. Insight can supply Oil Temperature probes in a variety of thread sizes to suite most engine types. Consult with the engine manufacturer to determine the probe-hole location and thread size. Ensure the probe does not interfere with any internal engine components. Refer to Drawing 610C-315 for G3 electrical connections or G4-315 for G4.

Installing The Oil Pressure Sensor

The GEM is supplementary for oil pressure. Install the Insight Oil Pressure Sensor (1/8 NPT) on a length of flex-hose "Tee-ed" into the existing oil pressure sensor. The Installer must supply the "Tee" fitting, flexible hose and mounting hardware. Refer to Drawing 610C-315 for G3 electrical connections or G4-315 for G4.

Installing The Tachometer Wiring for RPM

The GEM is supplementary for Tachometer. Insight provides a shielded cable with included protection-resistor (Insight P/N 610C-026) for connection to a magneto. Refer to Drawing 610C-315 for electrical connections for G3 or G4-315 for G4.

For aircraft equipped with electronic ignition systems with a tachometer signal output, use Insight Tachometer Signal Adapter P/N 610C-027 instead of P/N 610C-026. Wire according to Insight wiring diagram #101123.

Installing The Vibration Sensor

The GEM is supplementary for Vibration Measurement. Insight provides a shielded cable pre-terminated with a mating circular plastic connector (CPC) for connection to an Insight Vibration Sensor (Insight P/N 1000-004V).

For GEM models with a 25-pin D-sub connector refer to Drawing 610C-315 for electrical connections. Wire as shown for option "A". For GEM models with a 37-pin D-sub connector refer to Drawing G4-315.

Older Vibration Sensors and cables were equipped with a 7-pin CPC. New production sensors and cables are equipped with a 6-pin CPC. The two different connector types are not compatible. A cable adapter P/N G4-809A

may be installed to allow connection of a 7-pin cable to a 6-pin Vibration Sensor, or 7-pin connectors may be removed from service and new 6-pin connectors installed, consult Insight for details.

Aircraft with 24 Volt (28 Volt) electrical systems require a 750 Ohm resistor installed in series with the vibration sensors power supply wire.

The sensor should be mounted to an engine case bolt on the top of the engine as close to the propeller as practical. The sensor should be oriented with the nameplate up and the aircraft symbol pointing forward. The sensor may be oriented otherwise if the preferred mounting is impractical, please consult Insight technical support.

If the Vibration Sensor's Connector assembly is located so as to be subject to rain or other fluids, the connector assembly should be protected with liquid-resistant wrap or tubing suitable for location in the engine compartment.

Installing The Outside Air Temperature Probe

The GEM is supplementary for Outside Air Temperature. OAT probe must be mounted in a location which is in free ambient air. Avoid locating the probe adjacent to exhaust pipes, in a confined area, or on the top of the fuselage. Any location where the probe is exposed to direct sunlight or radiant heat from the runway pavement, will cause increased temperature readings above ambient temperature.

Insight recommends mounting the probe in the engine induction air inlet near the engine induction air filter. Probes located there will read well as soon as the engine is started.

Refer to Drawing No. 1200-016 for the mounting dimensions and appropriate hole size to drill.

Mount the OAT probe in the prepared hole and secure the nylon nut being careful not to over-tighten.

If the OAT probe is installed on a pressurized aircraft where bulkhead penetration is necessary and/or potting of the OAT probe is required, be certain to apply "Proseal" or equivalent potting substance prior to tightening.

NOTE: Be careful not to get potting substance on the connector.

Installing the Fuel Flow Sensor (for Aircraft without an existing Flow Sensor)

The GEM is supplementary for fuel flow. Aircraft without existing Fuel Flow (FF) sensors should have one Insight-supplied sensor installed per engine except for engines equipped with pressure-carburetors, which require two sensors per engine. The GEM model G4-002 (twin) does not support pressure-carburetors.

Aircraft equipped with TAS-1000 Air Data Systems may share the FF sensor signals with the GEM. Refer to the following installation drawings and the TAS-1000 Installation Manual Doc No. 1000-402.

Insight manufactures a variety of FF sensors for injected and carbureted engines. See drawing 1000-303 (3 pages) for sensor details and part numbers.

For single-engine aircraft or twins with two GEM instruments, wire the Insight FF sensor in accordance with Insight Drawing #610C-315, Option "C".

For G4-002 (Twin) installations use Drawing G4-315.

In all installations the Insight FF sensor(s) case must be connected to airframe ground.

The installer must determine the correct type and location for the FF Sensor, and supply the plumbing and fittings to hook up the FF Sensor to the fuel lines.

For all fuel flow sensor installations refer to FAA AC 43.13-1B, Chapter 8 Section 2, 8-30, 8-31, 8-37, 8-38.

Installing the Fuel Flow Signal Adapter (for Aircraft with an existing Flow Sensor)

The GEM is supplementary for fuel flow. Aircraft equipped with existing FF sensors may or may not be compatible with the GEM's Fuel Flow signal inputs.

An existing sensor may be part of a primary FF Instrument or it may be supplementary. If the existing FF sensor is primary it should remain in the aircraft to preserve the primary FF instrumentation.

If the existing FF sensor is not part of a primary FF instrument then it may be desirable to remove the existing FF sensor and install the Insight FF sensor as detailed above for aircraft without existing FF sensors.

If the existing FF sensor is going to be retained, it may be connected to the GEM through the use of the Insight Fuel Flow Signal Adapter (FFSA). The Insight FFSA works with most pulse-signal type FF sensors but compatibility with other manufactures' fuel flow sensors cannot be assured.

To connect a GEM to an existing fuel flow sensor/fuel computer system use Insight Fuel Flow Signal Adapter P/N 610C-025. Use Insight wiring diagram #101116. The GEM's K-factor must match the K-factor of the FF sensor to correctly measure fuel flow. Use the GEM's Configuration Page to set the required K-Factor.

Connections for RS-232 Data Communications (G3 and G4 only)

The GEM is supplementary for aircraft equipped with a compatible GPS system may be connected to the GEM's RS-232 communications ports. The GEM can transmit Fuel data in one of several common formats to the GPS. The GEM can receive navigation data from the GPS. Refer to the following installation drawings for wiring details. Refer to the GPS system manufacturer for configuration of the GPS to transmit and receive data.

Aircraft equipped with a TAS-1000 Air Data Computer may be connected to the GEM to datalog in-flight air and fuel data. The GEM and TAS-1000 must be wired to share the pulse FF signals and RS-232 data. Refer to the following installation drawings and the TAS-1000 Installation Manual Doc. No. 1000-402.

Wiring Considerations

The GEM is supplied with a factory-assembled EGT/CHT(/TIT) wiring harness configured for the specified number of cylinders and required length (for each engine). The harness edge connector contains a polarization pin that mates with a slot in the display's printed circuit board. This prevents improper engagement of the connector.

Before installing, confirm that the factory fabricated harness connector matches wiring diagram, Drawing # 1200-018. All the red thermocouple wires should be on one side of the connector.

The GEM circuit boards are supported during shipment by small anti-static shipping restraints. Leave these restraints in place during the installation of the display and remove only prior to inserting the harness edge connectors.

The EGT and CHT wire length is not critical and may be trimmed to any length as required to fit each probe.

CAUTION: Splicing of the thermocouple wire is not recommended. The thermocouple wire alloys are not compatible with soldering.

Note: Plan your Installation to include a service loop in the GEM wiring harness to allow for future adjustments.

Wires for the supplemental features are supplied pre-terminated at the sensor end, but must be terminated at the instrument end during installation. The D-sub connectors (25 and 37 pin) utilize crimp pins, see the materials section for recommended tooling.

Some of the D-sub connectors ground pins are shared by multiple wires, use a "pig-tail" style connection inside the connector shell to accommodate multiple wires connected to a single pin.

Display Power and Ground Wiring Connections

The GEM displays automatically accommodates both 14 and 28 Volt electrical systems. Connect the "red" power lead to a separate trip-free, re-settable circuit breaker (1 Amp) that receives power from the avionics bus or aircraft bus.

If the aircraft does not include an Avionics Master switch circuit or bus, we recommend that one be installed or a separate switch (user provided) to remove power from the Display unit during engine starts.

Connect the ground wire (black) to a common avionics ground bus (airframe ground).

CAUTION: For upgrade installations (from GEM 602 or 603) where the harness is grounded to the engine case, disconnect the ground from the engine case and connect the ground wire to the ground bus (airframe ground). Do not connect to two ground points.

NOTE: Double check the Display ground connection before applying power. Many aircraft have terminal strips under the instrument panel that will appear to be connected to airframe ground and will even measure to ground with an ohmmeter. The terminal strips may instead be connected to ground terminated loads such as landing lights or gear motors. When these loads are activated the voltage on this supposed ground will rise to full bus voltage (14 or 28V). [Extensive damage may result from improper grounding and is not covered under warranty.]

Refer to Drawing No. 1200-018.

EGT Probe Wiring

The temperature probes must be wired with the correct polarity. The EGT probes connect to the harness wires with the yellow jacket. The probe leads and harness wires are color coded (red and yellow) to facilitate correct polarity. Each wire is marked with the cylinder number.

Slide the wire marker down the wire so it remains with the installation for trouble-shooting. Strip the wires according to Drawing No. 8254 and terminate with the crimp-on terminals (provided).

Verify the quality of each crimp with a "sharp" pull on the wire. The terminal should be almost impossible to pull off when crimped correctly. Harness and probe wire colors should match as in Drawing No. 8254.

NOTE: The ring terminals may be crimped with a "service type" tool, however, AMP part number #47386 is recommended. Be sure to test each crimp by pulling on the wire to ensure it won't come out. The most common installation problems are the result of poor quality termination.

CHT Probe Wiring

The CHT temperature probes must be wired with the correct polarity. The CHT probes connect to the harness wires with the black jacket. The probe leads and harness wires are color coded (red and white) to facilitate correct polarity. Each wire is marked with the cylinder number.

Slide the wire marker down the wire so it remains with the installation for trouble-shooting. Strip the wires according to Drawing No. 8254.

Terminate with the crimp-on ring terminals provided. Verify the quality of each crimp with a “sharp” pull on the wire. The terminal should be almost impossible to pull off when crimped correctly.

Harness and probe wire colors should match according to Drawing No. 8254. Insulate and bundle as discussed below.

Routing the EGT/CHT/TIT Wiring Harness (P1 and P3)

It is essential to match the cylinder numbers on all the probes to display the proper information to the pilot.

The probe/harness connections should be insulated with the high temperature fiberglass sleeves provided and routed away from high temperature areas, e.g. exhaust stacks, turbochargers, etc.

The probe wires must not be tied in with ignition, alternator or cabin heater ignition wires because of potential errors in temperature readings.

All wires should be bundled and tied with nylon wire ties or lacing cord and attached to the airframe to prevent damage from vibration and wind buffeting.

The probe wiring harnesses are made of special alloy wire that must not be substituted or extended with copper wire.

Do not cut the harness too short. Leave a service loop to allow for service and maintenance or in case adjustments are required in the harness routing.

The power and ground wires are copper and may be extended if necessary, but **NOT** the thermocouple wires.

When the installation is complete all wires should be secured using wire ties and carefully checked for interference, rubbing or chafing with flight control cables, or other moving parts.

A Ferrite RF filter should be installed surrounding the Thermocouple wires and located close to the GEM. This is supplied by Insight on new harnesses, and are available from Insight to add on to existing installations.

Connecting and Routing the P2 Harnesses

The P2 harness connects to the D-sub connector (either 25 or 37 pins) on the back of the GEM. This harness carries the electrical signals for all the GEM's supplementary functions such as Fuel Flow, Oil Temperature and pressure, RS-232 communications, etc.

Route the wiring harness away from any high temperatures and high energy sources and be sure to leave a service loop to allow adjustments and ease maintenance. Route the thermocouple wires in the P2 harness through the Ferrite RF filter (on the P1 harness) as shown in Drawings No. 8252 and 8253.

Use the proper tools listed in the Tools and Materials section to crimp and insert the pins into the D-sub connector body.

The Feature Table on page six indicates the supplementary features available for each GEM model.

The G1 GEM has no P2 connector, all connections are made through P1.

The G2, G3, and G4-001 GEM's have a 25-pin D-sub connector, refer to Drawing No. 610C-315 (Pages 1-3).

The G4-002 (twin) GEM has a 37-pin D-connector, refer to Drawing No. G4-315 (Pages 1-3).

For aircraft with existing compatible Fuel Flow sensors, use Insight P/N 610C-025 FF Signal Adapter as shown on Drawing No. 101116 (one adapter per FF Sensor).

For twin engine aircraft equipped with two GEM's (G3 or G4-001) and a TAS-1000 Air Data Computer, refer to Drawing No. 121210.

Checking The Installation

Verify ALL connections before applying aircraft power. Pin 15 (connector P1) is aircraft ground and pin S is approximately +14V DC or +28V DC (See Drawing No. 1200-018).

When power is initially applied, the GEM display will illuminate to full brightness.

Immediately upon power application the GEM will display a status screen with serial number, software version number, etc., for a few seconds. After the status screen, the GEM reverts to the main GEM bar-graph page. EGT and CHT (and TIT) color-coded bar graph columns indicate their respective cylinder temperatures, and supplementary values appear in cyan.

The GEM Display brightness level automatically adjusts to match the ambient light level. The automatic dimming may be tested in bright ambient light by covering the entire face of the Display with the palm of your hand for several seconds. The Display will dim and then brighten when your hand is removed.

In low ambient light, the auto-dimming feature may be tested by shining a flashlight on the display for several seconds. It changes brightness slowly, in discrete steps, to prevent annoying flicker in response to rapid ambient light level changes.

NOTE!

Do not use a LED flashlight for the brightness test! Use a flashlight with an incandescent bulb!

After the tests described above have been performed, check for possible interference with existing avionics by listening for audio interference on Com, Nav, DME, ADF, etc. Interference is uncommon, however, these characteristics should be tested.

If interference is detected, remove power from the Display unit to check if it is the emitter of the interference. If the GEM series Display is the interference source, re-route the wiring harnesses away from affected equipment. Contact Insight Product Support if needed further assistance.

GEM Configuration Pages

G1 GEM's are **NOT** field-configurable so it is essential to supply all the essential aircraft engine data to Insight at the time of placing the GEM sales order. Failure to provide the correct configuration data will require the G1 GEM to be returned to the factory.

G2, G3 and G4 GEM models may be configured in the field but if all the necessary data is supplied to Insight at the time of placing the sales order, the GEM can be pre-configured at the factory. Installation will go quicker and easier if Insight does the configuration for you.

GEM models G2, G3 and G4 are configured by special pages not accessible in normal operation. Once saved, configuration data is stored in secure non-volatile memory until overwritten by new configuration data.

To access the configuration pages turn off the GEM for five seconds, and then apply electrical power while holding in the Page (PG) knob. The GEM will allow access to the Registration, General Info, Engine, Date/Time, K-factor, and Misc Configuration pages.

Information entered on the Registration page will appear in the header section of each datalog file.

The General Info page displays technical diagnostic data.

Engine configuration data must be set to match fuel system and engine specifications and limits.

Date/Time allows setting of the GEM's clock and calendar for datalogging.

K-Factor allows adjustment for non-standard Fuel Flow Sensor pulse rates.

Misc allows for setting of RS-232 data transmit protocol.

Turn the PG knob to switch between pages, use the Select (SEL) knob to scroll and modify configuration items within each page. Under "Save Config" select "YES" push the SEL knob to save changes on each page. After configuration changes have been saved, turn off electrical power for five seconds and then restart the GEM to resume normal operation. Do not perform configuration changes in flight.

Refer to the G-Series Pilot's Guide available from Insight for more information regarding configuration.

GEM Software Updates

Contact Insight Instrument Corp. for information regarding software updates.

FLIGHT TESTING THE GEM

It is essential that the GEM be flight tested.

On power-up the GEM will briefly display a status page showing Part Number, Serial Number, etc. Check to ensure that the REDLINE numbers displayed on the status page match the Aircraft Engines CHT/EGT/TIT limits as specified in the aircraft Type Certificate or Flight Manual.

The GEM must be observed in all phases of flight for consistency in performance. If a problem is noted during the flight test, discontinue the flight test and trouble-shoot the system. The GEM's datalog system automatically logs every flight.

Should you have any questions or problems during installation or trouble-shooting of the GEM don't hesitate to contact Insight Product Support.

WEIGHT and BALANCE DATA

- 1 G-series GEM Instrument 0.5 lb
- 6 Clamp EGT Probes 9 oz.
- 6 Spring CHT Probes 6 oz.
- 6 Gasket CHT Probes 4 oz.
- 1 Adapter CHT Probe 1 oz.
- 1 TIT Probe 1 oz.
- 1 Oil Temperature Probe 1 oz.
- 1 Oil Pressure Sensor 2 oz.
- 1 Vibration Sensor 1 oz.
- 1 Fuel Flow Sensor 6 oz.
- 1 FF Signal Adapter 1 oz.
- 1 Carburetor Temperature Probe 1 oz.
- 1 8 ft Wiring Harness 14 oz.
- 1 24ft Wiring Harness 34 oz.

Troubleshooting

The following is a compilation of the common symptoms and causes of problems that may be experienced with the GEM Systems. Close examination of these symptoms should assist in identifying the cause of the problem.

Note: All G-Series GEM's have a probe diagnostic page to check the thermocouple wire and probes integrity. For G2, G3 or G4's turn the Page knob to see the probe analysis page. For G1's push the top button to see the probe analysis page. The Diagnostic page shows a pair of numbers for each probe, the two numbers are the resistance (in Ohms) of each of the probes two wires, measured from the instrument to the probes grounded tip. The following example resistance numbers are approximate and some variation is normal and to be expected depending on the length of the wiring and the age of the wiring and probes.

For an 8 foot wiring harness the probe analysis page resistance should be:
EGT; 8 and 3 Ohms, and the CHT; 1 and 6 Ohms.

For a 24 foot wiring harness the probe analysis page resistance should be:
EGT; 26 and 10 Ohms, and the CHT; 4 and 18 Ohms.

Symptom: The GEM Display does not illuminate.

Cause: No ground return at Pin 15, of the edge connector either from the engine case or from airframe ground or supply Voltage is missing at Pin S, of the P1 edge connector from the circuit breaker or bus.

Symptom: One or more columns will not illuminate.

Cause: Try recycling power to check the Display. If all columns do not illuminate, the display has been damaged or is inoperative. Check the probe diagnostic page.

Symptom: One or more columns will not illuminate.

Cause: Check the probe connections, the display will blank columns with poor EGT and CHT connections. Columns 5 and 6 shouldn't illuminate on a 4 cylinder engine. Check the probe diagnostic page.

Symptom: No EGT in one or more columns.

Cause: Errors in harness wiring. Visually check probe connections and polarity. Check the probe diagnostic page or measure the resistance of the lead wire manually. It is approximately 1 ohm per foot. Take extreme care to not damage the connector terminals with the meter probes.

Symptom: No CHT in one or more columns.

Cause: Errors in harness wiring. Visually check probe connections and polarity. Check the probe diagnostic page or measure the resistance of the lead wire manually. It is approximately 1 ohm per foot. Take extreme care to not damage the connector terminals with the meter probes.

Symptom: No CHT in one or more columns.

Cause: Faulty probe. Visually check probe connections and polarity. Check the probe diagnostic page or measure the resistance of the probe manually. It is approximately one ohm. Take extreme care to not damage the connector terminals with the meter probes.

Symptom: Display goes out during engine start.

Cause: Voltage transient or over voltage condition. The display should not be turned on during engine start. An Avionics Master or separate power switch should be installed to apply power to the display.

Symptom: Display is unstable.

Cause: Noisy or defective magneto or ignition harness. Check operation on left and right magnetos. The temperature should rise slowly and may stabilize slightly or completely on one or the other magneto. Single magneto operation will pinpoint the problem to one ignition harness, unless both are faulty. Verify that the probe wires and GEM series system harness are isolated from the ignition harness. If necessary, repair or replace the faulty ignition harness to eliminate ignition related interference.

Symptom: Display is unstable.

Cause: Magneto ungrounded or defective P-lead. Check ignition harness for proper shielding, grounding, and loose spark plug caps. Check magnetos for proper grounding or evidence of arcing. Disconnect magneto P-leads one at a time. If this eliminates or reduces the problem, replace the P-lead. A faulty ignition harness will typically cause all EGT readings to "dance" up and down. The GEM series Display will detect this type of fault long before standard test methods, thus eliminating the potential of more serious problems.

Symptom: Display is unstable.

Cause: Noisy or defective alternator, defective generator or faulty ground connection. Try operation with alternator or generator off. Alternator related interference may indicate faulty commutator.

Symptom: Display is affected by radio transmissions.

Cause: Proximity of probe and/or display unit to the radio power wiring and away from radios and antenna coax. Check radio rack connector for missing 50 ohm matching device. The 50 ohm matching device is a thick washer-like component part that is installed underneath the connector end cap. The end cap will have to be unsoldered to check for the matching device. This seemingly unimportant component is supplied with all connectors and is required for proper operation of the connector. Utilize shielded-twisted pair for power leads.

Symptom: EGT indication is not uniform.

Cause: The EGT indication for a fuel-injected engine will typically vary a bar or two from perfectly uniform when leaned for cruise. Clean the fuel injection nozzles. Non-uniformity is normal in carbureted engines. All cylinders are measured by the same circuitry. It is almost impossible to not have identical response on all channels of the GEM series.

Symptom: A sudden or gradual reduction in the EGT indication can be symptomatic of several engine faults.

Cause: Exhaust leaks above the probe and poor compression due to bad rings, valves or valve guides. If a probe substitution does not reveal a faulty probe, check for mechanical faults in the engine. Consult the GEM series Pilot's Guide for more detailed engine diagnostic information.

Symptom: All EGT readings too high.

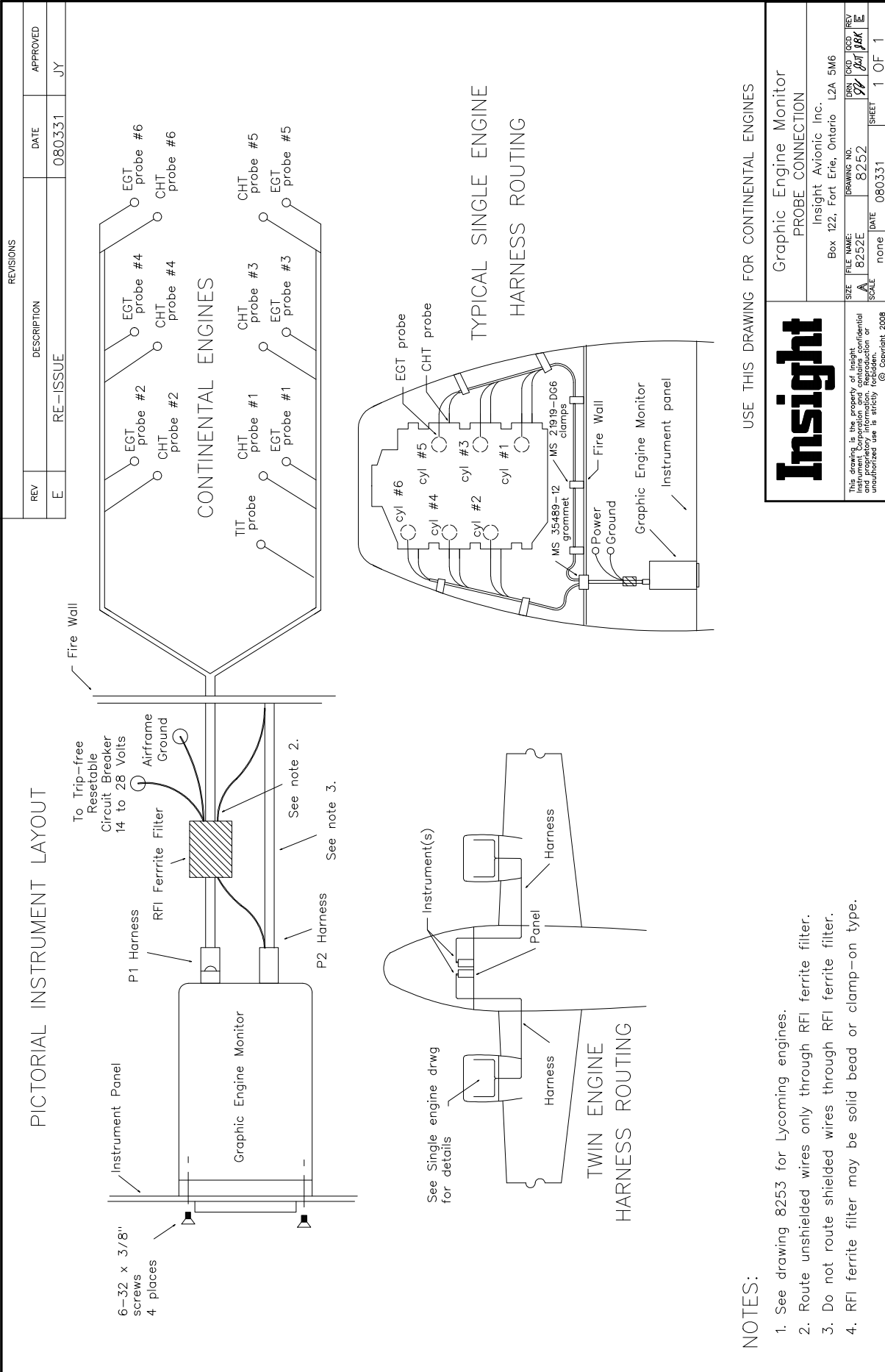
Cause: Readjust the EGT "BAR HEIGHT" on the Display. Use DVM a (digital voltmeter) to measure the difference between the instrument ground and engine block ground with the engine running and the battery charging. If the difference is greater than or 2 V DC with the alternator charging, remove the GEM ground and provide an extension directly to the engine block. If this solution fixes the problem, a ground fault exists between the engine and air-frame which should be remedied.

Symptom: Display indicates full scale or blanks out.

Cause: This can be symptomatic of an intermittent ground fault between engine and air-frame. See "All EGT readings too high".

Drawings

Drawing No.	Rev #	Title	Date
#8252	E	GEM CONNECTIONS FOR CONTINENTAL ENGINES	MAR 31/08
#8253	E	GEM CONNECTIONS FOR LYCOMING ENGINES	MAR 31/08
#8254	C	GEM PROBE CONNECTIONS	MAR 31/08
#1200-016	C	OAT/IAT PROBE MOUNTING DETAIL	MAR 31/08
#610C-315	E	DSUB 25-PIN INTERCONNECT DIAGRAM p1	JAN 24/13
#610C-315	E	DSUB 25-PIN INTERCONNECT DIAGRAM p2	JAN 24/13
#610C-315	E	DSUB 25-PIN INTERCONNECT DIAGRAM p3	JAN 24/13
#G4-315	B	DSUB 37-PIN INTERCONNECT DIAGRAM p1	JAN 24/13
#G4-315	B	DSUB 37-PIN INTERCONNECT DIAGRAM p2	JAN 24/13
#G4-315	B	DSUB 37-PIN INTERCONNECT DIAGRAM p3	JAN 24/13
#930309	C	GEM/GEMINI DISPLAY OUTLINES	MAR 31/08
#1200-018	E	GEM WIRING DIAGRAM	NOV 1/11
#610C-001	D	GRAPHIC ENGINE MONITOR	SEPT 1/11
#G4-001	A	G4 GRAPHIC ENGINE MONITOR	JUNE 21/10
#1000-303	D	FLOW SENSOR MOUNTING DIAGRAM p1	DEC10/10
#1000-303	D	FLOW SENSOR MOUNTING DIAGRAM p2	DEC10/10
#1000-303	D	FLOW SENSOR MOUNTING DIAGRAM p3	DEC10/10
#121210	A	GEM/FF/TAS and GPS INTERCONNECTION	DEC 10/12
#101116A	A	FUEL FLOW SIGNAL ADAPTER WIRING	DEC 15/10



REVISIONS		
REV	DESCRIPTION	DATE
E	RE-ISSUE	080331
		JY

USE THIS DRAWING FOR CONTINENTAL ENGINES

Insight

Graphic Engine Monitor
PROBE CONNECTION

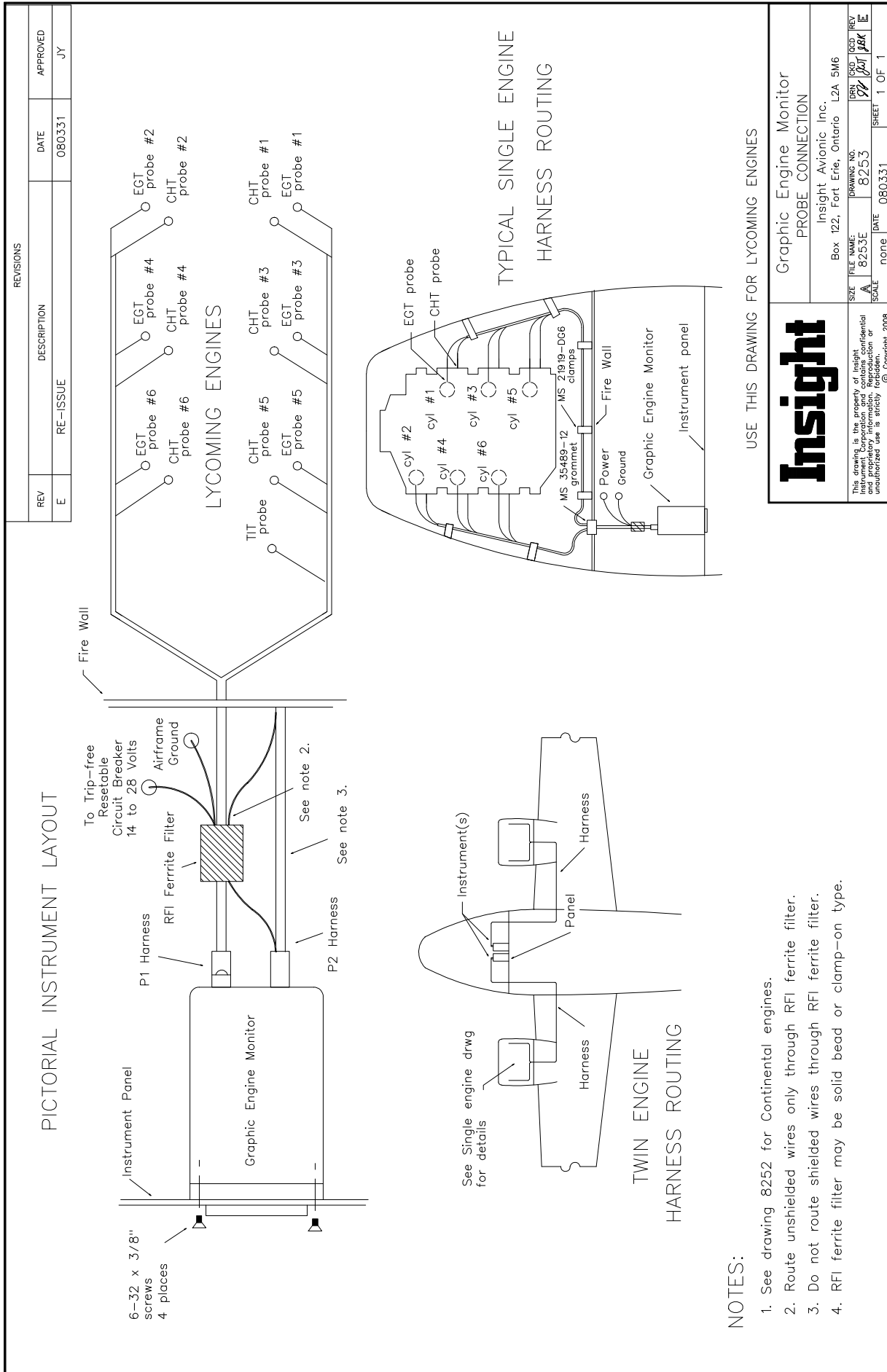
Insight Avionic Inc.
Box 122, Fort Erie, Ontario L2A 5M6

SIZE	FILE NAME	DRAWING NO.	REV	CD	REV
A	8252E	8252	01	01	01
SCALE	DATE	DRAWING NO.	SHEET 1 OF 1		
	none	080331			

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NOTES:

1. See drawing 8253 for Lycoming engines.
2. Route unshielded wires only through RFI ferrite filter.
3. Do not route shielded wires through RFI ferrite filter.
4. RFI ferrite filter may be solid bead or clamp-on type.



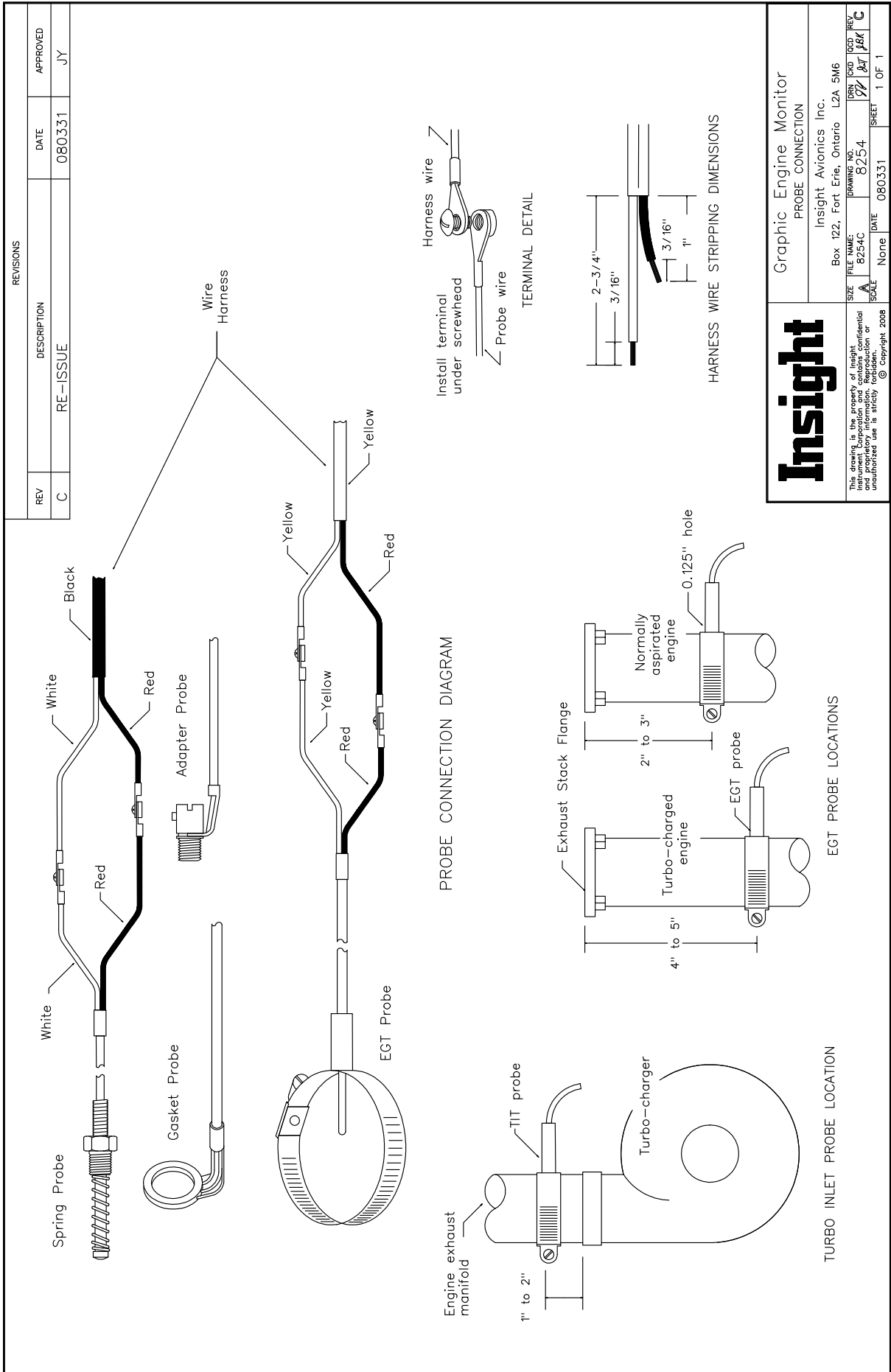
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
E	RE-ISSUE	080331	JY

NOTES:

1. See drawing 8252 for Continental engines.
2. Route unshielded wires only through RFI ferrite filter.
3. Do not route shielded wires through RFI ferrite filter.
4. RFI ferrite filter may be solid bead or clamp-on type.

USE THIS DRAWING FOR LYCOMING ENGINES

<h1 style="margin: 0;">Insight</h1> <p style="font-size: 8px; margin: 0;">This drawing is the property of Insight Instrument Corporation and contains confidential information. Its use without the written authorization of Insight Instrument Corporation is strictly prohibited. © Copyright, 2008</p>		Graphic Engine Monitor PROBE CONNECTION	
		Insight Avionic Inc. Box 122, Fort Erie, Ontario L2A 5M6	
SIZE: A FILE NAME: 8253E SCALE: none	DRAWING NO.: 8253E DATE: 080331	DRY CD: JY REV: JAK	SHEET: 1 OF 1



ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	ADDED P/N 1200-021	930601	JWT
	B	ADDED NOTES	960101	JWT
	C	RE-ISSUE	080331	JY

TEMPERATURE SENSOR WITH GASKET AND NUT P/N 1200-014 (IAT) OR P/N 1200-021 (OAT)

0.430 DIA ±0.003

RECOMMENDED MOUNTING CUT-OUT

AIRCRAFT EXTERIOR SKIN (OAT) OR INTERIOR TRIM (IAT)

RUBBER O-RING SEAL

RUBBER GASKET

NYLON HEX NUT 7/16"

SENSOR CABLE ASSEMBLY P/N 1200-015

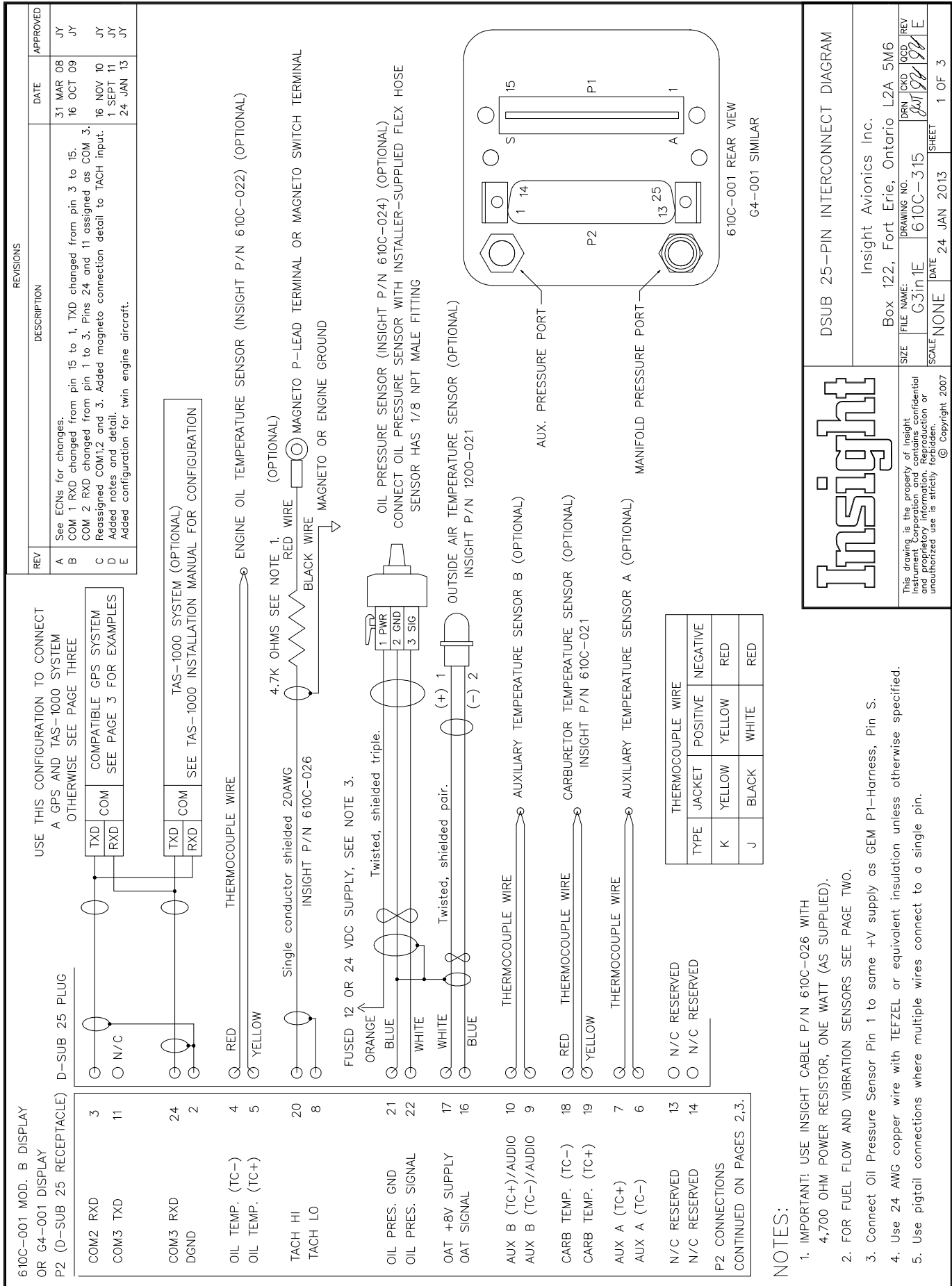
NOTES:

1. LOCATION OF OAT AND IAT PROBE IS CRITICAL TO CORRECT OPERATION REFER TO INSTRUCTIONS BEFORE LOCATING EITHER PROBE.
2. SENSOR CABLE ASSEMBLY IS PRE-TERMINATED BUT LENGTH MAY BE MODIFIED BY INSTALLER.
3. Torque nylon hex nut to 6 in.lb. MAX.
4. DO NOT apply any torque to bullet portion of sensor.

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OUTSIDE AIR TEMPERATURE / INSIDE AIR TEMPERATURE PROBE MOUNTING DETAIL	
Insight Avionics Inc.	
Box 122, Fort Erie, Ontario L2A 5M6	
FILE NAME: OATINSTC	DRAWING NO. 1200-016
SIZE: DRN	GCD
SCALE: none	DATE: 080331
SHEET: 1	OF 1



DSUB 25-PIN INTERCONNECT DIAGRAM

Insight

Insight Avionics Inc.
Box 122, Fort Erie, Ontario L2A 5M6

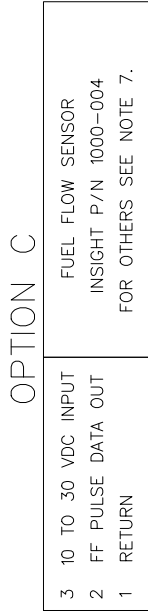
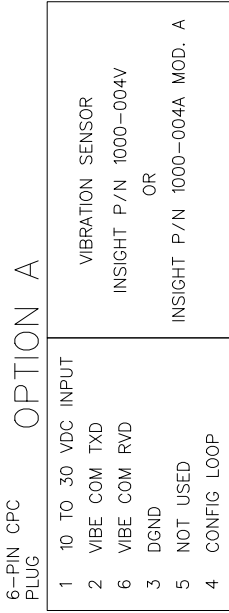
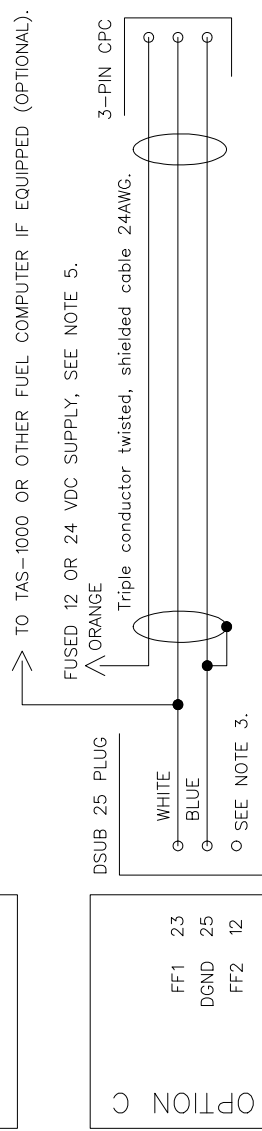
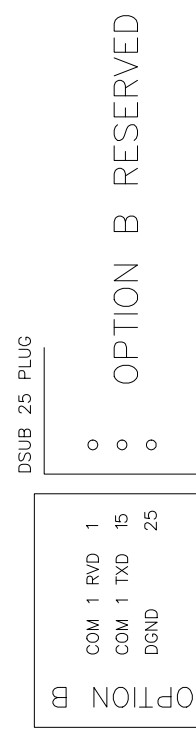
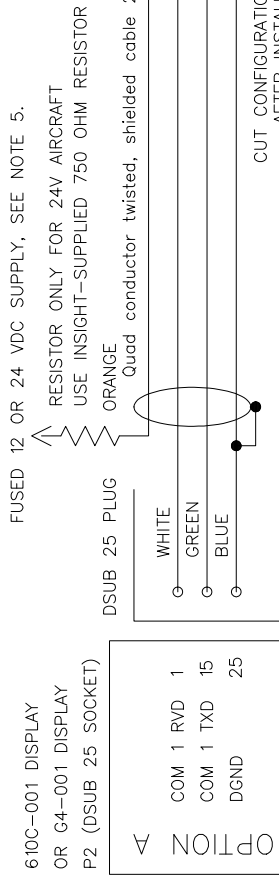
FILE NAME: G3in1E DRAWING NO: 610C-315

SCALE: NONE DATE: 24 JAN 2013 SHEET: 1 OF 3

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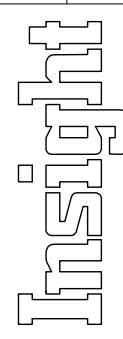
REV		DESCRIPTION		DATE		APPROVED	
A		See ECNs for changes.		31 MAR	08	JY	
B		610C-001 pin 24 changed to COM 3 RVD, pin 11 changed to COM 3 TXD.		16 OCT	09	JY	
C		1000-004A pin 2 changed to COM TXD, pin 7 changed to COM RVD.					
D		Reassigned COM 1 to FF/Vibration sensor.		16 NOV	10	JY	
E		Added notes and detail.		1 SEPT	11	JY	
		Changed CPC from 7-pin to 6-pin.		24 JAN	13	JY	

FUEL FLOW AND VIBRATION SENSOR OPTIONS



NOTES:

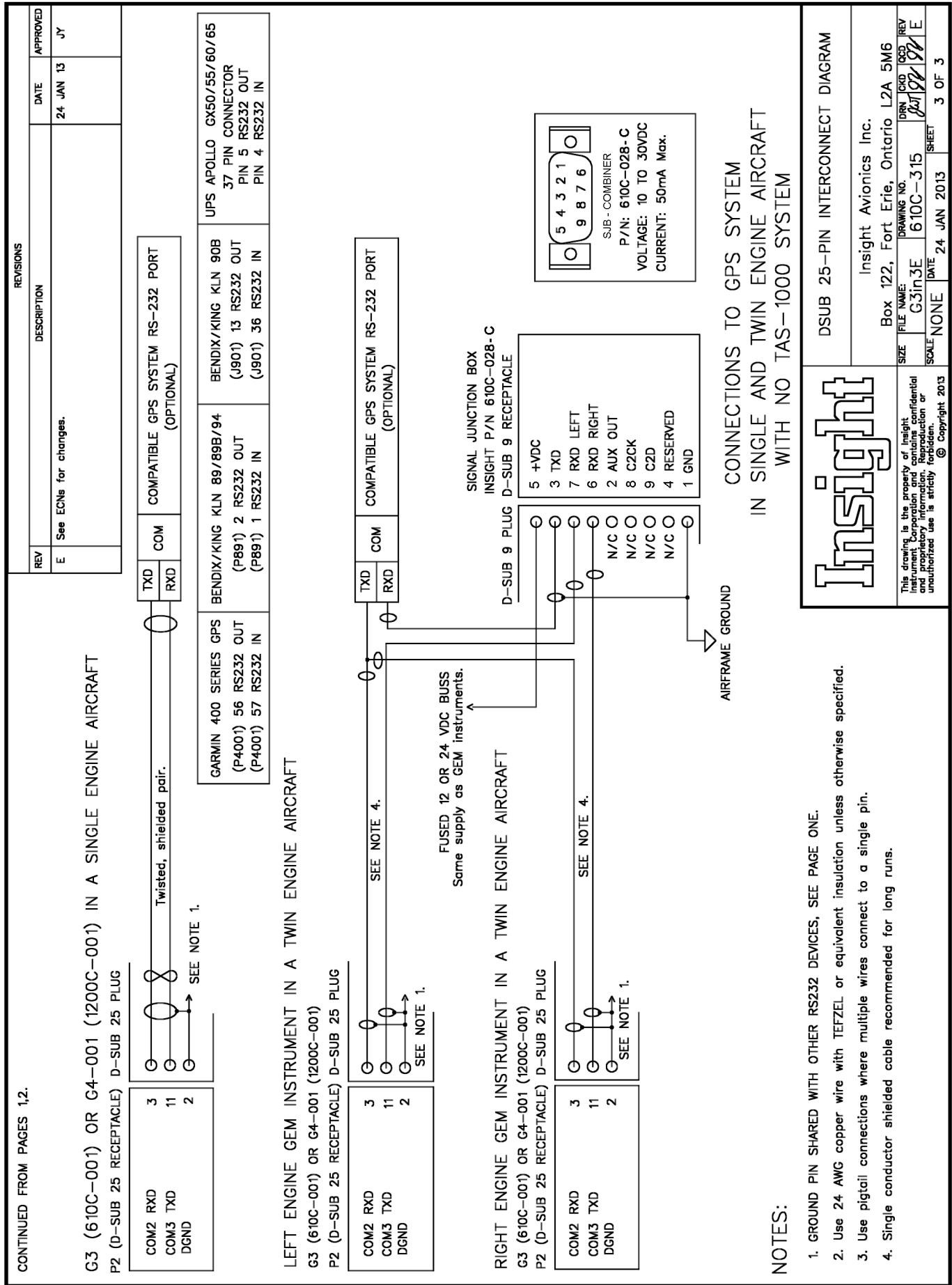
1. Use 24 AWG copper wire with TEFZEL or equivalent insulation unless otherwise specified.
2. IF NO FF OR FF/V SENSORS ARE REQUIRED LEAVE PINS 1,12,15,23, AND 25 UNCONNECTED.
3. FF2 PIN 12 MAY CONNECT TO A RETURN FF SENSOR (1000-004). CONSULT INSIGHT.
4. OPTION A AND OPTION C MAY BE USED TOGETHER, SHARE GROUND PIN 25.
5. Connect FF and vibration sensor VDC inputs to same +V supply as GEM P1-harness, Pin S.
6. Use pigtail connection where multiple wires connect to a single pin.
7. For connection to other fuel flow sensors use P/N 610C-025, see Drawing No. 101116A.

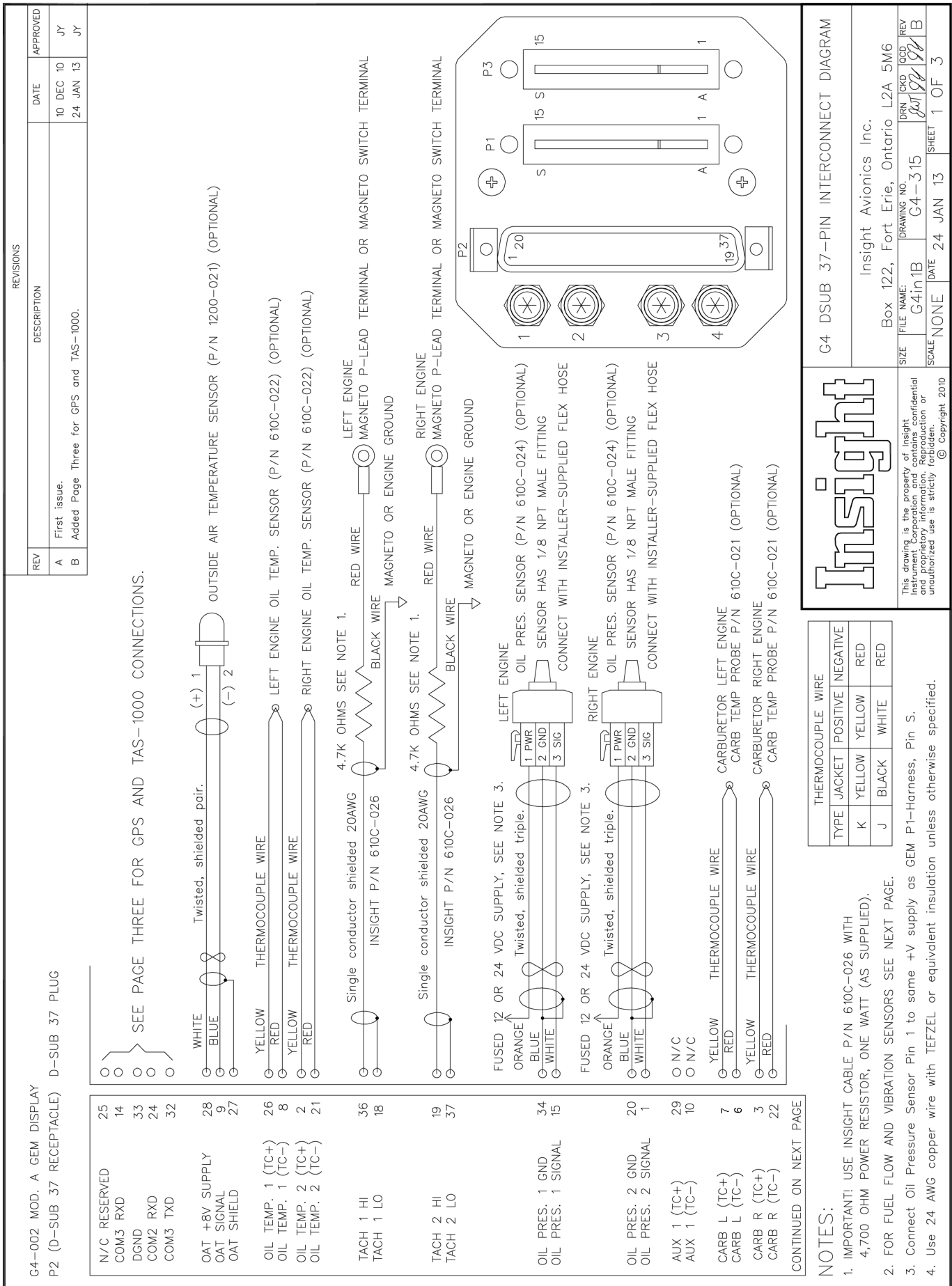


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DSUB 25-PIN INTERCONNECT DIAGRAM

Insight Avionics Inc.	
Box 122, Fort Erie, Ontario L2A 5M6	
FILE NAME: G3in2E	DRAWING NO: 610C-315
DATE: 24 JAN 13	DRN: JCD
SCALE: NONE	REV: E
SHEET: 2 OF 3	

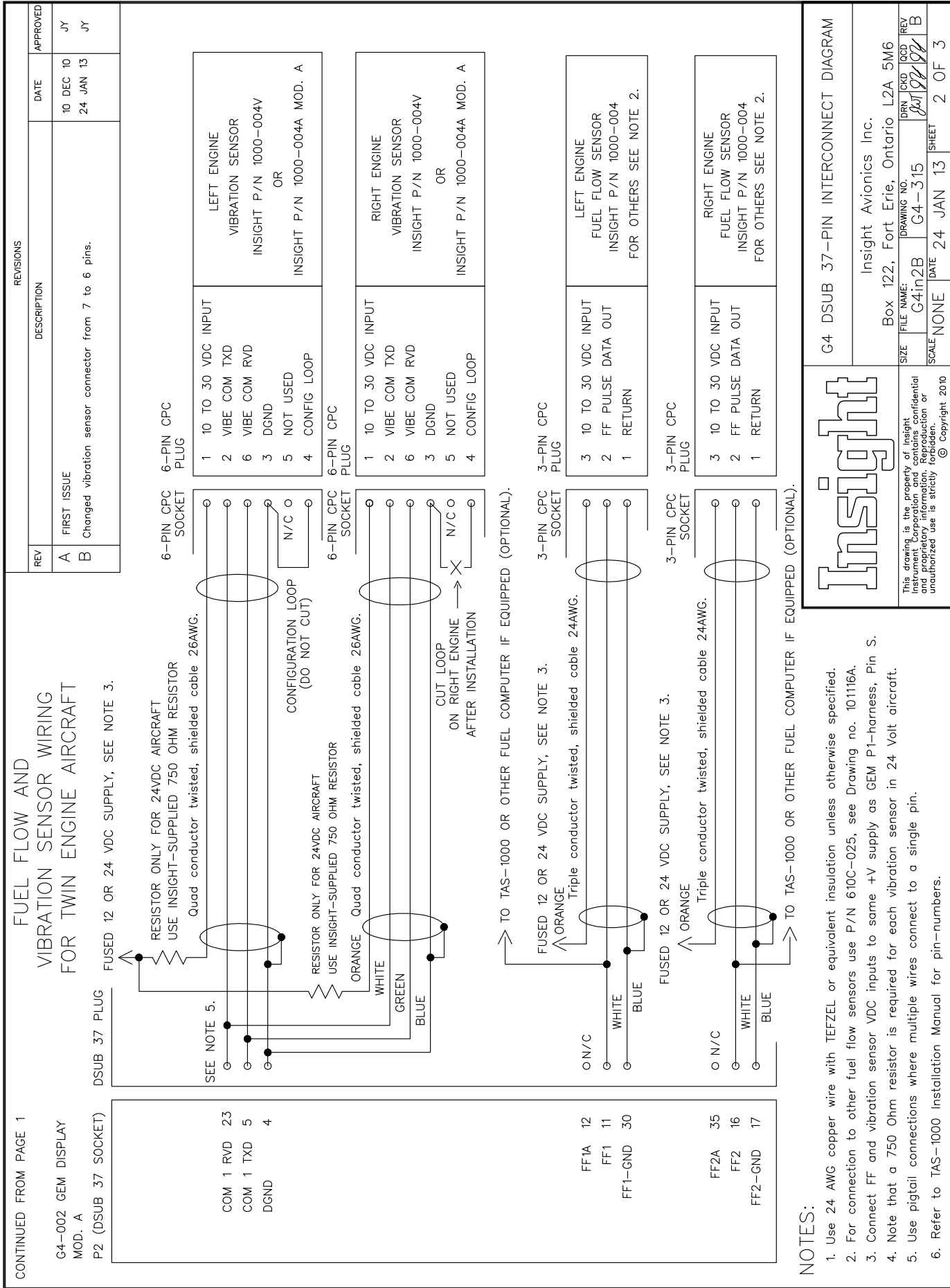




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G4 DSUB 37-PIN INTERCONNECT DIAGRAM	
Insight Avionics Inc. Box 122, Fort Erie, Ontario L2A 5M6	
SIZE: G4in1B	DRAWING NO.: G4-315
SCALE: NONE	DATE: 24 JAN 13
SHEET 1 OF 3	

- NOTES:**
- IMPORTANT: USE INSIGHT CABLE P/N 610C-026 WITH 4.700 OHM POWER RESISTOR, ONE WATT (AS SUPPLIED).
 - FOR FUEL FLOW AND VIBRATION SENSORS SEE NEXT PAGE.
 - Connect Oil Pressure Sensor Pin 1 to same +V supply as GEM P1-Harness, Pin S.
 - Use 24 AWG copper wire with TEFZEL or equivalent insulation unless otherwise specified.
- | THERMOCOUPLE WIRE | | | |
|-------------------|--------|----------|----------|
| TYPE | JACKET | POSITIVE | NEGATIVE |
| K | YELLOW | YELLOW | RED |
| J | BLACK | WHITE | RED |



CONTINUED FROM PAGE 1

G4-002 GEM DISPLAY MOD. A
P2 (DSUB 37 SOCKET)

REV	DESCRIPTION	DATE	APPROVED
A	FIRST ISSUE	10 DEC 10	JY
B	Changed vibration sensor connector from 7 to 6 pins.	24 JAN 13	JY



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G4 DSUB 37-PIN INTERCONNECT DIAGRAM

Insight Avionics Inc.

Box 122, Fort Erie, Ontario L2A 5M6

SIZE	FILE NAME:	DRAWING NO.:	DRN	CKD	100D	REV
	G4in2B	G4-315				B
SCALE	NONE	DATE	24 JAN 13	SHEET	2	OF 3

REVISIONS		DATE	APPROVED
REV	DESCRIPTION	DATE	APPROVED
A	First issue.	10 DEC 10	JY
B	Added notes for GPS.	24 JAN 13	JY

G4-002 MOD. A GEM DISPLAY
P2 (D-SUB 37 RECEPTACLE) D-SUB 37 PLUG

COM3 RXD	14
DGND	33
COM2 RXD	24
COM3 TXD	32
RESERVED A	31
RESERVED B	13
RESERVED	25

USE THIS CONFIGURATION TO CONNECT TO A GPS AND A TAS-1000 SYSTEM.

TAS 1000 RS-232 PORT (OPTIONAL)
See the TAS-1000 Installation Manual for pin-numbers and configuration.

COM3 RXD	14
DGND	33
COM2 RXD	24
COM3 TXD	32
RESERVED A	31
RESERVED B	13
RESERVED	25

USE THIS CONFIGURATION TO CONNECT TO A GPS WITH NO TAS-1000 SYSTEM.

COMPATIBLE GPS SYSTEM RS-232 PORT (OPTIONAL)
See DWG #610C-315 page3 for GPS pin numbers.

COM3 RXD	14
DGND	33
COM2 RXD	24
COM3 TXD	32
RESERVED A	31
RESERVED B	13
RESERVED	25

NOTES:

1. Use 24 AWG copper wire with TEFZEL or equivalent insulation unless otherwise specified.
2. Refer to the TAS-1000 Installation Manual for pin numbers and configuration.
3. Refer to the GPS manufacturers data for pin numbers and configuration.

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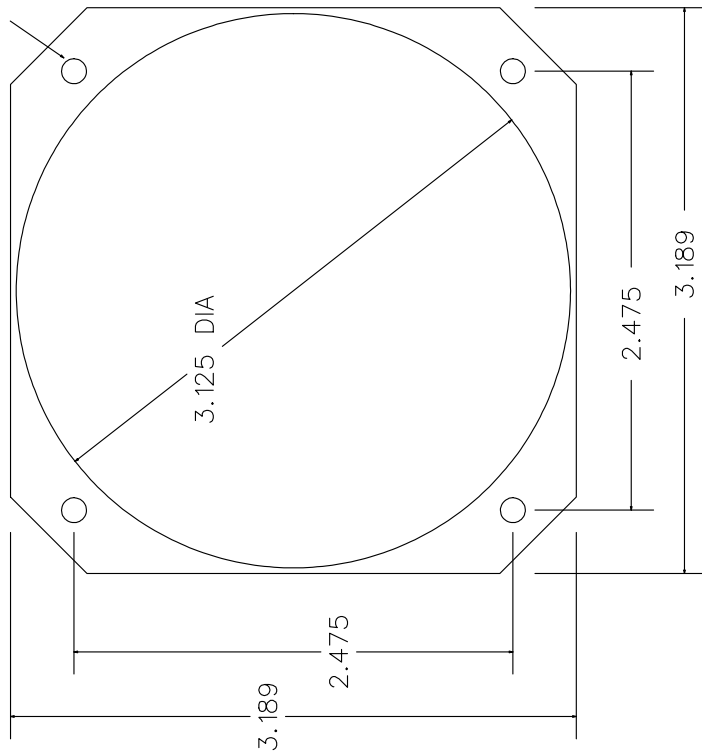
G4 DSUB 37-PIN INTERCONNECT DIAGRAM

Insight Avionics Inc.
Box 122, Fort Erie, Ontario L2A 5M6

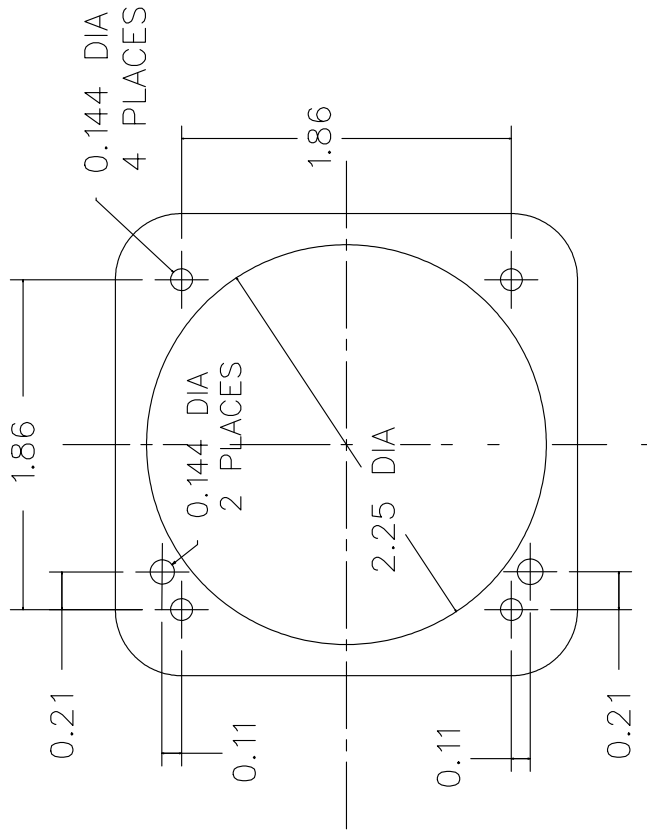
SIZE	FILE NAME:	DRAWING NO.	DRN ICD REV
G4in3B	G4-315		001 98 B
SCALE	NONE	DATE	SHEET
		24 JAN 13	3 OF 3

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	Addition of detail	930601	JWT
B	CORRECTED HOLE DIMENSION	031114	R.R.
C	REVISED FOR CLARITY	080331	JY

Mounting holes
6-32 4 places.



INSTRUMENT PANEL HOLE LAYOUT



G3 PANEL HOLE LAYOUT
(FOR P/N 610C-001)

Insight

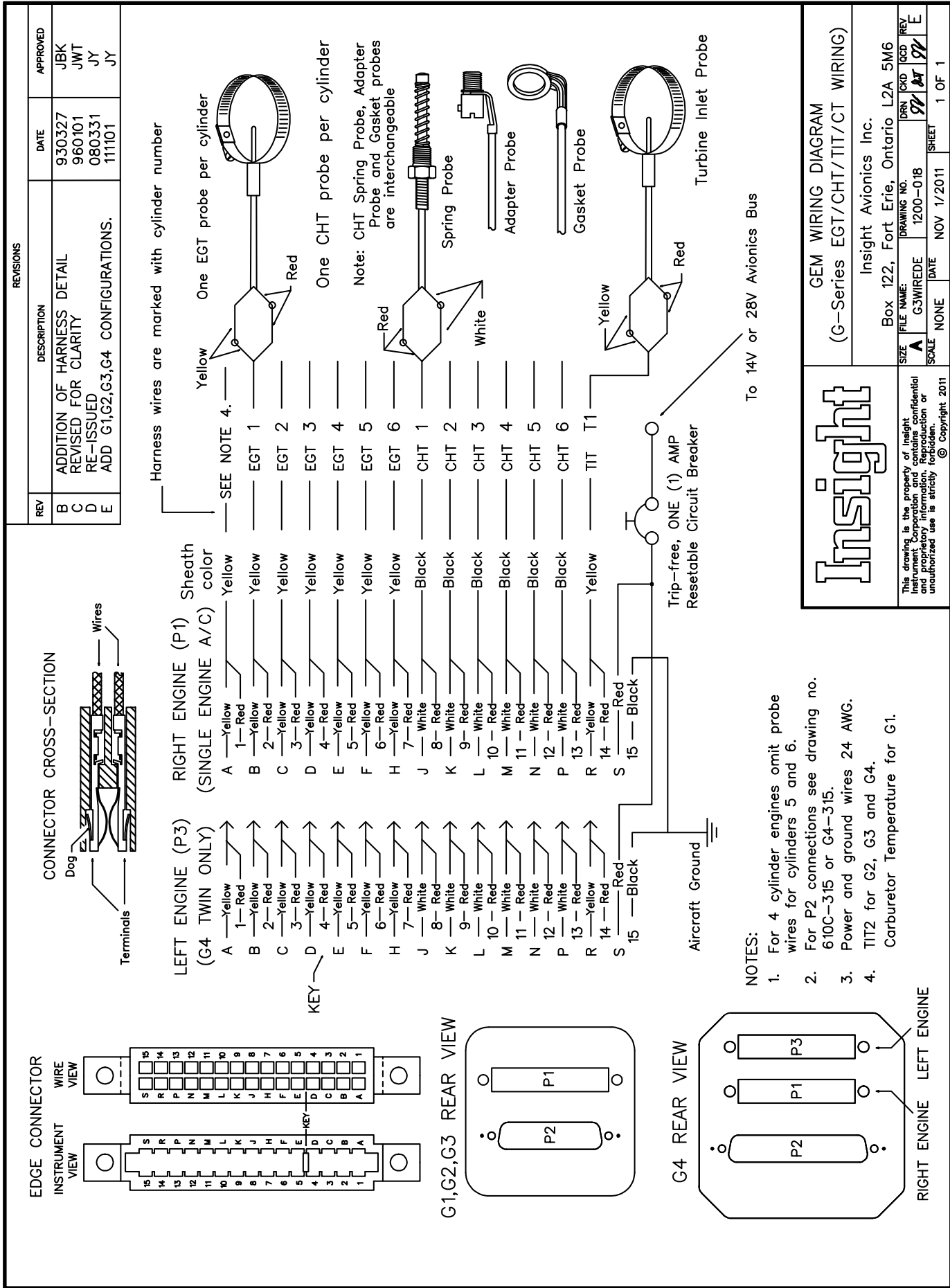
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GEM/GEMINI DISPLAY OUTLINES

Insight Avionics Inc.

Box 122, Fort Erie, Ontario L2A 5M6

SIZE	FILE NAME:	DRAWING NO.	DRN	DCD	REV
	gemdoutc	930309	93	18k	C
SCALE	DATE	SHEET	1 OF 1		
NONE	080331	080331			



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GEM WIRING DIAGRAM
(G-Series EGT/CHT/TIT/CT WIRING)

Insight Avionics Inc.
Box 122, Fort Erie, Ontario L2A 5M6

SIZE	FILE NAME	DRAWING NO.	DRN	CKD	QCD	REV
A	G3WIRED	1200-018	97	AT	97	E
SCALE	NONE	DATE	NOV 17/2011		SHEET	1 OF 1

REVISIONS		
REV	DESCRIPTION	DATE
NONE	Prototype.	JUL 4/07
A	Specification A for environmental testing.	MAR 31/08
B	Specification B.	OCT 16/09
C	Specification C.	JUN 21/10
D	Added G1 and G2 configurations.	SEPT 1/11

REV	DESCRIPTION	DATE
NONE	Prototype.	JUL 4/07
A	Specification A for environmental testing.	MAR 31/08
B	Specification B.	OCT 16/09
C	Specification C.	JUN 21/10
D	Added G1 and G2 configurations.	SEPT 1/11

FRONT VIEW

REAR VIEW

DATA RANGE

EXHAUST GAS TEMPERATURE: 200 TO 1800 F
 TURBINE INLET TEMPERATURE: 200 TO 1800 F
 CYLINDER HEAD TEMPERATURE: 200 TO 550 F
 TACHOMETER: 600 TO 4000 RPM
 OIL TEMPERATURE: -40 TO 250 F
 OIL PRESSURE: 20 TO 100 PSI
 CARBURATOR TEMPERATURE: -40 TO +120 F
 ALTERNATOR TEMPERATURE: -40 TO +250 F
 OUTSIDE AIR TEMPERATURE: -40 TO +120 F
 BUSS VOLTAGE: 8.0 TO 30.0 VDC
 G-LOAD (3-AXIS): +/- 5.0 G
 POWERPLANT VIBRATION (3-AXIS): +/- 5.0 G
 MANIFOLD PRESSURE: 6.0 TO 70.0 in.Hg
 OPTIONAL PRESSURE: 3.0 TO 36.0 PSI Absolute

FUEL FLOW:
 Fuel Flow Rate: 2.0 to 99 GPH.
 Maximum Fuel Quantity: 2000 U.S.G. or 9999 lb.
 Serial Interface (3): RS-232 9600 Baud Bi-directional

SPECIFICATIONS AND LIMITATIONS

Part Number: 610C-001
 Power: 10 TO 30 VDC, 2 W Maximum, 1 W Continuous.
 Weight: 0.5 lb.
 Altitude: -1000 to 35000 ft.
 Operating Temperature: -20 °C to +55 °C.
 Environmental: DO-160E
 Software: DO-178B LEVEL C

BEZEL MARKING	CONNECTIONS		CONTROLS	
	P1	P2	MP	
G1	YES	NO	NO	PUSHBUTTONS
G2	YES	YES	NO	KNOBS
G3	YES	YES	YES	KNOBS

ALL DIMENSIONS IN INCHES, TOLERANCE +/- 0.050.
INSTALLATION MANUAL: INSIGHT DOC. #070906.
OPERATION INSTRUCTIONS: INSIGHT DOC. #070907.
G3 CONFIGURATION SHOWN, G1 AND G2 SIMILAR



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INSIGHT INSTRUMENT CORPORATION
 Box 122, Fort Erie, Ontario L2A 5M6

FILE NAME: 610C-001
 DRAWING NO. 610C-001
 DATE: SEPT 1/11
 SCALE: none
 SHEET: 1 of 1

GRAPHIC ENGINE MONITOR

Insight Avionics Inc.

DRN: 070906
 REV: D

REVISIONS		
REV	DESCRIPTION	DATE
NONE	Prototype.	MAR 31/08
A	Added 3rd serial port to P2.	JUN 21/10

FRONT VIEW

INSTRUMENT MOUNTING HOLES (6-32 x4)

AMBIENT LIGHT SENSOR

3.120 DIA

3.190

G4 Insight GRAPHIC ENGINE MONITOR

LCD DISPLAY

G4-101

PG 3D DATA CARD (SEL)

PAGE CONTROL KNOB

SELECT CONTROL KNOB

REAR VIEW

P2 D-SUB RECEPTACLE

P1 30 PIN EDGE CONNECTOR

P3 30 PIN EDGE CONNECTOR

HARNES MOUNTING HOLES (4-40 x2)

1 2 3 4

PRESSURE PORTS #2 37 DEGREE FLARE (5/16-24)

LATCH-BLOCK(x2)

SIDE VIEW

NAMEPLATE

G4-105

3.650

DATA RANGES

EXHAUST GAS TEMPERATURE: 200 TO 1800 F

TURBINE INLET TEMPERATURE: 200 TO 1800 F

CYLINDER HEAD TEMPERATURE: 200 TO 550 F

TACHOMETER: 700 TO 3400 RPM

OIL TEMPERATURE: -40 TO 250 F

OIL PRESSURE: 20 TO 100 PSI

CARBURETOR TEMPERATURE: -40 TO +120 F

ALTERNATOR TEMPERATURE: -40 TO +250 F

OUTSIDE AIR TEMPERATURE: -40 TO +120 F

BUSS VOLTAGE: 8.0 TO 30.0 VDC

G-LOAD (3-AXIS): +/- 5.0 G

POWERPLANT VIBRATION (3-AXIS): +/- 5.0 G

MANIFOLD PRESSURE (2): 6.0 TO 70.0 in.Hg

OPTIONAL PRESSURE (2): 3.0 TO 36.0 PSI Absolute

FUEL FLOW:

Fuel Flow Rate: 2.0 to 99 GPH.

Maximum Fuel Quantity: 2000 U.S.G. or 9999 lb.

Serial Interface (3): RS-232 9600 Baud Bi-directional

CONNECTOR CONFIGURATIONS

CONNECTOR	CONFIGURATION
P1	P2
G4-001	30-PIN
G4-002	30-PIN

SPECIFICATIONS AND LIMITATIONS

Part Numbers: G4-001, G4-002

Power: 10 TO 30 VDC, 2 W Maximum, 1 W Continuous.

Weight: 0.5 lb.

Altitude: -1000 to 35000 ft.

Operating Temperature: -20 °C to +55 °C.

Environmental: DO-160E

Software: DO-178B LEVEL C

ALL DIMENSIONS IN INCHES, TOLERANCE +/- 0.050.

G4 GRAPHIC ENGINE MONITOR

Insight Instrument Corp.

Box 122, Fort Erie, Ontario L2A 5M6

SIZE: FILE NAME: DRAWING NO. DRN. TO: GBD. REV.

SCALE: G4SpecA G4-001 DATE: JUN 21/10 SHEET: 1 of 1

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REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	Added housing and bracket.	June 22/00	JWT
B	CHANGED TITLE	June 15/01	R.R.
C	ADDED 2 ADDITIONAL MOUNTING OPTIONS	MAY 26/03	R.R.
D	ADDED VIBRATION AND K-FACTOR OPTIONS	DEC 10/10	JY

TYPICAL INSTALLATION

TOP VIEW

SIDE VIEW

FRONT VIEW

3-PIN CONNECTOR PINOUT

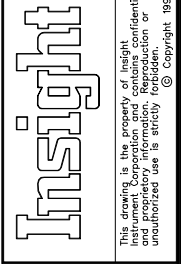
7-PIN CONNECTOR PINOUT

PART NUMBERS

FLOW SENSOR	INJECTOR	CARBURETOR	1000-004-1(-Knnnnn)(-EPR)	1000-004-4(-Knnnnn)(-EPR)
TRUE FLOW SENSOR	1000-006-1X	SEE NOTE 12.	SEE NOTE 12.	SEE NOTE 12.
FLOW/VIBRATION SENSOR	1000-004A-1	1000-004A-4		
VIBRATION SENSOR	1000-004V(-Xn)	1000-004V(-Xn)	SEE NOTE 15.	SEE NOTE 15.

NOTES:

1. Install INSIGHT FLOW SENSOR, one per engine.
2. Use ONLY approved 1/4 NPT fittings for transducer inlet and outlet, installer supplied.
3. Use ONLY approved fuel line assemblies.
4. Use approved thread sealant. Torque pipe threads to a max of 15 ft. lbs. (180 in. lbs.)
5. INSIGHT supplied electrical harness; 1/3 TURN, 3-pin OR clip-on 7-pin for FLOW/VIBRATION SENSOR.
6. A straight length of fuel line upstream from the sensor inlet will improve accuracy by reducing turbulence in the rotor.
7. CONFIRM TRANSDUCER CASE IS GROUNDED TO AIRFRAME GROUND BEFORE POWERING UP.
8. Mount transducer with nomenclature facing up.
9. Confirm all wiring PRIOR to powering up.
10. SEE INSTALLATION SCHEMATIC 1000-816 FOR FLOW SENSOR WIRING DETAILS.
11. SEE INSTALLATION SCHEMATIC 1000-816 FOR TRUE FLOW SENSOR WIRING DETAILS.
12. SPECIFY GPS MANUFACTURE AND MODEL WHEN ORDERING TRUE FLOW SENSOR, BENDIX KING B-FORMAT, APOLLO AND GARMIN Z-FORMAT.
13. FLOW SENSOR 30,000 PULSES PER GALLON UNLESS INDICATED BY -Knnnn.
14. FLOW SENSOR DATA SIGNAL 5V UNLESS -EPR, EXTERNAL PULL-UP RESISTOR REQUIRED, SEE WIRING DIAGRAM.
15. Install vibration sensor, one per engine, consult Insight for alternate application.



FLOW SENSOR AND TRUE FLOW SENSOR MOUNTING DIAGRAM (BRACKET TYPE 1)	
Insight Instrument Corporation Box 122, Fort Erie, Ontario L2A 5M6	
FILE NAME:	DRN 800
DRAWING NO.:	1000-303
SCALE:	none
DATE:	June 1/99
SHEET:	1 OF 3

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TYPICAL INSTALLATION

TOP VIEW

SIDE VIEW

FRONT VIEW

PART NUMBERS	
FLOW SENSOR	CARBURETOR
1000-004-2(-Knnnn)(-EPR)	1000-004-5(-Knnnn)(-EPR)
1000-006-2X SEE NOTE 12.	1000-006-5X SEE NOTE 12.

NOTES:

1. Install INSIGHT FLOW SENSOR, one per engine.
2. Use ONLY approved 1/4 NPT fittings for transducer inlet and outlet, installer supplied. Use appropriate fittings to match airplane fuel lines.
3. Use approved thread sealant. Torque pipe threads to a max of 15 ft. lbs. (180 in. lbs.)
4. INSIGHT supplied 1/3 turn bayonet mount power and signal harness P/N CAB-1000-809
5. A straight length of fuel line upstream from the sensor inlet will improve accuracy by reducing turbulence in the rotor.
6. Mount on firewall or airframe with nomenclature facing up.
7. Installer may drill additional holes in bracket if necessary.
8. CONFIRM TRANSDUCER CASE IS GROUNDED TO AIRFRAME GROUND BEFORE POWERING UP
9. Confirm all wiring PRIOR to powering up
10. SEE INSTALLATION SCHEMATIC 1000-301 FOR FLOW SENSOR WIRING DETAILS.
11. SEE INSTALLATION SCHEMATIC 1000-816 FOR TRUE FLOW SENSOR WIRING DETAILS.
12. SPECIFY GPS MODEL WHEN ORDERING TRUE FLOW SENSOR, B = BENDIX KING, Z = APOLLO AND GARMIN.
13. FLOW SENSOR 30,000 PULSES PER GALLON UNLESS INDICATED BY -Knnnn.
14. FLOW SENSOR DATA SIGNAL 5V UNLESS -EPR, EXTERNAL PULL-UP RESISTOR REQUIRED, SEE WIRING DIAGRAM.

PIN	FUNCTION
1	AVIONICS GROUND (DO NOT GROUND TO ENGINE)
2	DATA OUT (TRANSMIT)
3	10 TO 30 VDC INPUT

3--PIN CONNECTOR PINOUT

Insight

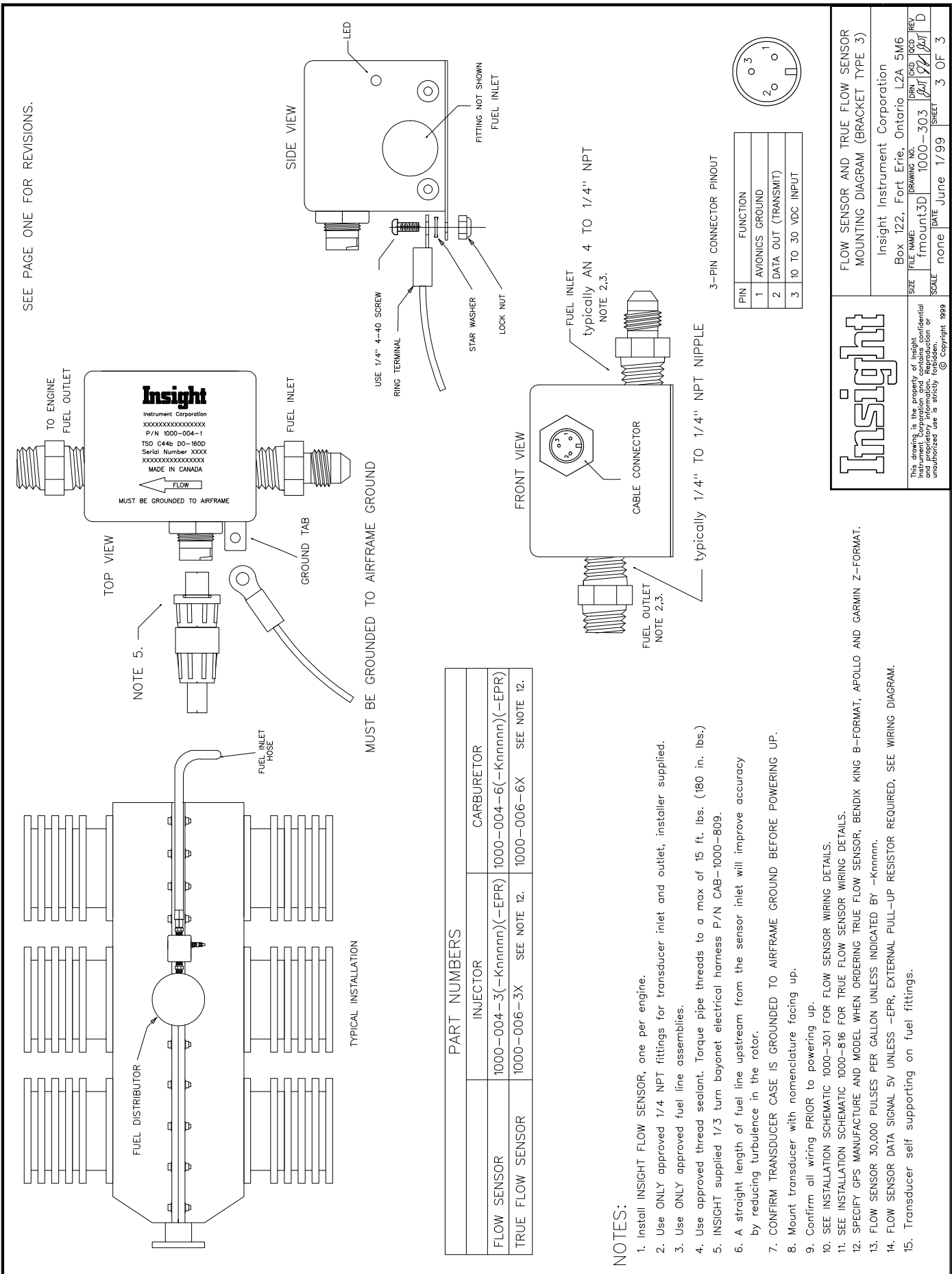
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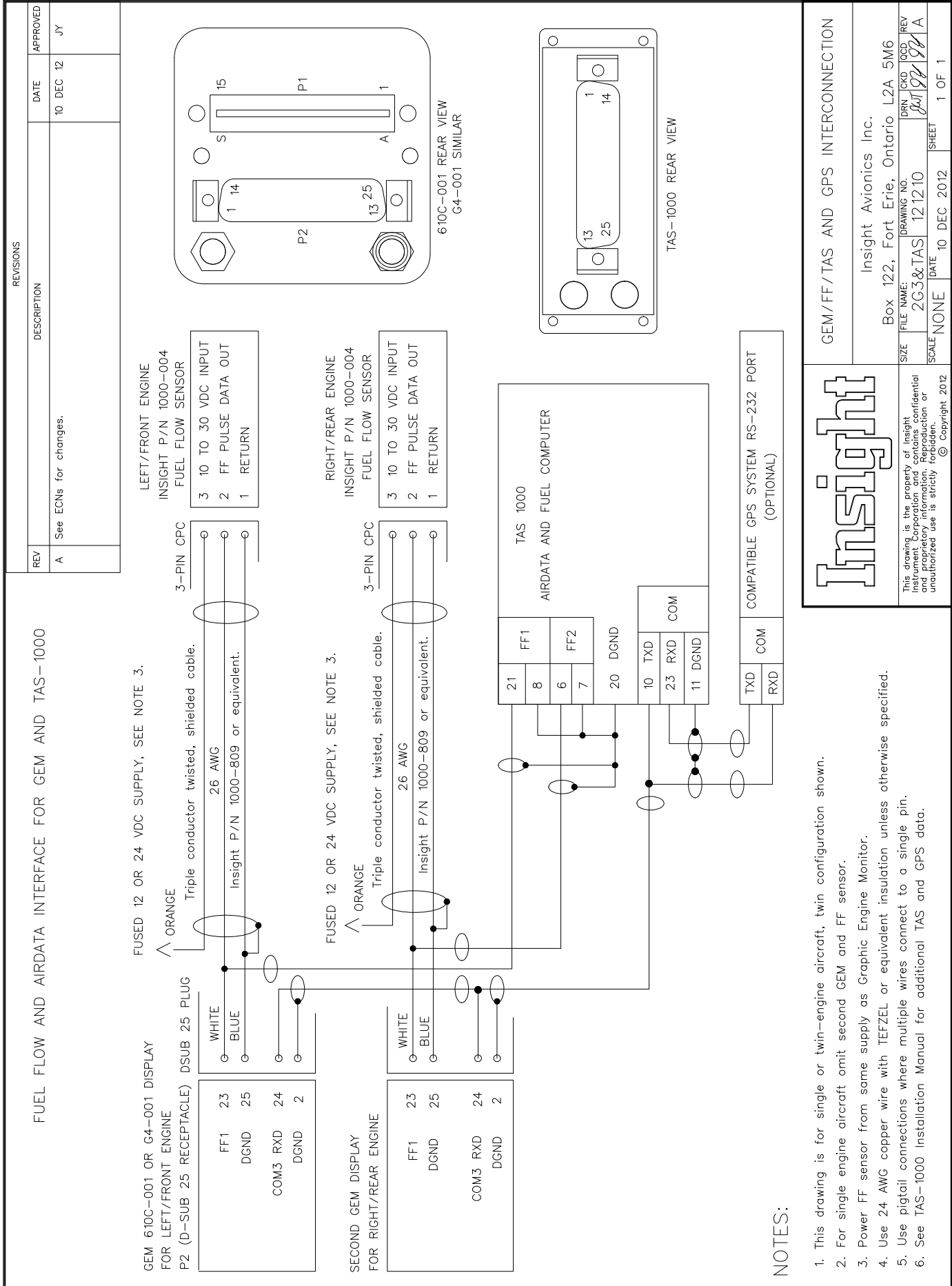
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FLOW SENSOR AND TRUE FLOW SENSOR MOUNTING DIAGRAM (BRACKET TYPE 2)

Insight Instrument Corporation
Box 122, Fort Erie, Ontario L2A 5M6

SIZE	FILE NAME:	DRAWING NO.	DRN	DKG	DOC	REV
	fmount2D	1000-303	pat	pat	pat	D
SCALE	DATE	JUNE 1/99	SHEET	2 OF 3		





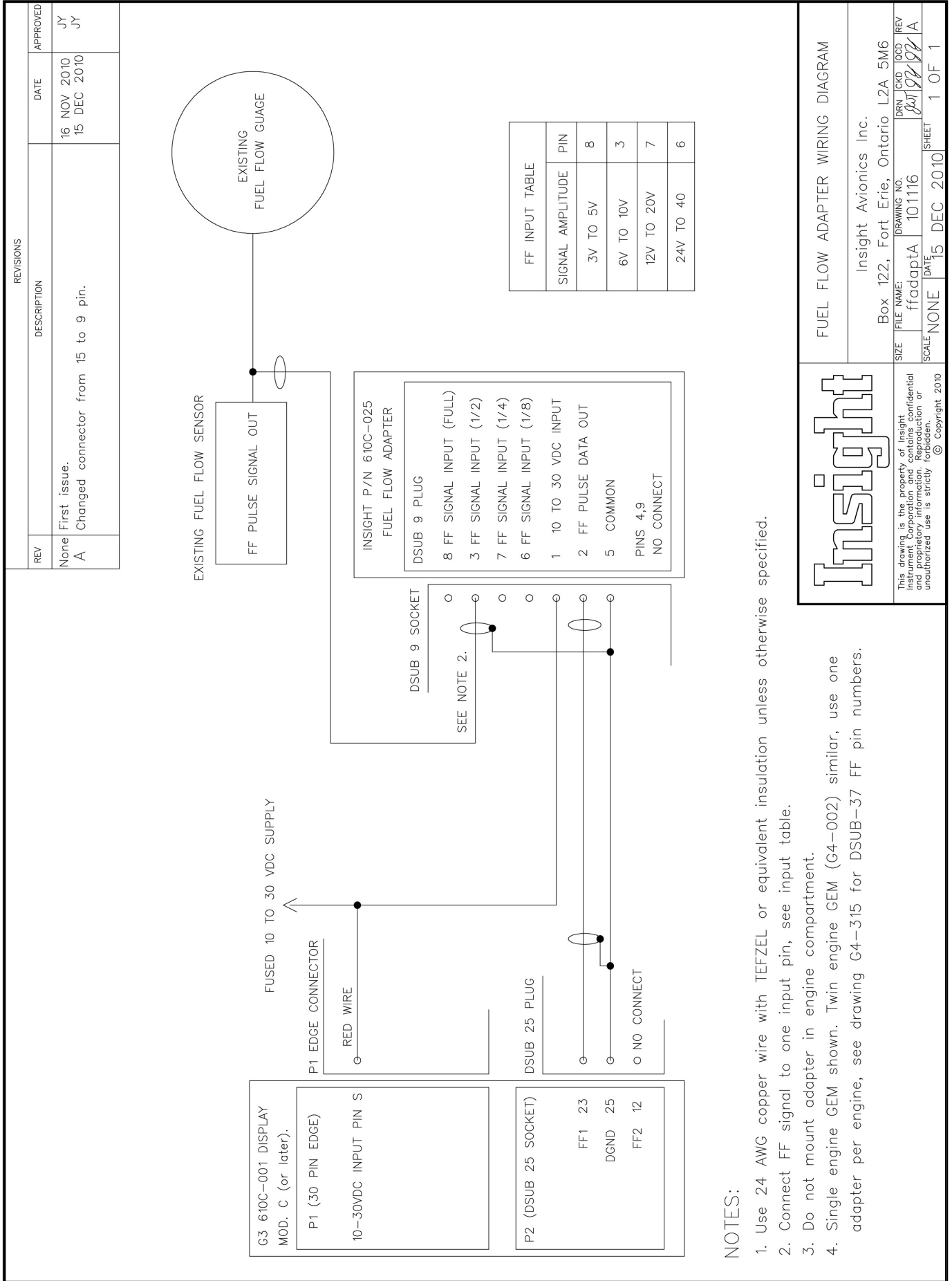
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GEM/FF/TAS AND GPS INTERCONNECTION

Insight Avionics Inc.
 Box 122, Fort Erie, Ontario L2A 5M6

SIZE	FILE NAME:	DRAWING NO.	DRN	CKD	RCD	REV
SCALE	NONE	2G3&TAS	121210			A
	DATE	10 DEC 2012	SHEET	1 OF 1		



NOTES:

1. Use 24 AWG copper wire with TEFZEL or equivalent insulation unless otherwise specified.
2. Connect FF signal to one input pin, see input table.
3. Do not mount adapter in engine compartment.
4. Single engine GEM shown. Twin engine GEM (G4-002) similar, use one adapter per engine, see drawing G4-315 for DSUB-37 FF pin numbers.

Insight

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FUEL FLOW ADAPTER WIRING DIAGRAM

Insight Avionics Inc.

Box 122, Fort Erie, Ontario L2A 5M6

SIZE	FILE NAME	DRAWING NO.	DRY	CUD	OCD	REV
	ffadapta	101116				A
SCALE	NONE	DATE	15 DEC 2010	SHEET	1	OF 1

Technical Support

If you have difficulty installing or using a G Series system, please read the G series documentation. Every G Series system is shipped with complete instructions for installation and use on a CD. You may also find the same information on our website www.insightavionics.com under Documentation.

The answers to many technical questions can be found in these documents. Insight provides customer support free of charge for as long as you own the instrument. If you have any questions concerning G Series operation do not hesitate to call.

The Customer Service department accepts calls Monday through Friday between 9 am and 5 pm EST. Be sure to have your instrument model number and serial number(s) ready when you call.

GEM Model No. _____

GEM Serial No. _____

Aircraft Type _____

Service Procedures

Like many modern electronic devices, the Graphic Engine Monitor is extremely reliable. Other than initial configuration during installation, the G series requires no adjustment or routine maintenance. The G Series routinely performs a self-test on power-up to test its vital functions. Should the G series fail this test, it will halt on a red screen with a description of the error.

Errors of this nature must be returned to the factory for service.

If the instrument performs the self-test successfully but you feel that the instrument is not functioning as expected discuss the problem with your dealer, or consult the troubleshooting section of the G Series Installation Instructions. Keep in mind that in the vast majority of cases, erratic or unusual G Series operation can be traced to an installation problem, a problem with probes, wiring harness or the aircraft's electrical system.

Due to its reliability and the extensive testing that it undergoes, the instrument itself is the least likely source of trouble. For this reason we strongly encourage you to contact Insight Customer Service at one of the numbers listed below before returning an instrument to the factory, or any time you have any questions concerning the operation of the Graphic Engine Monitor. By contacting us first we may be able to assist you in correcting your problem without the hassle and downtime of sending in an instrument that is not the source of the difficulty.

(905) 871-0733

Web: www.insightavionics.com

E-mail: G3TechSupport@InsightAvionics.com