

CHECK WIRING HARNESS BEFORE INSTALLATION

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

THE GEM SERIES INSTALLATION MANUAL

Graphic Engine Monitors
Models 602, 603, 610, 1200

**READ THESE INSTRUCTIONS COMPLETELY
BEFORE PROCEEDING WITH INSTALLATION**

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DRAWING 8258 VERSION 3.0.1

May 1996

insight
Instrument Corporation

If You Read Nothing Else Read This page!

Follow these recommendations to minimize installation related problems.

Models 602, 603

- BE SURE that the display mounting screws do not penetrate the display face by more than 1/8" inch or you will break the display. Instrument panels come in different thicknesses, so the supplied screws may need to be shortened. Measure the portion of the screw which protrudes from the back side of the panel to be certain.
- BE SURE that the display ground wire has a good low-resistance connection to the engine case. Improper grounding can cause erratic readings or damage the instrument.

ALL Models

- 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.

Warranty policy

The Insight Instrument Corporation's Graphic Engine Monitor temperature display unit is warranted against defects in materials and workmanship for two years from date of purchase.

Insight Instrument Corporation's temperature probes are warranted for one year from date of purchase or 1000 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 these advanced Graphic Engine Monitoring systems. Please read it carefully and completely before starting.

Insight Instrument Corporation's GEM Series of Graphic Engine Monitors provides simultaneous analog (and on some displays, digital) display of engine temperatures for nearly all makes and models of piston-powered aircraft. 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.
- Be sure that all electrical connections are correct and properly made.
- Follow anti-static procedures.

Temperatures are sensed through thermocouple type probes which are installed in the engine (and other areas) for temperature data gathering. These probes are crucial to the proper and accurate operation of the GEM display. Therefore, utmost care must be exercised during installation in the aircraft.

Models 602 and 603 configure themselves automatically for 4 or 6 cylinder engines. The GEM Models 610 and 1200 displays are configured with the Hewlett-Packard Palmtop Computer using Insight's GEMCOM software. The configuration is easily transferred into the 610/1200 Series display using a wireless infrared interface contained within the display and the Palmtop computer. Details about how to configure the 610/1200 are described later.

For a comprehensive description of functions and features, consult the GEM/GEMINI Pilot's Guide.

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.

Installation Planning

- Plan the location of the display such that it is not positioned near any source of high current and is easily visible by the pilot.
- The engine harnesses should be positioned away from sources of high energy, such as ignition harnesses, P-leads, alternator wiring and high frequency radio antennas.
- Some thought about the process and steps needed may save hours of installation time and trouble-shooting.

Tools and Materials Required

- Proper wire stripping and crimping tools
- Trip-free, resettable Circuit breaker &SHY; 1AMP (602,603), 2AMP (610,1200)

INSTALLING THE GRAPHIC ENGINE MONITOR

Installing the Display

Models 602, 603, and 610 displays mount in a 2.25 inch diameter display cutout, while Model 1200 mounts in a 3.125 inch diameter display cut-out. Care should be given to provide sufficient depth allowance for harness and cable routing at the rear of the display. See Drawing #930309 on Page 24 for display outline and hole layout.

Connections to the GEM series displays shall be made in accordance with Drawing No's. 1200-017 and 1200-018 on Pages 22 and 23. Do Not connect the GEM ground wires to both the engine and the airframe.

NOTE: The possible existence of a "double" ground condition should be verified and corrected, particularly if the GEM is a replacement for a previously installed GEM display.

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 on Page 19.

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 EGT probe must be located closer to the flange than recommended, compensating for the resultant higher temperatures is accomplished using the "BAR HEIGHT" adjustment procedure.

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.

See "FLIGHT TESTING THE GEM" on Page 11-12 for details.

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.

Installing The Turbine Inlet Temperature Probes (Models 603, 610, 1200 only)

There are three types of Turbine Inlet Temperature (TIT) probes which can be used with the GEM series systems.

- Clamp-Type TIT Probe (Part number 2871) - is identical to the EGT probe except that the clamp diameter is larger
- Threaded-Type TIT Probe, including a weld-on boss (Part Number 2872)
- Threaded-Type, 1/4" NPT TIT probe (Part Number 2873)

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.

Probe Type 2872 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", on Page 2 and refer to Drawing No. 8254 on Page 19 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.

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 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 Inside Air Temperature Probe (Model 1200 only)

The Inside Air Temperature (IAT) probe must be mounted in a location in which there is free ambient air. Avoid locating the probe adjacent to ventilation ducts, near windows or near the windscreen. Select an area of air circulation, no direct sunlight and where the pilot wants to know cabin temperature.

Refer to Drawing No. 1200-016 on Page 21 for the mounting dimensions and appropriate hole size for drilling purposes.

Mount the IAT probe in the prepared hole and secure the nylon nut, being careful not to overtighten.

Installing The Outside Air Temperature Probe (Models 610 and 1200 only)

The 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. Refer to Drawing No. 1200-016 on Page 21 for the mounting dimensions and appropriate hole size to drill.

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. Mounting the probe near the engine induction air filter will often read well as soon as the engine is started.

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.

Wiring Considerations

The GEM series system is supplied with a factory-assembled wiring harness configured for the specified number of cylinders. The harness edge connector contains a polarization pin which 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 #8255. All the red thermocouple wires should be on one side of the connector.

The GEM series Display 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.

Unlike most other EGT and CHT installations the probe wire length is not critical and may be trimmed to any length as required to fit each probe.

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

CAUTION: Splicing of the thermocouple wire is not recommended.

Display Wiring

Power Connections - All models

The GEM series Display automatically accommodates both 14 and 28 Volt electrical systems.

Connect the "red" power lead to a separate trip-free, re-settable circuit breaker which receives power from the avionics or aircraft bus (1 amp-models 602,603; 2 amp-models 610, 1200).

If an Avionics Master switch exists, power will be removed from the GEM series Display during engine starts and shutdowns. If the aircraft installation does not include an Avionics Master switch circuit or bus, we recommend that one be installed or a separate switch provided to remove power from the Display unit during engine starts.

Grounding - Models 602/603 only

Connect the ground wire directly, and only to the engine case. (No airframe connections).

Grounding - Models 610,1200 only

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

CAUTION: For upgrade installations (GEM 602/603 to 610 and 1200); harness is grounded at the engine block, 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.]

Back-Lighting - Models 610, 1200 only

The gas-plasma display dims automatically with reductions in ambient light. For models 610 and 1200, back-lighting is provided by connection to any aircraft dimmable DC lighting source. The instrument automatically configures itself for 14 or 28V dimming bus voltage. Refer to Drawing No. 1200-017 on Page 22.

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 on Page 19 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 on Page 19.

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 on Page 19

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 on Page 19.

Insulate and bundle as discussed below.

Routing the Wiring Harness

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 fiber-glass 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 which must not be substituted or extended with copper wire.

The power and ground wires are copper and may be extended if necessary.

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.

Connecting and Routing the IAT and OAT Harnesses (Models 610 and 1200 only)

Refer to Drawings 1200-016 and 1200-017, on Pages 21 and 22 for wiring information.

Route the IAT and OAT harnesses (factory-terminated with probe connectors) to the probes, and secure.

Attach the harness connectors to the probes making certain that the connectors engage properly and that the male pins on the probes are undamaged.

Checking The Installation

Verify the power and ground connections before applying aircraft power. Pin 15 on the GEM series Display is aircraft ground and pin S is approximately +14V DC or +28V DC (See Drawing No. 1200-018 on Page 23).

For Models 602, 603, pin 15 must be connected to the engine case.

For Models 610,1200, pin 15 may be connected to the ground bus (airframe ground).

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

Models 610,1200 only

Immediately upon power application the version number of the operating system software will appear in the “Digital Display” window for approximately two seconds. After the version numbers extinguish, the GEM series Display reverts to Monitor Mode operation. Monitor Mode is the default power-on operating mode. EGT and CHT bar graph columns indicate their respective cylinder temperatures, and the temperature currently displayed in the “Digital Display” windows are identified by the illuminated annunciator, EGT, CHT, TIT, OAT, IAT. The selected EGT or CHT cylinder number is indicated by the blanked “Highlight Box”.

All models

The GEM series 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.

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.

CONFIGURING THE GEM (Models 610 and 1200 only)

GEM Software Installation

GEMCOM is Insight's program for communicating with the GEM 610 or GEMINI 1200. It is pre-loaded on the Insight RAM-card included with the Palmtop computer.

CAUTION: Always switch off the HP Palmtop before inserting or removing the RAM-card to protect the contents of the card.

To install GEMCOM into the HP Palmtop, first install batteries and initialize the Palmtop according to the HP User's Manual. Then (switch off the HP) insert the RAM-card, (switch on) and run the built-in HP FILER program (the first blue application key from the left). From the FILER, view the "A:" drive (RAM-card), highlight the "install.bat" file and press ENTER. The install file will copy all necessary files from the RAM-card to the Palmtop's memory. All GEMCOM program and data files will be stored in a directory called "GEM". Remove the RAM-card and store in a safe location for future use.

Automatic Start of GEMCOM

To automatically start GEMCOM first exit any open applications. Then simultaneously press and hold the CTRL, ALT, and DEL keys.

CAUTION: This method of starting GEMCOM "reboots" the Palmtop computer. Rebooting while application programs are running may result in loss of data files!

Return to the HP Palmtop's built-in applications by quitting GEMCOM (select "Q" from GEMCOM's main menu).

NOTE: The reboot method of starting GEMCOM is enabled by use of the Palmtops "autoexec.bat" and "config.sys" operating system files. Altering or removing these files will disable the automatic start of GEMCOM. Consult the Palmtop Users Manual for detailed information.

Manual Start of GEMCOM

GEMCOM can be manually started from within the FILER by highlighting the "GEMCOM.EXE" file, and pressing (ENTER). Selecting "Q" from the GEMCOM Main Menu returns control to the FILER.

Selecting Functions

GEMCOM provides access to the advanced user functions through a standard screen menu system. Functions are selected by pressing the Number Key (NOT the F# function key) corresponding to the desired selection.

Function Menu Selection:

- 1) HELP
- 2) GEM CLOCK
- 3) GEM CONFIG
- 4) EGT BAR HEIGHT
- 5) N/A
- 6) DATA TRANSFER
- 7) DATA LOG CONFIG
- 8) EXPAND FILE
- 9) IR COMM TEST
- Q) QUIT (to SYSTEM MANAGER)

An explanation of each of these functions is available on-line in the HP Palm Top computer by pressing F1 (Help) and selecting the topic.

FLIGHT TESTING AND CALIBRATING THE GEM

(Models 602 and 603 only)

It is essential that the installation be flight tested and calibrated. The Graphic Engine Monitor is pre-calibrated for average aircraft and may require slight adjustment. The goal of calibration is to center the average peak EGT indication around the asterisk when the aircraft is operated at typical altitudes and power settings. It is also important that 12 or more bars indicate when the engine is leaned at the low end of the desired operational power range.

The instrument will thus indicate 1-3 EGT bars during idle, 4-8 bars during takeoff and 12-16 bars when leaned for cruise.

Calibrating the GEM-602

For normally aspirated (non turbocharged) engines the average peak indication should be centered about 1 bar higher than the asterisk at 3,000 ft. Altitude, centered at the asterisk at 6,000 ft., and would be a bar or two below the asterisk at 12,000 ft. The Display may be calibrated with a jeweler's screwdriver through a small adjustment hole below the bezel ring on the front face of the Display. The adjustment hole is intentionally hidden by the Display panel and is accessed by removing the mounting screws and tilting the Display. An access hole may be drilled to allow calibration from the Display panel if desired. Each clockwise turn of the calibration adjustment will increase the reading at cruise power setting about two bars. At idle power settings each clockwise turn will increase the reading about one bar.

Calibrating the GEM-603

Turbocharged engines have little or no altitude sensitivity over most of their operational range so the highest EGT indication should be centered at the asterisk at normal power settings. The GEM-603 is calibrated similarly to the GEM-602, but has a different adjustment mechanism. It has a larger calibration hole above and to the left of the bezel ring. A one tenth inch blade common screwdriver is required for adjustment. The adjustment is actually a continuous rotation ten position rotary switch. Each clockwise click of the calibration adjustment will increase the reading one bar at cruise power setting. This adjustment effects the height of the EGT bars only. The turbine inlet digital display is unaffected and is permanently calibrated at the factory for best accuracy. Once the GEM-603 is set up for a given aircraft no further adjustment is ever required. The adjustment hole is intentionally hidden by the panel and is accessed by removing the mounting screws and tilting the Display. An access hole may be drilled to allow calibration from the panel if desired.

The pilot should consult the GEM Pilot's Guide for details on the use of the Display.

FLIGHT TESTING THE GEM

(Models 610 and 1200 only)

It is essential that the GEM series Display be flight tested. The GEM series Display EGT "BAR HEIGHT" is pre-adjusted at Insight Instrument Corp. It may be necessary to readjust the EGT "BAR HEIGHT" while in flight. The HP Palm Top computer will be required for this adjustment on the GEM 610 and GEMINI 1200.

To perform this adjustment, follow the instructions which are described in Section "CONFIGURING THE GEM ", on Pages 10-11.

The GEM series Display 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 troubleshoot the system.

Observe the EGT function. For normally aspirated (non-turbocharged) engines, the average peak indication, after leaning for cruise, should be around the "Reference Asterisk" when the aircraft is operated at typical altitudes and power settings. It is also important that 12 or more bars indicate when the engine is leaned at the low end of the desired operational power range.

Turbocharged engines have little or no altitude sensitivity over most of their operational range so the highest EGT indication should be centered at the "Reference Asterisk" at normal power settings, after leaning for cruise.

It is normal for the GEM series Display to indicate 1-3 EGT bars during idle, 4-8 bars during takeoff and 12-16 bars when leaned for cruise.

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

Trouble-shooting

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

Symptom: The GEM series Display does not illuminate.

Cause: No ground return at Pin 15, of the "LEFT ENGINE" connector either from the engine blocks or from airframe ground

Symptom: The GEM series Display does not illuminate.

Cause: Voltage is missing at Pin S, of the "LEFT ENGINE" connector from the circuit breaker or bus.

Symptom: One or more columns or segments will not illuminate.

Cause: Try recycling power to check the Display. If all columns do not illuminate, the GEM series Display has been damaged or is inoperative.

Symptom: One or more columns or segments 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.

Symptom: No EGT in one or more columns.

Cause: Errors in harness wiring. Visually check probe connections and polarity. Check for probe continuity at the display connector. The resistance of the lead wire 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 for probe continuity at the display connector. The resistance of the lead wire 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. Swap probes to isolate fault to probe. Swap connections with a known good probe to isolate the fault to the harness, terminal crimp or GEM series Display. If an EGT probe is completely inoperative, the CHT reading will appear as a single bright bar where the dark bar would normally appear.

Symptom: No CHT in one or more columns.

Cause: Faulty probe. Swap probes to isolate fault to probe. Transpose connections with known good probe to isolate the fault to the harness, terminal crimp, or Display.

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: No Columns blink during leaning.

Cause: The EGT "BAR HEIGHT" is too low. (see Flight Testing on Page 11-12 for details).

Symptom: EGT Annunciator will not stay blinking.

Cause: Intermittent probe connections or interference. Check for interference (see Display is unstable). Check for intermittent probe connections (see No EGT and No CHT).

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 (2 or more bars) 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 Display ground and engine block ground with the engine running and the battery charging. If the difference is greater than .2 V DC (models 602,603) or 2 V DC (models 610,1200) with the alternator charging, remove the GEM series 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.

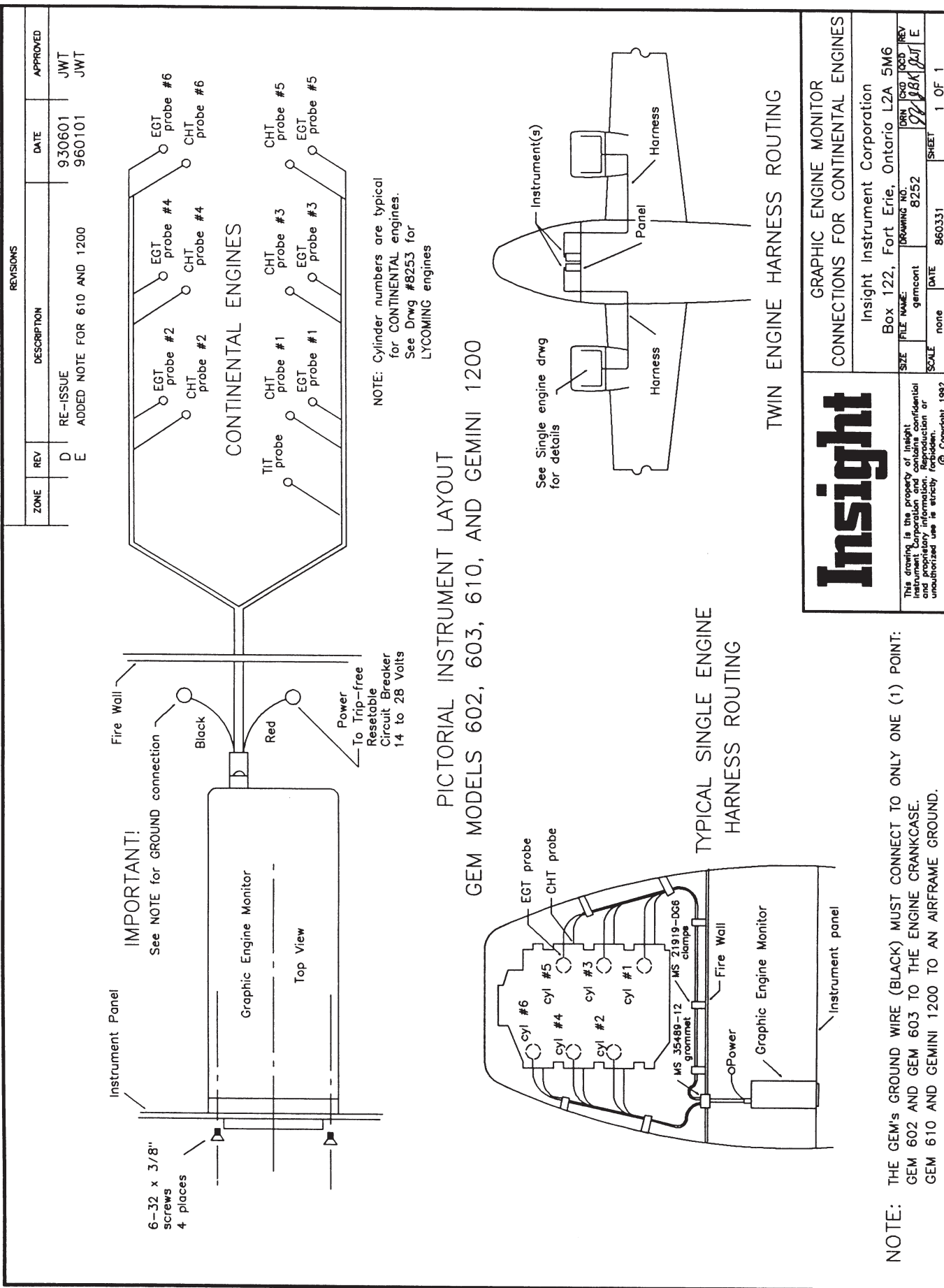
Cause: This can be symptomatic of an intermittent ground fault between engine and air-frame. See "All EGT readings too high".

Symptom: Software version number (ex. "118") shown continuously on Display.

Cause: Problems detected in GEM system during or after self-test. Contact Insight Product Support for service, information or instruction.

Drawings

Drawing No.	Revision #	Title	Date
#8252	E	GEM CONNECTIONS FOR CONTINENTAL ENGINES	860331
#8253	E	GEM CONNECTIONS FOR LYCOMING ENGINES	860331
#8254	B	GEM PROBE CONNECTIONS	860331
#8255	C	GEM WIRING DIAGRAM	860331
#1200-016	B	GEM/GEMINI IAT/OAT PROBE MOUNTING DETAIL	930601
#1200-017	C	GEM/GEMINI DB15 INTERCONNECT DIAGRAM	921201
#1200-018	C	GEM/GEMINI WIRING DIAGRAM	921204
#930309	B	GEM/GEMINI DISPLAY OUTLINES Appendix	031114



REVISIONS			DATE	APPROVED
ZONE	REV	DESCRIPTION		
	D	RE-ISSUE	930601	JWT
	E	ADDED NOTE FOR 610 AND 1200	960101	JWT

NOTE: Cylinder numbers are typical for CONTINENTAL engines. See Drwg #8253 for LYCOMING engines

PICTORIAL INSTRUMENT LAYOUT
 GEM MODELS 602, 603, 610, AND GEMINI 1200

TYPICAL SINGLE ENGINE
 HARNESS ROUTING

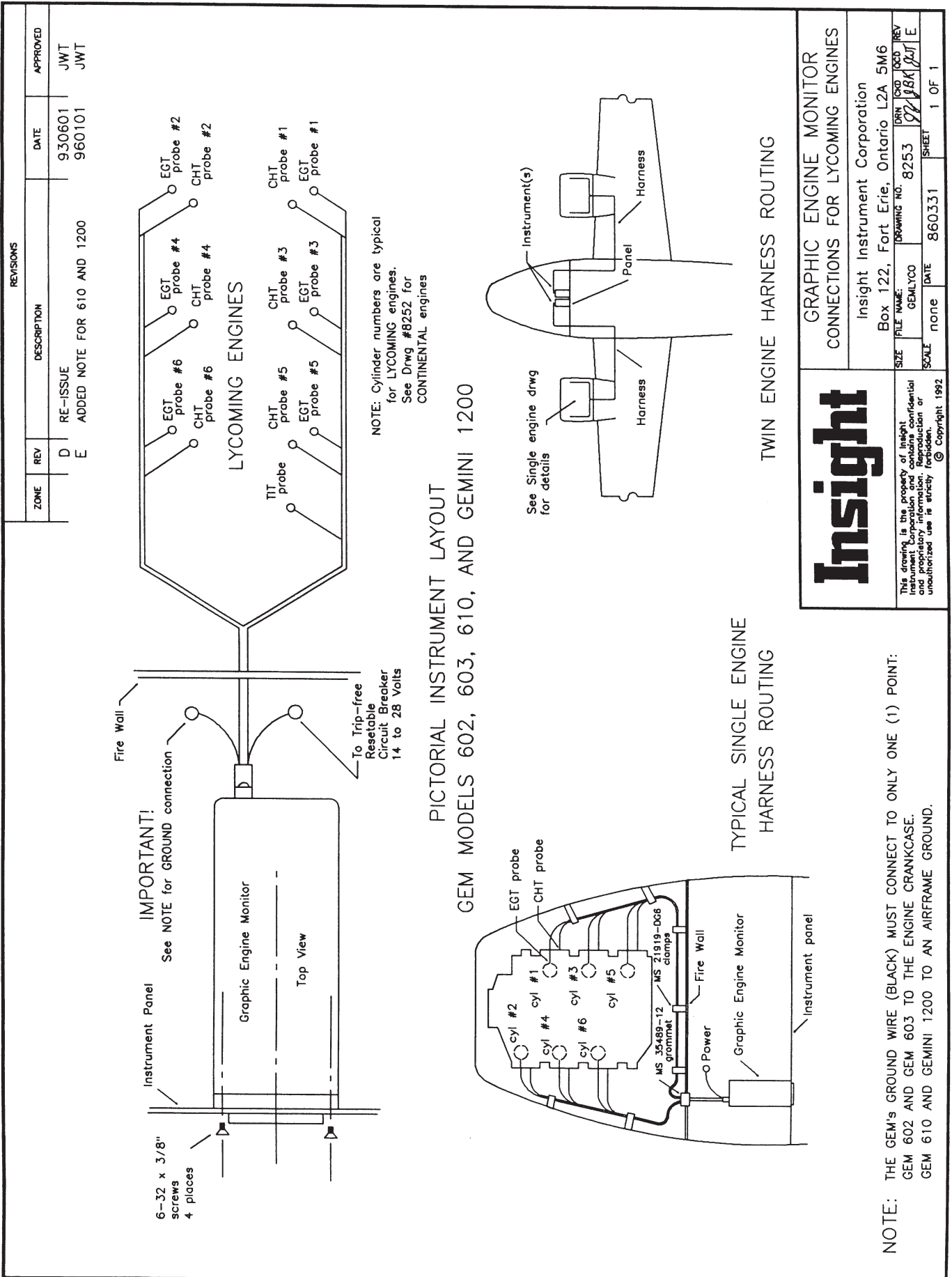
TWIN ENGINE HARNESS ROUTING

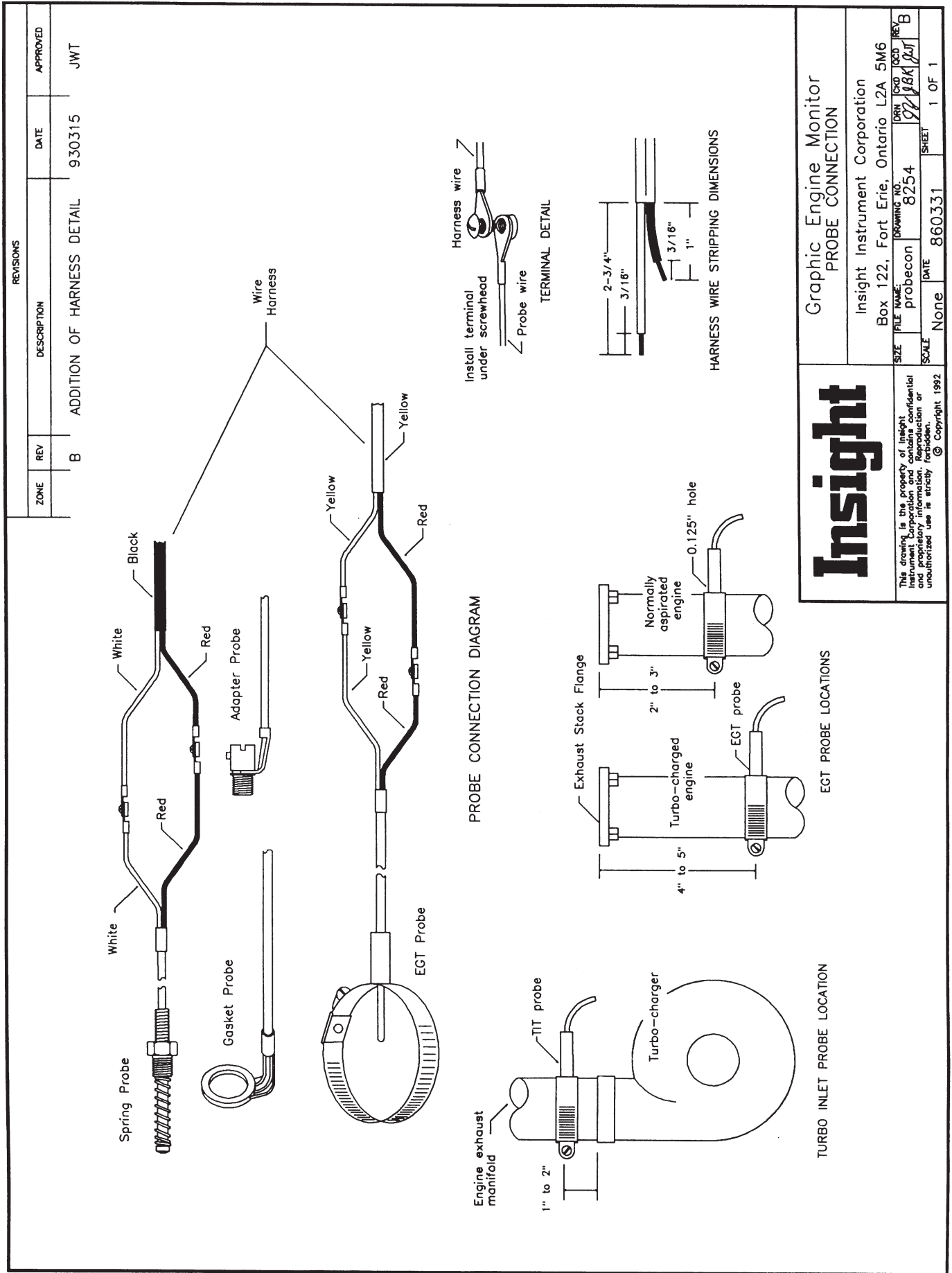
Insight

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GRAPHIC ENGINE MONITOR CONNECTIONS FOR CONTINENTAL ENGINES	
Insight Instrument Corporation Box 122, Fort Erie, Ontario L2A 5M6	
SIZE	DRAWING NO. 8252
FILE NAME: gemcont	DRW (CWD) JCB:REV
SCALE none	DATE 9/2/88 JJK/JWT/E
SHEET 1 OF 1	

NOTE: THE GEM's GROUND WIRE (BLACK) MUST CONNECT TO ONLY ONE (1) POINT: GEM 602 AND GEM 603 TO THE ENGINE CRANKCASE. GEM 610 AND GEMINI 1200 TO AN AIRFRAME GROUND.



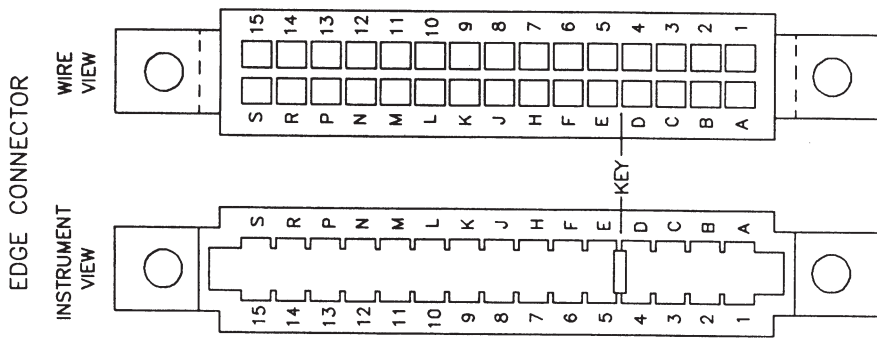


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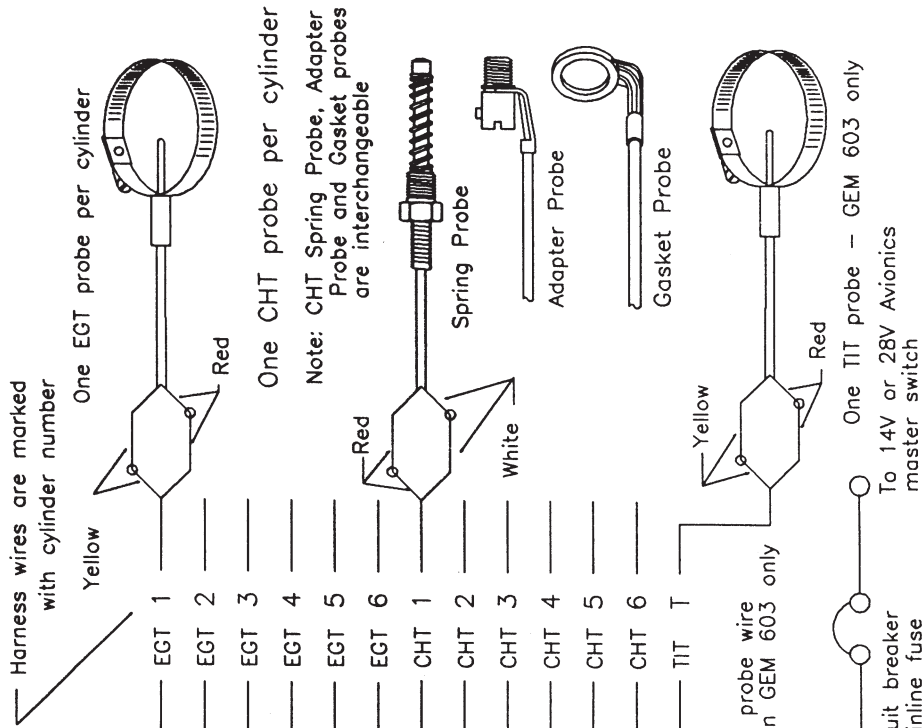
Graphic Engine Monitor PROBE CONNECTION	
Insight Instrument Corporation Box 122, Fort Erie, Ontario L2A 5M6	
FILE NAME: probecon	DRAWING NO. 8254
SCALE: None	DATE: None
SHEET: 1	OF 1

REVISIONS		DATE	APPROVED
ZONE	REV	DESCRIPTION	
	C	REVISED FOR CLARITY	960101
			JWT



CONNECTOR

- | | | |
|---|---------------|--------------|
| A | No Connection | Sheath color |
| B | 1 — Yellow | Yellow |
| C | 2 — Red | Yellow |
| D | 3 — Yellow | Yellow |
| E | 4 — Red | Yellow |
| F | 5 — Yellow | Yellow |
| G | 6 — Red | Yellow |
| H | 7 — Yellow | Yellow |
| J | 8 — Red | Black |
| K | 9 — White | Black |
| L | 10 — Red | Black |
| M | 11 — White | Black |
| N | 12 — Red | Black |
| P | 13 — White | Black |
| R | 14 — Red | Yellow |
| S | 15 — Red | Black |



Harness wires are marked with cylinder number

Yellow

Sheath color

CONNECTOR

EDGE CONNECTOR

WIRE VIEW

INSTRUMENT VIEW

KEY

One EGT probe per cylinder

Yellow

Sheath color

CONNECTOR

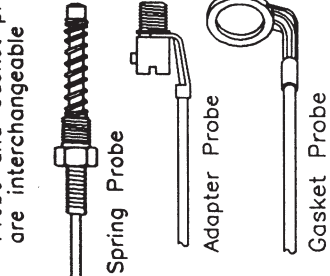
EDGE CONNECTOR

WIRE VIEW

INSTRUMENT VIEW

KEY

One CHT probe per cylinder
 Note: CHT Spring Probe, Adapter Probe and Gasket probes are interchangeable



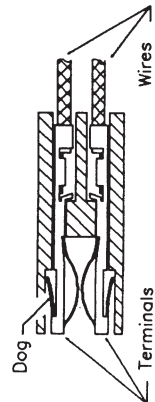
Engine Block Ground

1 Amp circuit breaker or inline fuse

Note: 'T' probe wire on GEM 603 only

One TIT probe — GEM 603 only
 To 14V or 28V Avionics master switch

CROSS-SECTION



Note: Omit probe wires for cylinders 5 & 6 on 4 cylinder engines.

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GEM 602 / GEM 603
 WIRING DIAGRAM

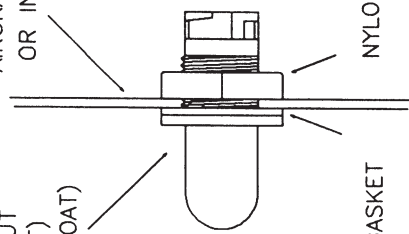
Insight Instrument Corporation
 Box 122, Fort Erie, Ontario L2A 5M6

SIZE	FILE NAME	DRAWING NO.	DRN	ISO	DOC	REV
	GEMWIRE	8255	92	188	1	C
SCALE	None	DATE	860331	SHEET	1	OF 1

INSTRUMENT WIRING DIAGRAM

REVISIONS			
ZONE	REV	DESCRIPTION	DATE
	A	ADDED P/N 1200-021	930601
	B	ADDED NOTES	960101

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



RECOMMENDED MOUNTING CUT-OUT

0.430 DIA
±0.003

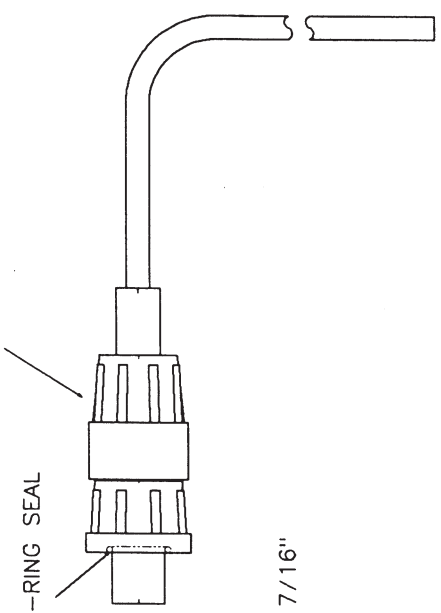
AIRCRAFT EXTERIOR SKIN (OAT) OR INTERIOR TRIM (IAT)

RUBBER O-RING SEAL

SENSOR CABLE ASSEMBLY P/N 1200-015

NYLON HEX NUT 7/16"

RUBBER GASKET

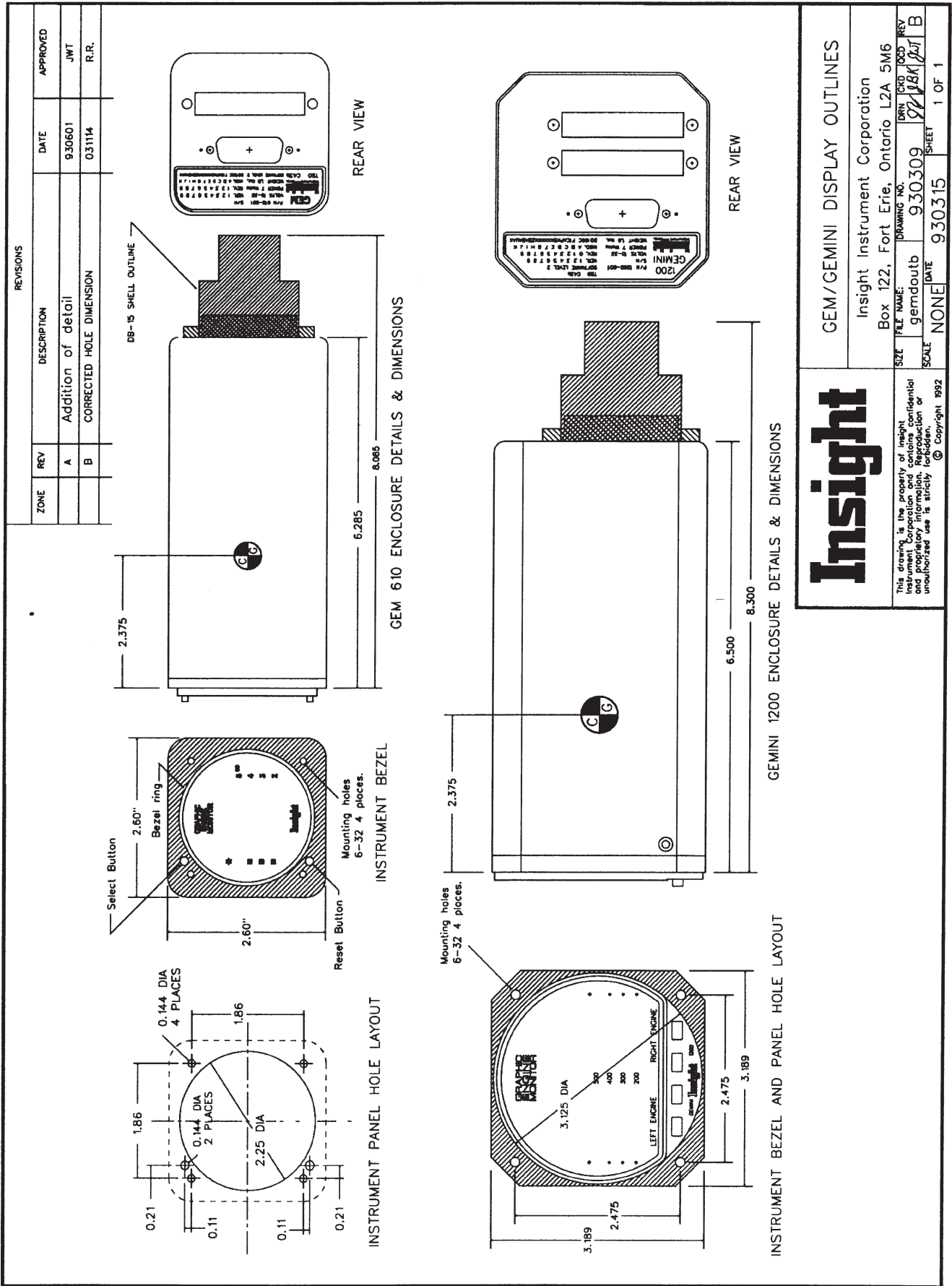


SEE DB15 CONNECTOR INTERCONNECTION DWG. NO. 1200-017 FOR WIRING DETAILS

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.

<p>OUTSIDE AIR TEMPERATURE / INSIDE AIR TEMPERATURE PROBE MOUNTING DETAIL</p>	<p>Insight Instrument Corporation Box 122, Fort Erie, Ontario L2A 5M6</p>
<p>FILE NAME: OATINST 1200-016</p>	<p>DRN: [initials] DCD: [initials] REV: [initials]</p>
<p>SCALE: none</p>	<p>DATE: 930601 SHEET: 1 OF 1</p>



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GEM/GEMINI DISPLAY OUTLINES

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

DRAWING NO.	930309	DATE	NONE	SHEET	1 OF 1
FILE NAME:	gemdoutb	DRN: (C)D (O)D (R)V		SCALE	

APPENDIX

WEIGHT and BALANCE DATA

Quantity	Description	Weight	
		Oz.	Gms.
1	Display Unit GEM 602 or 603	12.0	345
1	Display Unit GEM 610	14.5	411
1	Display Unit GEMINI 1200	16.0	457
6	EGT Clamp Probes	8.4	240
6	CHT Spring Probes	4.8	150
5	CHT Spring Probes	4.0	125
6	CHT Gasket Probes	3.6	108
1	CHT Spring Probes	0.6	17
1	Adapter Probe	0.6	17
1	8 Ft. Wiring Harness	11.0	302
1	24 Ft. Wiring Harness	31.0	876
1	IAT/OAT Probe	3.5	99

If you have difficulty installing or using a GEM system, please read the GEM's documentation. Every GEM system is shipped with complete instructions for installation and use. The answers to many technical questions can be found in this booklet, or the GEM Installation Manual. Insight provides customer support free of charge for as long as you own the instrument. If you have any questions concerning GEM 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 _____

HPLX Technical Support

Answers to questions about the use of the HPLX's built-in applications (FILER, 123 Spreadsheet, etc.) are found in the HPLX User's Guide and HPLX Quick Start Guide. Telephone numbers for Hewlett-Packard are in the HPLX's manuals.

Educational Video

To assist our customers in installing and using GEMs, Insight has produced an educational video CD entitled Modern Engine Management-. Our video is available free of charge. Call or write to obtain your personal copy of this classic production.

Service Procedures

Like many modern electronic devices, the Graphic Engine Monitor is extremely reliable. Other than configuration during installation, the GEM requires no adjustment or routine maintenance. Should you suspect a malfunction, perform the self-test described under Test Mode. If the GEM fails this test, it must be returned to the factory for service. If the instrument performs the self-test successfully, discuss the problem with your dealer, or consult the troubleshooting section of the GEM Installation Instructions. Keep in mind that in the vast majority of cases, erratic or unusual GEM operation can be traced to an installation problem, a problem with probes, wiring harness or the aircraft's electrical system. The instrument itself is the least likely source of trouble. For this reason we 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.

Technical Support Contact Phone Numbers:

(905) 871-0733

Web: www.insightavionics.com