



FAA APPROVED INSTALLATION MANUAL FOR THE EGT-701 Report 103

INSTALLING THE EGT-701 SCANNER®

1/20/09

Rev-E

THE OWNER OF THIS EDM-700/800/730/830
MUST KEEP THIS MANUAL

TABLE OF CONTENTS

	Page
1) INSTALLING THE INDICATOR	3
2) EXHAUST GAS TEMPERATURE PROBE	3
3) TURBINE INLET TEMPERATURE PROBE	3
4) CYLINDER HEAD TEMPERATURE PROBE	4
5) SPARK PLUG GASKET CHT PROBE	4
6) INDUCTION AIR TEMPERATURE PROBE	4
7) OIL TEMPERATURE PROBE	5
8) OIL PRESSURE TRANSDUCER	7
9) OUTSIDE AIR TEMPERATURE PROBE	7
10) FUEL FLOW OPTION	8
11) WIRING	9
12) EGT AND CHT PROBE WIRING	9
13) ROUTING THE WIRING HARNESS	11
14) MANIFOLD PRESSURE INSTALLATION & CALIBRATION	12
15) RPM SENSOR INSTALLATION	13
16) OPERATING INSTRUCTIONS	14
17) INDICATOR INSTALLATION & RECORD	16
18) ENGINE OPERATION	16
19) LIMITATIONS & OPERATION	16
20) COMPONENT PARTS LIST FOR EGT PROBE	17
21) COMPONENT PARTS LIST FOR CHT PROBE	17
22) COMPONENT PARTS LIST FOR OIL PROBE	17
23) COMPONENT PARTS LIST FOR OAT PROBE	17
24) COMPONENT PARTS LIST FOR MANIFOLD PRESSURE	17
25) COMPONENT PARTS LIST FOR RPM	17
26) COMPONENT PARTS LIST FOR SINGLE ENGINE EGT/CHT	17
27) WEIGHT AND BALANCE DATA	17
28) CHANGING PROGRAMMED LIMITS	18
29) TROUBLE-SHOOTING	20
FIG-1 INSTRUMENT BEZEL TEMPLATE	22
FIG-2 EGT/CHT/TIT PROBE PLACEMENT	23
FIG-3 EGT PROBE INSTALLATION	24
FIG-6 EGT/CHT PICTORIAL LAYOUT	25
FIG-7 WIRING DIAGRAM DRAWING 300701	26
FIG-9 DRAWING 700744 FUEL FLOW WIRING	27
INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA)	28

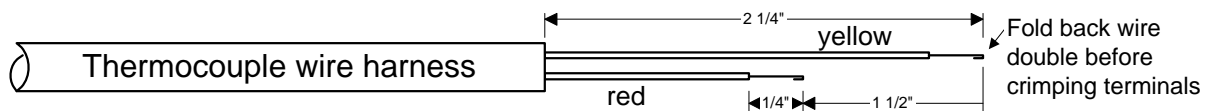
J.P.INSTRUMENTS Inc.
PO BOX 7033
HUNTINGTON BEACH CA 92646

FAA APPROVED 1/20/09

READ THIS FIRST

The following notes apply to a new installation. **Read this section before proceeding.**

- a) The JPI warranty found in the back of the pilots guide clearly states that JPI will replace defective parts under warranty, **but does NOT cover labor to remove or install any parts.**
- b) To prevent damage to the display **it is essential that the four mounting screws not penetrate the instrument more than 0.12 inches.** Damage caused by screw penetration is not covered under warranty.
- c) You must be an FAA certified aircraft mechanic to install this instrument.
- d) Check that any necessary FAA approvals (STC's, etc) are available for the aircraft before beginning the installation.
- e) The most common cause of probe problems is poor terminal crimps. Crimp ring terminals with AMP part 45518 crimp tool or equivalent. **Fold back the wire double before crimping terminals.**



- f) This installation will require some parts unique to your aircraft that are not supplied with the kit, (including but not limited to tie-wraps, hoses and fittings). Acquire all the necessary parts prior to beginning the installation.
- g) Do NOT use aluminum fittings with the FXT-201 or FXT-231 fuel flow transducer.
- h) Write down the K-factor engraved on the side of the fuel flow transducer here _____. Once the transducer is installed and covered with the fire sleeve, you will not be able to access this K factor.
- i) Determine the locations of all holes before drilling to ensure that nothing interferes with the probe, clamp, clamp screw or wire.
- j) Provide service loops at the instrument.
- k) Thermocouple wire length is not critical. Trim to required length, allowing for service loops at the engine so that probes can be swapped with probes on adjacent cylinders for troubleshooting purposes.
- l) Dress all wires away from high temperature components such as exhaust stacks.
- m) Never splice thermocouple wire using copper wire. Use only K-type thermocouple wire. Solder using zinc chloride flux such as Nokorode brand – rosin flux alone won't work.
- n) Observe correct polarity on all probe wires. Connect like colors together (red to red, yellow to yellow).
- o) **This instrument must be grounded at the engine**, not at the avionics ground.
- p) If a spark plug gasket probe is used, expect the CHT reading on that cylinder to be somewhat higher than on the cylinders with bayonet probes. At additional cost an adapter probe (bayonet or screw-in) is available that permits the factory CHT probe and the JPI probe to be placed in the same bayonet location.

1) INSTALLING THE INDICATOR Installation

Should Be Done In Accordance With Advisory Circular AC43.13-1A. All Models have the same basic Part No. EGT-701 ().

EDM-700/800 Model :A steel template supplied with the installation kit is used as a guide for drilling two button holes in the instrument panel. Align and **Mount** the Template into the instrument panel hole. First drilling a 0.125 hole. Remove the template and check the instrument alignment, if OK re-drill with a 0.147 drill. Buttons can be removed by pulling off. The EGT-701 mounts in a standard 2.25" or 3 1/8" instrument hole. The instrument **configures itself automatically** for 4 to 9 cylinders, 14/28 volt aircraft. The instrument is 7.5" deep less connectors and is 2.6 square behind the panel.

TO PREVENT DISPLAY DAMAGE IT IS ESSENTIAL THAT THE FOUR MOUNTING SCREWS NOT PENETRATE THE INSTRUMENT MORE THAN .12 INCHES.

DAMAGE OF THIS NATURE IS NOT COVERED UNDER WARRANTY.

EDM-730/830 Model: Mounts in a standard 3.1/8" instrument hole. First place the mounting bracket on the instrument and tighten the clamp hex screw until you can just remove the instrument from the bracket. The Mounting bracket is then placed behind the instrument panel hole and screwed (6-32 x 1/2" screws) in place using the existing holes. Three screws should be used leaving one hole vacant on either side of the hex screw. Locate the hex screw in a location that you can easily get to from the rear of the panel. The body of the instrument is 3.0 inches and 2.0 inches deep less connectors. The body of the instrument is 3.0 inches and 2.0 inches deep less connectors.

2) EXHAUST GAS TEMPERATURE PROBE (EGT)

The Model M-111 Probe will fit any existing holes in the exhaust stack in any engine having the diameter of 1/8" to 1/4". If no hole exists, it will require the drilling of a 1/8" diameter hole and ream to fit. It is important that each probe be mounted a **uniform** distance from the exhaust stack flange. A nominal distance of 2 to 4 inches from the exhaust flange is recommended. (See fig-2). If the recommended distance is impractical because of obstructions, slip joints or bends in the exhaust system then position the probes a uniform distance from the flange as space permits. Be certain to locate all holes **BEFORE** drilling to ensure that nothing interferes with the probe, clamp, clamp screw or wire. Careful matching of probe position will provide best temperature readings. Insert the probe in the exhaust or previously drilled hole (see fig-3) so that the tip of the probe is in the center of the exhaust stream. Tighten the stainless steel clamp to a torque of 45 in/Lbs. Cut off the excess strap close to the screw. Probe warranty is void if mounted in a slip-joint of any kind.

RADIAL ENGINES , EGT

Radial engine exhaust, require a larger EGT clamp (supplied) to fit the 2.5 inch exhaust pipe. The EGT probe is installed in the same fashion as a Lycoming or Continental engine and should be placed between the exhaust pipe flange and the accumulator at a distance of 2 to 3 inches from the engine exhaust flange. Cylinder head temperatures are measured with a spark plug gasket type probe placed under the front sparkplugs. Refer to the engine manufactures red line and set the EDM-700 appropriately. Front spark plugs will read 15 to 20 degrees cooler than the rear plugs. Do not route the EGT/CHT harness in with the ignition harness. Do not extend the yellow thermocouple leads with copper wire.

3) TURBINE INLET TEMPERATURE PROBE (TIT)

The standard TIT probe P/N M-111 with a special clamp is placed in the exhaust stack accumulator to a **maximum** depth of 1/2 inch and approximately four (4) inches from the Turbine inlet if possible, on the wastgate side of the turbine. TIT will appear as the seventh column "T" and the expression "1650 TIT" will be seen when the dot is in place over it. The EDM-700 input is also compatible with the aircraft's factory TIT and may be piggy backed.

The EDM-700 TIT cable may be connected in parallel (piggyback) at the TIT probe (preferred), or at the ship's TIT gage. Check the TIT readings between the EDM and the ships TIT gage in flight, then do the following calibration procedure. (This may be done in flight or on the ground.)

INSTALLING THE EGT-701 SCANNER®

1/20/09

Rev-E

Page 4 of 30

Press & hold 'STEP' and 'LF' keys simultaneously until you see 'PROGRAM' and 'RATE 4'. (Note: Bargraph disappears)

Now press & hold 'STEP' and 'LF' simultaneously again until you see 'ORIG. TIT' and 'ORIG. T-N'.

Tap 'LF' once to change to 'ORIG. T-Y'.

Tap 'STEP' once to display 'CAL TIT' and 'TIT+ 0'.

This is the correction added to (+), or subtracted from (-) the EDM reading for TIT (at high temperatures).

Hold in 'LF' to raise the correction, or tap 'LF' to lower it.

For example, if the EDM read 100 less than the ship's TIT, Then hold in 'LF' until you see 'TIT+100'.

Adjust the correction slightly if a difference between the EDM and the ship's gage still exists.

Now tap 'STEP' once to complete setup.

4) CYLINDER HEAD TEMPERATURE PROBE (CHT), BAYONET

The Bayonet probe 5050 has the 3/8-24 adaptor boss as part of the probe and is screwed into the base of the cylinder (See fig-2). The bayonet probe has a screwdriver slot to facilitate tightening.

NOTE: Required original equipment that has a Red Line may not be replaced by the EGT-701 TIT or CHT installation. This includes but is not limited to all aircraft with adjustable cowl flaps and on aircraft with placards on the instrument panel showing a climb air speed, for cooling, different from the best rate of climb air speed.

If a previously installed TIT, CHT or EGT is listed on the aircraft equipment list as Optional Equipment or not listed at all, it may be replaced by the EGT/CHT SCANNER.

5) CYLINDER HEAD TEMPERATURE PROBE (CHT) SPARK PLUG GASKET

Most factory installed cylinder head temperature gauges utilize a **bayonet** or **screw-in** resistive type probe that occupies one of the bayonet sockets. This probe is not compatible with the thermocouple probes required for the EGT-701.

The spark plug gasket probe, P/N MM-113, replaces the standard copper spark plug gasket on one spark plug. The plug chosen, upper or lower, should be the one that provides the best correlation with the other temperature probes. Due to the spark plug location, the gasket probe may read 25°F higher or lower than the factory probe. The probe is usually placed on the plug that receives the most direct cooling air. After many removals the probe may be annealed for re-use. Heat and quench in water. At additional cost an adapter probe P/N MM-113-3/8 is available that permits the factory CHT probe and a JPI probe to fit the same bayonet location.

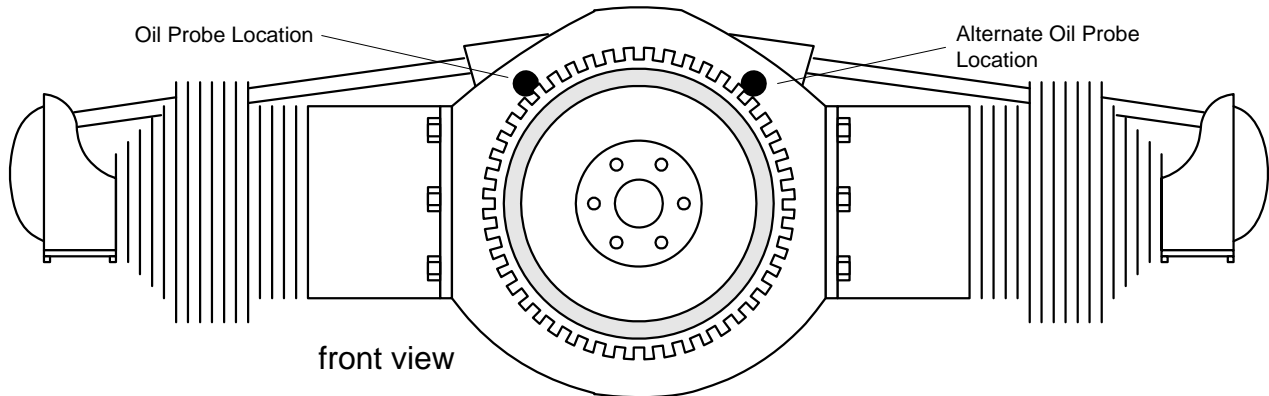
6) INDUCTION AIR TEMPERATURE PROBE (IAT) / CARB TEMP.

Induction Air temperature probe, IAT, is installed just after the inter-cooler (OUT) and the Compressor Discharge Temp (CDT) just before the inter-cooler (IN). The probe is an EGT probe and installed the same way as an EGT probe. A large clamp is supplied to fit around the airport leaving the inter-cooler or a 1/8 NPT is available. IAT option is displayed as an independent digital temperature like "125 IAT". On non-turbo engines the IAT in reality is the Carburetor temperature and displayed as "34 CRB".

7) OIL TEMPERATURE PROBE

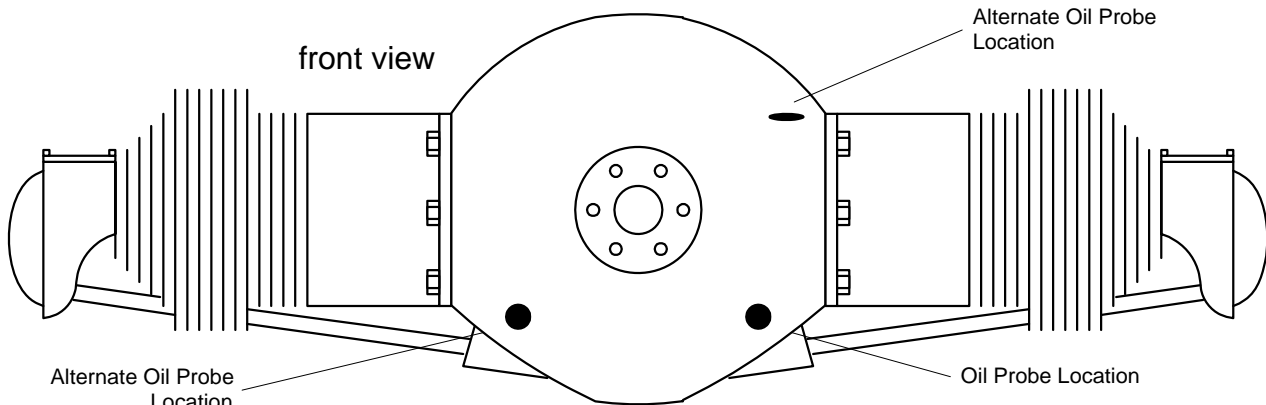
The Oil Temperature Probe PN 400505-C or 400505-L is installed as a supplemental oil temperature indicator.

Lycoming Engines: The -L part number is for all Lycoming direct drive engines and is installed in the *right* (passenger side) front oil galley by removing the existing 1/8 NPT plug on the passenger side of the engine and inserting the optional JPI oil probe supplied with the kit. Oil temperature will be displayed as an independent temperature like "230 OIL" and will be displayed in the seventh column automatically if TIT is not available. The original oil temperature gauge and sensor must remain. Check for oil leaks and safety wire before first flight.



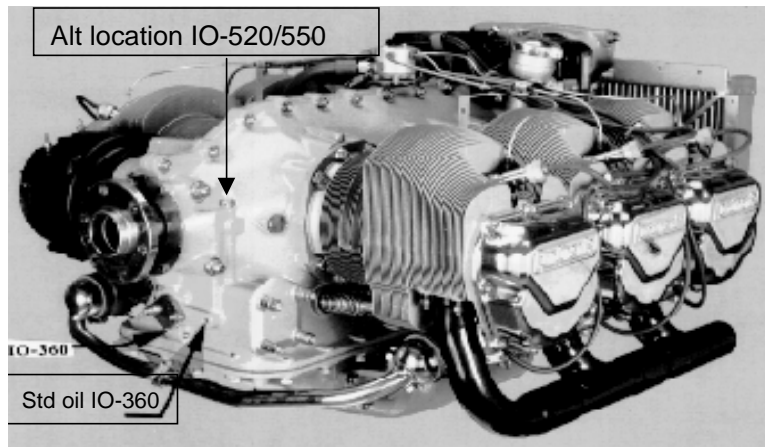
Lycoming Engines

Continental Engines: The -C part number is for all Continental direct drive engines and is installed in the *left* (pilot side) front oil galley by removing the existing 3/8 or 1/8 inch NPT plug (see figure below) located on the front, pilots side of the engine. Insert the optional JPI oil probe supplied in the kit. For 3/8 inch NPT installations, use the supplied brass adapter. An alternate location is on the top, front of the engine on the pilot's side, where the probe is inserted vertically. There are two 1/8 NPT plugs close together. Install the probe in the position that is above and to the rear of the nearby position.

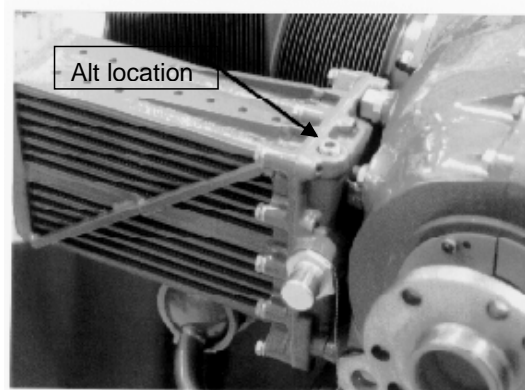


Continental Engines

Continental Engines Oil probe location



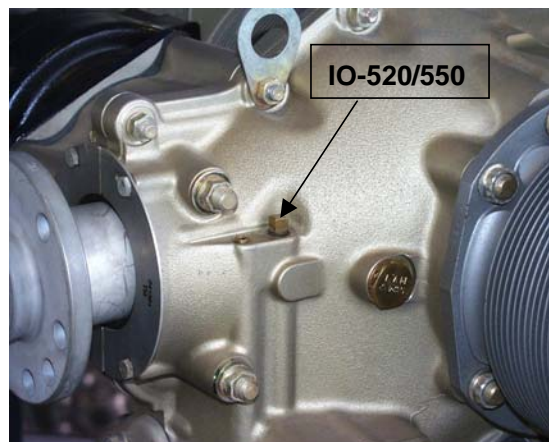
IO-360



O-470

Requires ¼ NPT to 1/8 NPT reducer Oil reports after thermostat opens

Alternate Oil Location

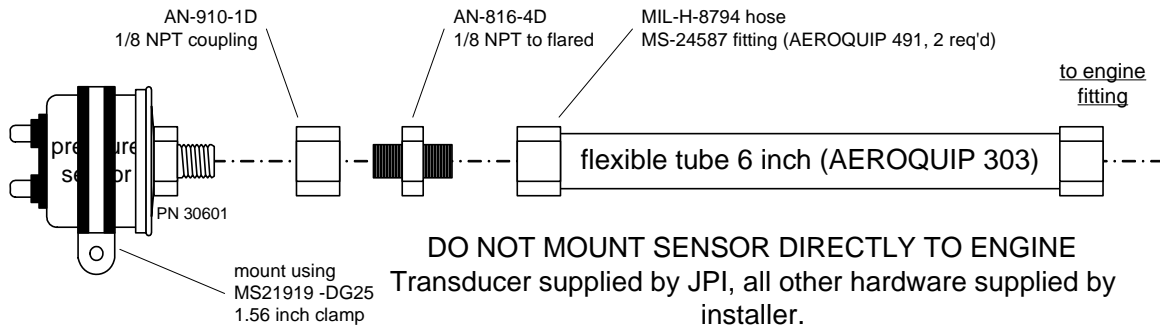


IO-520/550

The oil probe P/N 400505-C is installed by removing the 3/8 or 1/8 pipe plug located on the front of the engine inline with the push rods. This oil galley feeds the valve lifters. Insert the JPI 1/8 NPT probe supplied with the kit. Check for leaks after installation. Due to cowling restrictions the alternate oil location may be chosen. The probe leads are routed back to the cockpit along with the EGT wires. Do not install the Oil Probe in the rear of the engine near the vernatherm (oil temperature regulator).

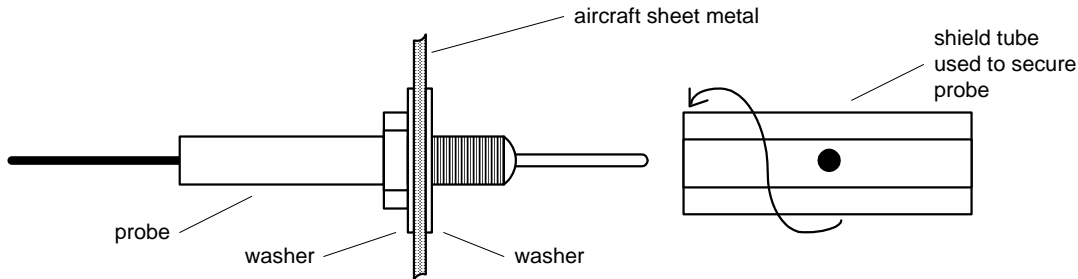
8) Oil Pressure Sensor Installation

Use the J3 connector harness 790420 labeled OIL-P for a VDO pressure sensor (shown in diagram below). Oil pressure sensor mounts using an aluminum clamp MS21919. Mount to firewall or tie wrap to existing wiring bundle. Mount the pressure sensor to the pressure line using a flexible hose and fittings (not supplied) as depicted in the drawing below. Use aluminum clamp to mount the pressure sensor to firewall. Do not mount the sensor directly to the engine. Connect the other end of the hose to the engine manufacturer's recommended location for engine oil pressure. An alternate method of installation is to install a T-fitting (not supplied) in the aircraft's oil pressure gage line in the cockpit near the oil pressure gage. There is no polarity on the oil pressure transducer wires.



9) OUTSIDE AIR TEMPERATURE PROBE, OAT

Install the OAT probe, P/N 400510 in the airframe manufacturer's recommended location. If this is not possible, it is recommended that the OAT probe be placed in clean airflow such as in a cabin air scoop or below the underside of the wing away from engine heat or exhaust. In this case it is recommended that the installation be done similar to the antenna installation instructions of AC 43.12-2a "Acceptable Methods, Techniques and Practices". The outside aluminum tube is used to both hold the probe in place and shield it from radiated heat. OAT option is displayed as an independent digital temperature like "75 OAT". Be sure that when testing the OAT it is not in direct sun and the engine is running.



10) FUEL FLOW OPTION

The EGT-701 receives signal from any installed Flowscan Transducer of the following Flowscan P/N's embossed on to the top of the transducer. The K-Factor is engraved on the side of the Transducer. Wire per drawing 700744, Route the JPI wires along the existing wiring bundle lacing every foot.

Flowscan Instruments, Seattle WA 98106

FlowScan PN	Shadin equivalent PN
201-A	
201-B	680501/680600
201-C	
231	680503

Install the function switch in the panel per drawing 700124.

Select the appropriate installation configuration from the three following fuel system categories:

<input type="checkbox"/> For gravity feed systems without a fuel pump	use transducer FXT-231 (yellow plastic top). Connect the transducer between the fuel tank and carburetor.
<input type="checkbox"/> For pump feed or fuel injected systems without vapor return lines	use transducer FXT-201 (black plastic top). Connect the transducer between the engine driven pump and servo/throttle body or carburetor.
<input type="checkbox"/> For all fuel injected engines with vapor return lines to the fuel tank before the servo/throttle.	use transducer FXT-201 (black plastic top). Connect the transducer between the throttle body and the fuel flow divider.

The transducer output port should be mounted lower or level with the carburetor inlet port (or fuel servo on a fuel injected engine). If this is not possible, an anti-siphon loop should be put in the fuel line between the fuel flow transducer and the carburetor or fuel servo.

Find a convenient location within 8 inches of a hose support or fitting to suspend the fuel flow transducer. Mount it away from any hot exhaust pipes. The hose support or fitting may be on the input or output line of the fuel flow transducer.

Secure the end of the transducer to any convenient point on the engine with MS21919

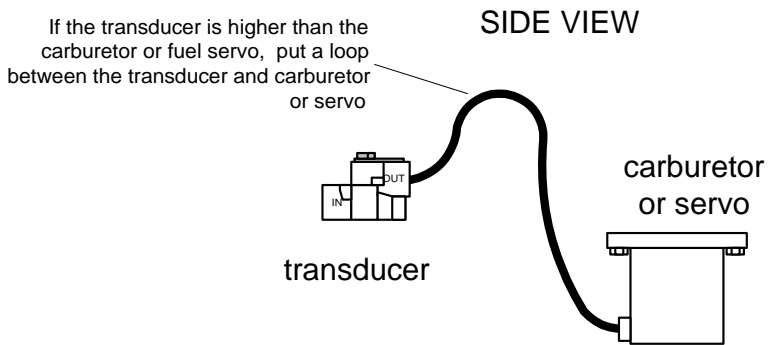
clamps or equivalent. **Do not place an angled elbow joint immediately prior to the input port of the fuel flow transducer.** There should be two

inches of straight flow immediately before the transducer input port.

For a **carbureted** engine: remove the fuel hose which connects the carburetor to the fuel tank. Purchase two new hoses — one to connect the carburetor to the fuel flow transducer, and the other to connect the fuel flow transducer to the fuel tank. Before connecting the fuel hose to the carburetor, verify that the boost pump delivers at least 125 percent of takeoff fuel flow at minimum fuel pressure as marked on the fuel pressure gage.

For a **pump-fed carbureted or fuel injected engine without vapor return** lines: remove the fuel hose which connects the engine-driven pump and the servo/throttle body or the carburetor. Purchase two new hoses one to connect the engine-driven pump to the fuel flow transducer, and the other to connect the fuel flow transducer to the servo/throttle body or the carburetor.

For a **fuel injected engine with vapor return** lines before the servo/throttle: remove the fuel hose which connects the throttle body and the flow divider. Purchase two new hoses one to connect the throttle body to the fuel flow transducer, and the other to connect the fuel flow transducer to the flow divider. For Continental fuel injected engines adjust the fuel pressure to account for the pressure drop across the transducer per Continental Service Bulletin M89-10.



INSTALLING THE EGT-701 SCANNER®

1/20/09 Rev-E Page 9 of 30

There must be flexible hose into and out of the fuel flow transducer. The hoses must meet TSO-C53a type C or D FAA specification. The new hoses must be the same size as the current hose in the aircraft. The fuel flow transducer must be wrapped with fire sleeving. Cut a 1 inch slit in the center of the fire sleeve and pass the transducer connector and cable through it. Seal with high temperature silicone RTV sealant.

The placard **“Do not rely on fuel flow instrument to determine fuel levels in tanks”** must be mounted on the aircraft instrument panel near the EGT-701. If the aircraft is equipped with a primary fuel flow instrument, the following placard must be mounted on the aircraft instrument panel near the EGT-701 **“Refer to original fuel flow instrumentation for primary information.”**

11) WIRING (12 / 24 volt)

The EGT-701 automatically accommodates both 14 and 28 volt electrical systems. Connect the power lead (red) to a separate 5 amp circuit breaker (or 2 amp slow blow in-line fuse) connected to the avionics power buss. The avionics master switch will then be used to turn off the instrument during engine start-up. The EDM-700 has a 10-second warm-up. If the panel lacks an avionics master switch we recommend that one be installed or a circuit breaker switch be provided to turn off the EGT-701 during engine start-up. If the voltage fall below 9.8 vdc the instrument will turn off automatically. The Instrument should be **grounded at the engine**. No connection to the aircraft dimmer system is required because the instrument dims automatically with reductions in ambient light.

12) EGT and CHT Probe Wiring

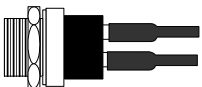
The EGT-701 is supplied with special Teflon insulated Chromel Alumel factory assembled wiring harness configured for the correct number of cylinders. The wire harness is marked E-1= EGT-1, C-1= CHT-1, etc. TIT is marked “T”, Oil I = “O” and OAT = “A”. For retrofits of the EGT-100 SCANNER or bar graph instruments, where only the indicators are being exchanged, the old harness wires need to be pinned with AMP P/N 665049 and fitted into AMP D-SUB connector P/N 205207-1 with hood per drawing 300701 fig-6 or connected directly via an adapter connector.

NOTE: Unlike most other EGT & CHT installations the probe wire length is not critical and should be trimmed to any length as required for a clean installation.

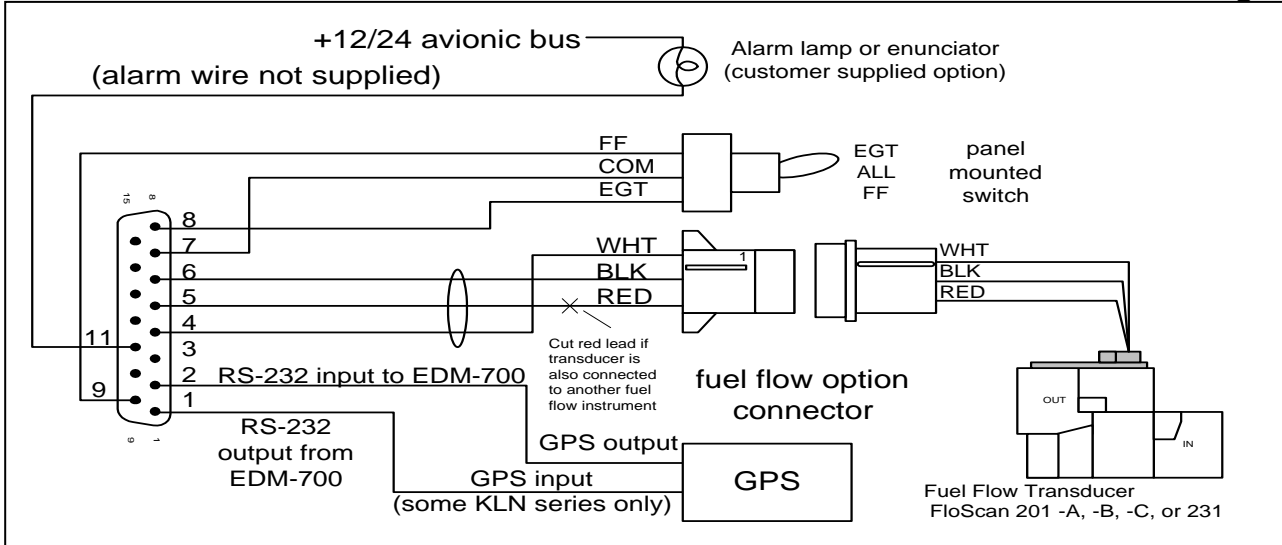
The Temperature probes must be wired with the correct polarity. Each wire is marked with the cylinder number. The EGT and CHT probes connect to the temperature indicator with yellow jacket Teflon Chromel Alumel wire supplied. Strip the wires according to drawing 5057 and terminate with the crimp-on ring 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. With in a few inches of the instrument terminal strip a connector may be installed.

NOTE: The ring terminals may be crimped with a “service type” tool, however AMP part number 48518 tool is recommended. Be sure to test each crimp by pulling on the wire to assure it will not come out. The most common installation problems are poor quality terminations.

The EGT-701 must be **grounded to the engine block**, not at a ground point under the instrument panel. No connection to the aircraft dimmer system is required or permitted because the instrument dims automatically with reductions in ambient light.



Install the data port connector in the instrument panel. This is the 2.5 mm ID, 5.5 mm OD on the twisted white and black wires on J1. See *Installing the Instrument* section earlier in this manual.

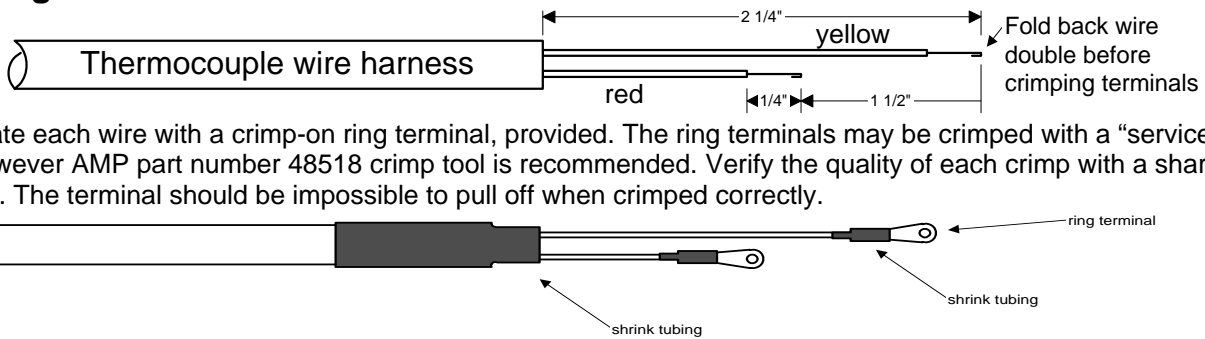


Before you begin, note that the most common cause of probe problems is poor terminal crimps.

When cutting each pair of leads in the wiring harness to the proper length to connect to the probes, leave enough slack in the harness so that probes from adjacent cylinders may be interchanged if necessary for trouble-shooting and servicing. Thermocouple wire length is not critical and should be trimmed to any length as required for a clean installation.

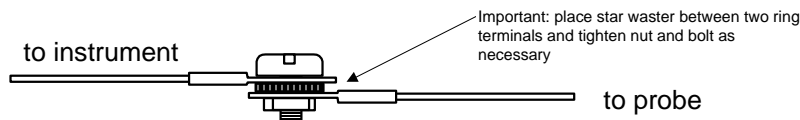
The Temperature probes must be wired with the correct polarity. Each wire is marked with the cylinder number. The EGT and CHT probes connect to the temperature indicator with yellow jacket Teflon Chromel Alumel wire supplied.

Strip the wires as shown below, observing color codes. **Important: fold back the wire double before crimping terminals.**

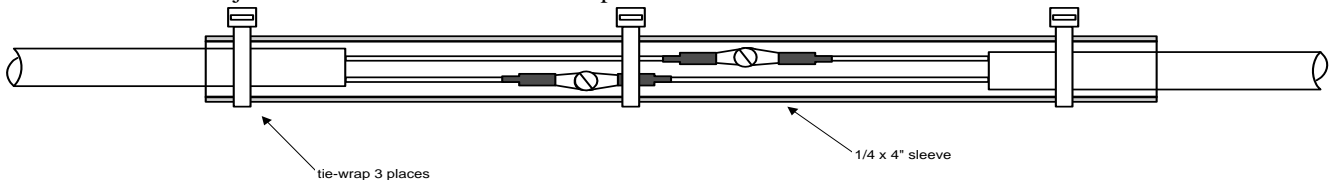


Terminate each wire with a crimp-on ring terminal, provided. The ring terminals may be crimped with a "service-type" tool, however AMP part number 48518 crimp tool is recommended. Verify the quality of each crimp with a sharp tug on the wire. The terminal should be impossible to pull off when crimped correctly.

Place a 1/4 x 4 inch sleeve over each pair of wires in the harness. Connect the harness ring terminal to the probe ring terminal using the supplied number 4 screws and nuts, placing the star washer *between* the ring terminals, not against the nut.



Slide the sleeve over the joint and secure with three tie-wraps.



13) ROUTING THE WIRING HARNESS

Route the wires from the probes and sensors through the firewall using fireproof rubber grommets and flame retarding silicone. Use an existing hole if possible. Following the existing wiring harness and connect to the indicator marking each lead with the cylinder number. All wires must be routed **away from high temperature** areas (exhaust stacks, turbochargers, etc.). Secure Probe leads to a convenient location on the engine approximately 8 to 12 inches from the probe, being sure there is sufficient slack to absorb engine torque. It is essential in routing the probe wire that this wire not be allowed to touch metal parts of the airframe or engine since abrasion will destroy this high temperature wire.

Connect the JPI RPM sensor to the wiring harness using the 3-pin connector supplied.

Secure thermocouple wires along the route to the indicator. Secure wire using original clamps, tie wrap if possible.

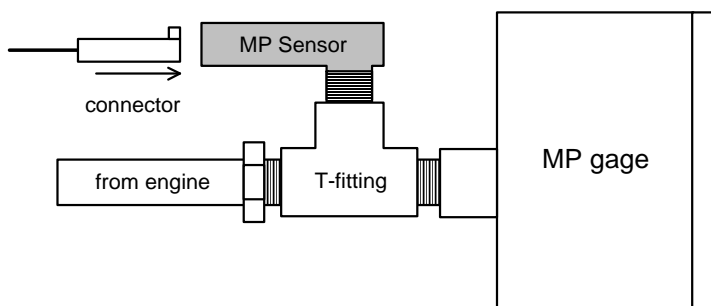
CAUTION: Be sure the wiring does not obstruct the controls under the panel.

- The probe wires must not be tied in with ignition, alternator or twin engine cabin heater ignition wires because of potential interference with temperature readings.
- Temperature probe wiring harness is made of Chromel-Alumel alloy wire (yellow) that **must not be substituted or extended with normal copper wire**. The power and ground wire are normal copper. Leads may be spliced with additional Chromel-Alumel wire using copper butt splices.
- When the installation is complete all wires should be secured using ties and carefully checked for interference, rubbing or chaffing with flight control cables or other moving parts.

14) Manifold Pressure (MP) Sensor

Install a T-fitting (not supplied) in the aircraft's MP gage line in the cockpit near the MP gage. Install the JPI MAP sensor

P/N 604010 on the T-fitting. Connect the JPI MP sensor to the wiring harness using the 4-pin connector supplied. The MAP sensor uses a 1/8 NPT fitting. Note: this is eligible for installation on all 4 & 6 cylinder engines only. There are no alarm limits.



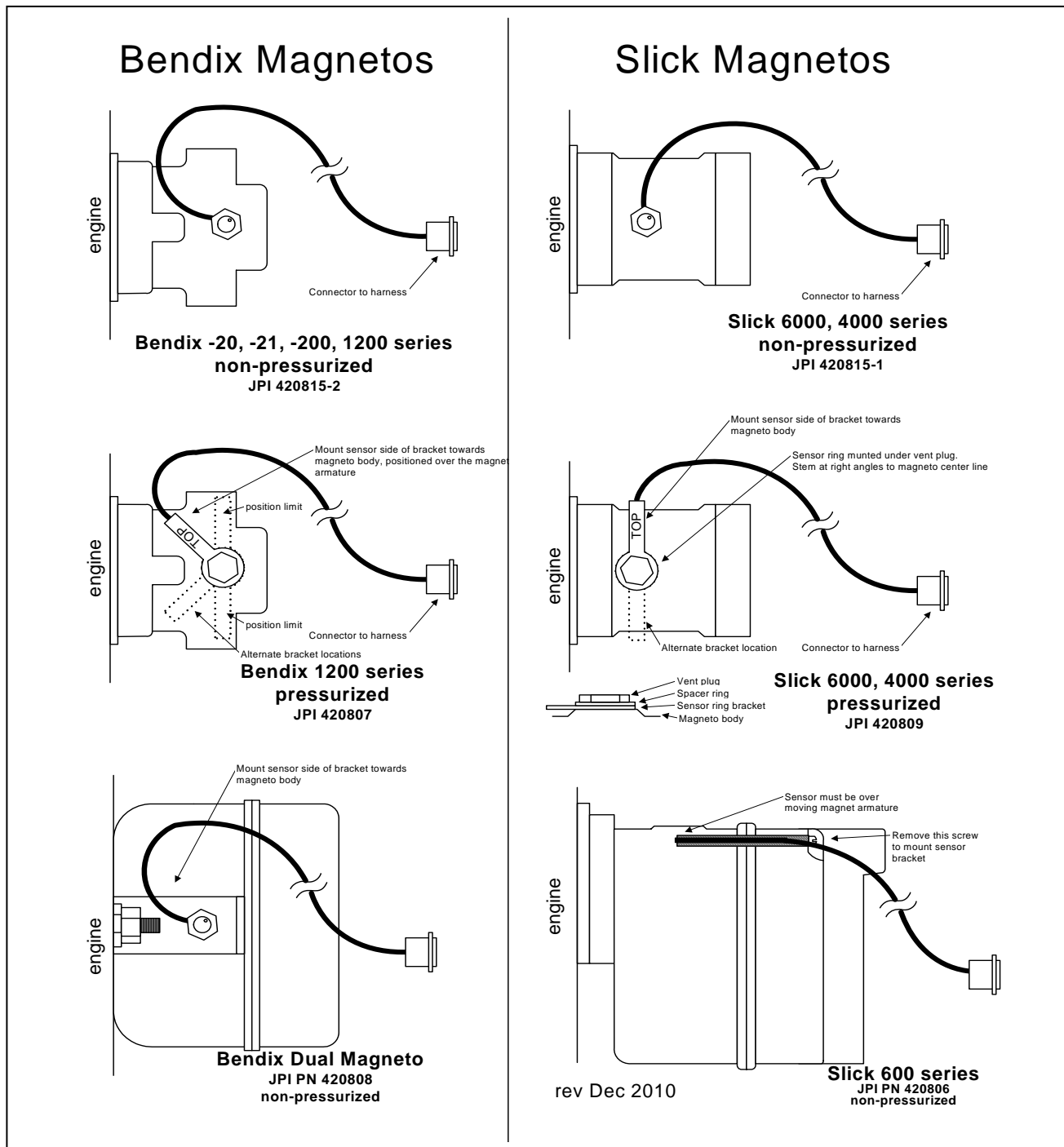
Manifold Pressure Calibration

The manifold pressure must be calibrated to the ambient air pressure. Enter the current ambient barometric pressure. The engine must *not* be running. This setting is *not* the same as the altimeter setting that you receive from ATIS or unicom. It will vary with field elevation. Use the chart below to calculate the MP FACTOR. Multiply this MP FACTOR by the altimeter setting that you receive from ATIS or unicom. For example if the field elevation is 1700 ft and the altimeter setting is 30.1, the MP FACTOR is 0.9400 from the table. Multiply 30.1 x 0.9400 to get the ambient MP of 28.29.

Field Elev	MP FACTOR	1300	0.9539	3200	0.8896	5100	0.8289
-500	1.0182	1400	0.9504	3300	0.8863	5200	0.8258
-400	1.0145	1500	0.9469	3400	0.8830	5300	0.8227
-300	1.0109	1600	0.9435	3500	0.8798	5400	0.8196
-200	1.0073	1700	0.9400	3600	0.8765	5500	0.8165
-100	1.0036	1800	0.9366	3700	0.8733	5600	0.8135
0	1.0000	1900	0.9332	3800	0.8700	5700	0.8104
100	0.9964	2000	0.9298	3900	0.8668	5800	0.8074
200	0.9928	2100	0.9264	4000	0.8636	5900	0.8043
300	0.9892	2200	0.9230	4100	0.8604	6000	0.8013
400	0.9856	2300	0.9196	4200	0.8572	6100	0.7983
500	0.9821	2400	0.9162	4300	0.8540	6200	0.7953
600	0.9785	2500	0.9129	4400	0.8508	6300	0.7923
700	0.9750	2600	0.9095	4500	0.8477	6400	0.7893
800	0.9714	2700	0.9062	4600	0.8445	6500	0.7863
900	0.9679	2800	0.9028	4700	0.8414	6600	0.7833
1000	0.9644	2900	0.8995	4800	0.8382	6700	0.7804
1100	0.9609	3000	0.8962	4900	0.8351		
1200	0.9574	3100	0.8929	5000	0.8320		

15) RPM Sensor installation

There are four types of magnetos commonly in use. You must have the correct RPM sensor for the magneto installed in the aircraft. The following part numbers apply: Slick – pressurized 4000, -6000 series use JPI P/N 420809. For the Bendix pressurized -1200 series use P/N 420807. Dual magnetos use JPI PN 420808. For the Bendix -20 series and Slick 600 use JPI P/N 420806. Mount the sensor as shown in the appropriate diagram below. Note: this is eligible for installation on all 4 & 6 cylinder engines only.

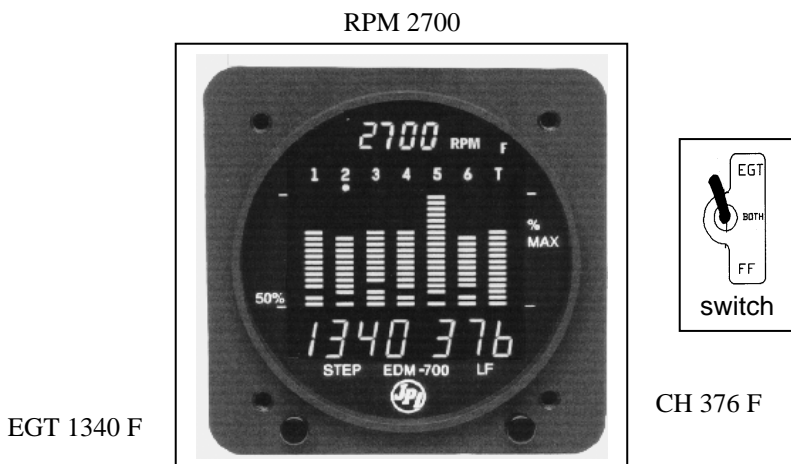


16) DESCRIPTION / OPERATING INSTRUCTIONS

The EGT-701 temperature indicator displays temperature digitally and in analog format. The EGT as displayed is based on probes located near the exhaust outlet for each cylinder and the TIT probe, if installed, is adjacent to the turbo charger. These probes are not necessarily collocated with the primary probes therefore; EGT-701 may not indicate the same as the aircraft primary instruments. The analog display is an electronic bar graph (vertical columns, one per cylinder) of EGT & TIT temperatures presented as a percentage of 1650°F. Below the vertical columns the specific value for EGT and CHT are displayed digitally. The dot over the column indicates which cylinder's digital information is presently displayed. The missing bars at the base of the columns indicate the hottest and coldest Cylinder Head temperature trend. During Lean Find mode the leanest cylinder is displayed along with the fuel flow (optional) at that time. Depressing the LF and STEP button simultaneously brings up the adjustable scan rate function, OAT in °C or °F. Depress the LF button will change the value of the rate or Oat in °C or °F. Exit by Depressing STEP.

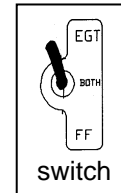
If the EGT-701 buttons are not depressed for 10 minutes the system will start scanning automatically. Depressing the STEP button will stop the automatic scan and index through all the functions available. During constant power cruise, if the LF button is depressed for five seconds the Bargraph will level at mid scale. The leveled bars represent the peaks of each column. Each bar represents 10 °F and now acts as an EGT & TIT trend monitor, quickly showing an increase or decrease in temperature. Depress again to return to normal; nothing else is affected. With the fuel flow option there is a three position toggle switch. The positions are: 1) **EGT**, digital and Bargraph display of temperatures, 2) **FF**, digital display of GPH, REM and USED Fuel. Temperature Bargraph remains. 3) **Both**, cycles through everything installed. The data port output sends RS232 serial data every 6-sec.

Options of Fuel Flow, TIT, OAT, IAT (induction air temp.), OIL, BAT (voltage) and are displayed digitally with headlines after the number, as "230 OIL" or "14 GPH". A large value (50 +) of "CLD" indicates shock cooling usually associated with rapid descents at low power. Optional functions not installed will not display. The same acronyms are incorporated in the TFT flat panel display.

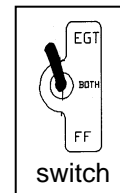


EDM-800 Plasma display

EDM-830 TFT Flat panel display Portrait



EDM-830 TFT Flat panel display Landscape



EDM-830 system mounts in a 3.125 inch instrument panel hole in either a portrait or landscape position depending on panel hole location.

By holding the Step button (white) for approx. 10 seconds and arrow will appear on the display showing which way is up. Use the LF button to index the arrow. When the proper position is achieved, press the step button and the system will reboot in the direction chosen.

17)Installation Record

The indicator and probes FAA TSO approved, as a temperature indicator under TSO-C43b. Record the installation of the EGT-701 per STC# SA 2586NM. Make an appropriate entry in the aircraft log book. FAA form 337 may be required.

18)Operation

Airplane flight manual limitations based on primary instrument indication take precedence over those of the EGT-701.

CAUTION: Comply with manufacturer’s airplane/rotorcraft flight manual leaning procedure. Do not exceed applicable engine or aircraft limitations.

CAUTION

Comply with manufacturer’s Airplane/Rotor craft
Flight Manual leaning procedure.
Do not exceed applicable engine
or aircraft limitations.

After establishing desired cruise power depress the LF button to activate the Lean Find Mode. As the mixture is leaned, the column display on the EGT-701 for one cylinder will begin blinking; indicating the exhaust gas temperature for that cylinder has peaked. Continue with the leaning procedure as recommended by the aircraft manufacturer while monitoring the primary engine instruments and the EGT-701 display. Once the leaning procedure has been completed, depress the Step button briefly to exit the Lean Find Mode and enter the Monitor Mode.

ENGINE OPERATION: Operate and lean the engine in accordance with the manufacturers’ recommendations for different power settings. Lycoming recommends running peak EGT only at 75% power or less. Continental recommends running peak EGT at 65% power or less.

19) EGT-701 SPECIFICATIONS and LIMITATIONS

OUTPUT FUNCTIONS (ALL OPTIONS):

FACTORY LIMITS

EGT (Exhaust Gas Temp.,K ,Max. limit 2500°F)	1650 °F
CHT (Cylinder Head Temp., J/K Max. limit 600°F)	450 °F
TIT (Turbine Inlet Temperature, K, Max. limit 2500°F)	1650 °F
OIL (Oil temperature, K, Max. limit 600°F)	(Hi/Lo) 230/90°F
OAT (Outside Air Temp., K, Limit -40 to 300°F)	
IAT (Induction Air Temp., K, Max. Limit 600°F.)	
CLD (Rate of change of CHT)	-60°/minute
DIF (Maximum EGT differential)	500 °F
LFM (Lean Find Mode, detects first EGT peak)	
BAT (Voltage, 0 to 40 volts.) Not FAA Approved under TSO-C43b	15.5/11.0 or 31.0/22.0 Hi/Lo
RPM Tested under TSO-C43b (Does not comply with TSO-C49a)	
MAP Tested under TSO-C43b (Does not comply with TSO-C45)	

The conditions and test required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards.

An alarm causes the digital function to flash when the particular limit is exceeded. Factory set alarm limits for CHT (450°F) and OIL (230°F) are lower than the actual aircraft limits. The values may be adjusted to suit individual preference by pressing the reset button. Other factory set alarm limits are: “BAT” Voltage 15.5/11.0 or 31.0/22.0 Hi/Lo as appropriate; “DIF” (differential Hi/Lo EGT) 500°F; “TIT” 1650°F Hi; “OIL” Lo 90°F; “CLD” (Rate of change of cylinder head temperature in degrees per minute) -60 degrees/minute. The pilot should be aware of the setting of each alarm for his particular aircraft. **An alarm is “Canceled” by holding the step button in for 5 seconds** and seeing the word “OFF”. Then, only that particular alarm is canceled. Canceled alarms will not appear again until the power

INSTALLING THE EGT-701 SCANNER®

has been removed and reapplied to the EGT-701. The entire display dims automatically depending on the ambient lighting.

20) Component Parts List for EGT PN-1280, TIT PN-1200, IAT PN-1300 Probe in polybag

- 1 Thermocouple probe PN M-111
- 1 Stainless Steel Clamp Thimble
- 1 Stainless Steel Exhaust Seal Washer
- 1 Stainless Steel Screw Type Clamp
- 2 Ring Terminals
- 2 Screws and nuts 6-32 X 1/4
- 1 Fiberglass tube 1/2" X 4"

21) Component Parts list for CHT probe PN 1260

- 1 Bayonet Probe Spring loaded PN-5050
- 1 Or Gasket thermocouple probe PN MM-113
- 2 Ring Terminals
- 2 Screws and Nuts 6-32 X 1/4"
- 1 Fiberglass tube 1/2" X 4"

22) Components Parts list for OIL probe PN 1240

- 1 P/N 400505 -C or -L, OIL probe
- 2 Ring Terminals
- 2 Screws and Nuts 6-32 X 1/4"
- 1 Fiberglass tube 1/2" X 4"

22) Components Parts list for OIL pressure PN 306018

- 1 P/N 306018 OIL pressure transducer
- 2 Ring Terminals

23) Components Parts list for OAT probe PN 1220

- 1 P/N 400510, OAT probe
- 2 Ring Terminals
- 2 Screws and Nuts 6-32 X 1/4"
- 1 Fiberglass tube 1/2" X 4"

24) Components Parts list for Manifold pressure sensor probe P/N 604010

- 1 P/N 604010, Manifold pressure sensor with 1/8 NAP termination.

25) Components Parts list for RPM sensor P/N depends on Magneto make and model.

- 1) Bendix magneto series 20,21.....P/N 420806
- 2) Bendix magneto series 1200,.....P/N 420807
- 3) Bendix magneto Plug StdP/N 420815-2
- 4) Bendix magneto Dual.....PN 420808
- 5) Slick magneto series 4000 or 6000 P/N 420809 or Plug PN 420815-2
- 6) Slick magneto Plug Std.....PN 420815-1

26) Component Parts list for Single Engine, EGT and CHT

P.N.	EGT-701	-4C	-6C	-7C	-8C	-9C
Temperature Indicator		1	1	1	1	1
EGT probe KIT PN 1280		4	6	7	8	9
CHT probe KIT PN 1260		3	5	6	7	
CHT Gasket probe KIT PN 1260		1	1	1	1	9
Oil probe with option O KIT 1240		1	1	1	1	1
TIT probe with option T KIT 1200		1	1	1	1	
OAT probe with option A KIT 1220		1	1	1	1	1
IAT probe with option I KIT 1300		1	1	1	1	1
Oil pressure transducer PN 306018		1	1	1	1	1
MAP P/N 604010		1	1	1	1	1
RPM one of P/N 420806, 7, 9, 15-1,-2		1	1			
TC Harness PN 700702		1	0	0	0	0
TC Harness PN 700700		0	1	1	1	1
TC Harness PN 700200		1	1	1	1	1
TC Option wire PN 700201		0	0	2	4	6

27) Weight and Balance Data

TSO C43b, Temperature Indicator EGT-701	30 oz. / 1.9 lbs
EGT probe MM-111	2.0 oz. Each / 0.125 lbs
CHT probe 5050	1.5 oz. each / 0.094 lbs
Wire P.N. WK.-24 Harness 8 ft.	14.0 oz. each / 0.88 lbs
RPM, MAP, and Oil pressure	1.5 oz each / .094 lbs

40 CHANGING THE PROGRAMMED LIMITS

Setting the K-factor (Fuel Flow Option)

You must set the K factor before using the EGT-701 with fuel flow. Note the K-factor that was engraved on the fuel flow transducer.

1. Turn on the EGT-701 and after self-test, press STEP until the instrument is cycling normally.
2. Place the select toggle switch in the FF position.
3. Start the Pilot Programming Procedure by simultaneously holding the STEP and LF buttons for five seconds. You will see the word PROGRAM for two seconds.
4. Tap the STEP button repeatedly until you see KF-SET.
5. Hold STEP and LF for five seconds. First digit blinks: 29 . 00
6. Tap or Hold LF to change flashing digit (for example): I9 . 00
7. Tap STEP for next digit: I9 . 00
8. Tap or Hold LF to change flashing digit: I8 . 00
9. Tap STEP for next digit: I8 . 00
10. Repeat steps 7 and 8 for the remaining two digits.
11. Verify the K-factor that was engraved on the fuel flow transducer is now displayed.
12. Hold STEP and LF for five seconds to exit.
13. Tap STEP

Setting the Data Recording Option Parameters

(Data Recording Option only)

If you haven't already done so, start the pilot programming procedure; simultaneously hold the STEP and LF buttons for five seconds. You will see the word PROGRAM for two seconds. To change the date, time and user id for the Data

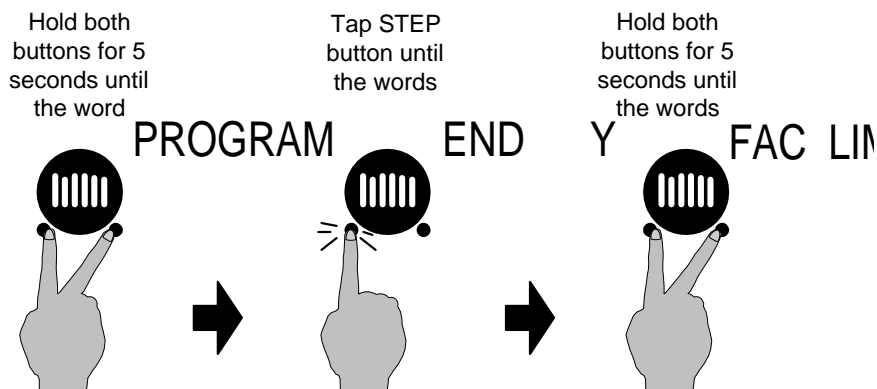
INSTALLING THE EGT-701 SCANNER®

Recording Option, tap the STEP button until the display shows DUMP? N. Next, simultaneously hold the STEP and LF buttons for five seconds. Then set the date and time as show below

<i>Tap STEP to next item</i>	<i>LF sequences through these values</i>	<i>Comments</i>
MNTH	I ⇒ I2	Month
DAY	I ⇒ 3I	Day
YEAR	80 ⇒ 79	1980 through 2079
HOUR	00 ⇒ 23	24 hour time. We suggest you set Zulu time.
MIN	00 ⇒ 59	Tapping the step will also zero the seconds (not shown)
USER ID	N I2345	Hold both STEP and LF buttons simultaneously until the first character flashes. Use LF to select the first character. STEP moves to the next character.
		Hold both STEP and LF to exit.

Setting the Alarm Limits

Turn on the EGT-701 and after self-test, press STEP until the instrument is cycling normally. To start the Alarm Limit Procedure, with the EGT-701 powered up, do the following:



Tap the STEP button to advance to the next item in the list. Tap the LF button to select alternate values of that item. Hold the LF button to rapidly back up. *Prompts listed in the first column are displayed for only two seconds.*

Changing the Alarm Limits:

<i>STEP to next item</i>	<i>LF sequences through these values</i>	<i>Description</i>
FAC LIM		Factory Limits.
	FAC? N ⇔ FAC? Y	Restore factory defaults
REV X.XX		Firmware rev. number.
TYPE K	TYPE K ⇔ TYPE J Hold STEP and LF for five seconds to toggle	Type K or Type J CHT probes. USE THIS WITH CAUTION.*
EGT-CHT	ENG F ⇔ ENG C	Select F or C degrees for all engine temps.
BATTERY	I0.0 H BAT ⇒ 35.0 H BAT	Battery high voltage limit, set in 0.5 volt increments.
	8.5 L BAT ⇒ 30.0 L BAT	Battery low voltage limit.
EGT DIF	30 DIF ⇒ 990 DIF	EGT difference limit set in 10° increments.
CHT HI	90 H CHT ⇒ 500 H CHT	CHT high limit set in 5° increments.
COOL CHT	-5 CLD ⇒ -200 CLD	Cooling limit set in 5°/min. increments.
TIT HI	650 TIT ⇒ 2000 TIT	Both EGT and TIT hi limits are the same.
OIL TEMP	40 H OIL ⇒ 500 H OIL	Oil temperature high limit, set in 5° increments.
	I0 L OIL ⇒ 250 L OIL	Oil temperature low limit set in 5° increments

INSTALLING THE EGT-701 SCANNER®

1/20/09

Rev-E

Page 20 of 30

OIL PRESS		Oil pressure low limit
FUEL FLW	FUEL GAL⇒FUEL KGS⇒FUEL LTR⇒FUEL LBS⇒	Selects the units in all parameters where fuel quantity or fuel rate is displayed
MAIN TK	MAIN=50	Main tank capacity, in units selected
AUX TNK	AUX? N↔AUX? Y	Y - Yes - aircraft has auxiliary tanks
	AUX=0	Auxiliary tank capacity
LO TIME	MIN =45	Alarm limit in minutes for low time in tanks
LO FUEL	REM =I0	Alarm limit for low fuel quantity in tanks, in units selected
	CARB? N ↔CARB? Y	Y - Yes: carbureted engine
RECRD?	RECRD? Y↔RECRD? N	Data Recording Option Y-only data recording. N – Only real-time data output.
	END Y ↔ END N	Y - Yes to exit; N - No to review list again

*CHT will read incorrectly if the wrong probe type is selected. Type K probes generally have red and yellow wires; type J probes have black and white wires.

Fuel Flow Units (Fuel Flow Option)

Selects the units in *all* parameters where fuel quantity or fuel rate is displayed. If you change this parameter, it does *not* change the numerical value of the fuel tank capacity. You must do this manually. For example if you change from Gal. to Lbs., the tank capacity will be interpreted as 50 Lbs. rather than 50 gallons; the EGT-701 will not convert 50 Gal to equivalent pounds.

Main Tank Capacity (Fuel Flow Option)

Enter the total capacity of the main tanks in the fuel flow units selected. If you have tank tabs (but no auxiliary tanks) and sometimes fill only to the tabs, set the main tank capacity to the capacity up to the tabs.

Auxiliary Tanks (Fuel Flow Option)

If you do not have auxiliary tanks or tank tabs, answer “No.” If you answer yes, you will be asked to input the capacity of the auxiliary tanks in the fuel flow units selected. If you have tank tabs and sometimes fill only to the tabs, set the auxiliary tank capacity to the difference between full tank capacity and tab capacity.

Low Time Alarm Limit (Fuel Flow Option)

Select the value of the time remaining, in minutes, that triggers the alarm. Time remaining is calculated at the current fuel flow rate.

Low Fuel Alarm Limit (Fuel Flow Option)

Select the value of the fuel remaining, in the selected fuel flow units, that triggers the alarm. Fuel remaining is calculated at the current fuel flow rate.

Carburetor? (Fuel Flow Option)

Different response filters are used depending on whether your engine is carbureted or fuel injected. The filter for a carbureted engine has a slower response time to reduce sudden fluctuations in readings.

29) Troubleshooting

- a) **A missing column in the display on start up** indicates that the diagnostic routine has found an open wire or probe with a poor connection. The error message will indicate which channel to examine.
- b) **A missing column in the display during flight** indicates a widely varying or erroneous temperature value. The probe is deleted from the indexing to prevent false alarms.
- c) **Start up OPEN PRB message.** If one of the temperature probe circuits is open, the display indicates OPEN PRB followed by one of these messages: EGT 1, EGT 2, EGT 3, EGT 4, EGT 5, EGT 6, EGT 7, EGT 8, EGT 9, CHT 1, CHT 2 , CHT 3, CHT 4, CHT 5, CHT 6, CHT 7, CHT 8, CHT 9, OIL, IND, OAT, TIT. Check the connector at the instrument and verify that a female pin is not recessed in the connector. Check the crimps where the probe is connected to the wiring harness.

INSTALLING THE EGT-701 SCANNER®

1/20/09

Rev-E

Page 21 of 30

- d) **A negative reading** (- in front of the number) indicates reverse polarity on the red and yellow thermocouple wire to probe.
- e) **Ohmmeter check.** Remove the connector from the rear of the instrument and measure the resistance of the probe lead pairs. The reading should be about 10 ohms. At the connections between the probe and the wiring harness in the engine compartment, the resistance should read about 2 ohms.
- f) **All readings varying rapidly.** Verify that the Instrument is **grounded at the engine block** for single engine installations. If an adapter probe is being used insure that it is screwed in tightly and grounded. Remove the factory original probe that is in the adapter and note if problem is resolved. If so an ohm ground exists between the engine and the adapter probe.
- g) **One CHT reads higher or lower than the others.** It is most likely that this is the cylinder that has the spark plug gasket probe installed. Choose the upper or lower spark plug, the one that provides the best correlation with the other temperature probes. Due to the spark plug location, the gasket probe may read higher or lower than the factory probe. Place the probe on the plug that receives the most direct cooling air
- h) **One cylinder seems to read erroneously.** Physically swap the suspected probe with a probe from a correctly reading cylinder. If the problem moves to the correctly reading cylinder (stays in the same column on the instrument) check the crimps between the probe and the wiring harness. Check the pins on the connector that plugs into the instrument. If those check okay, then the probe should be replaced. If the problem moves to the other probe's column on the instrument, the temperature readings are correct and there is probably a problem with the original cylinder.
- i) **Large EGT span.** Normally aspirated (carburetor) engines at normal cruise display a "DIF" of 125 to 175°F spread between cylinders. Injected engines at normal cruise display a "DIF" 50 to 90°F spread between cylinders. All cylinders are measured by common circuitry. It is unlikely that the calibration is in error on only one channel.
- j) **Temperature reading varies** more than 500°F in one second. Check for a poor quality crimp between the probe and harness.
- k) **All EGT or CHT readings seem too high or low or unsteady.** Verify that the Instrument is grounded at the engine block for single engine installations. Use a DVM (digital voltmeter) to measure the difference between instrument ground and the engine block ground. If the difference is greater than 0.5 volts with the alternator charging, the ground to the instrument is faulty.
- l) **All EGT and CHT readings seem too low.** The instrument may be set to display engine temperatures in Celsius when you are used to seeing Fahrenheit. See Pilot's Guide under Pilot Programming.
- m) **OAT readings in error more than 10°**, but oil and CHT readings are okay. Look for *copper wire spliced* in line to the OAT probe. The OAT reading can be adjusted $\pm 10^\circ$. See Pilot's Guide under Pilot Programming.
- n) **All CHTs read high (100F)** EGT-701 calibrated for Gem installation "J" calibration. Change to "K" calibration using the procedure to set alarm limits described earlier.

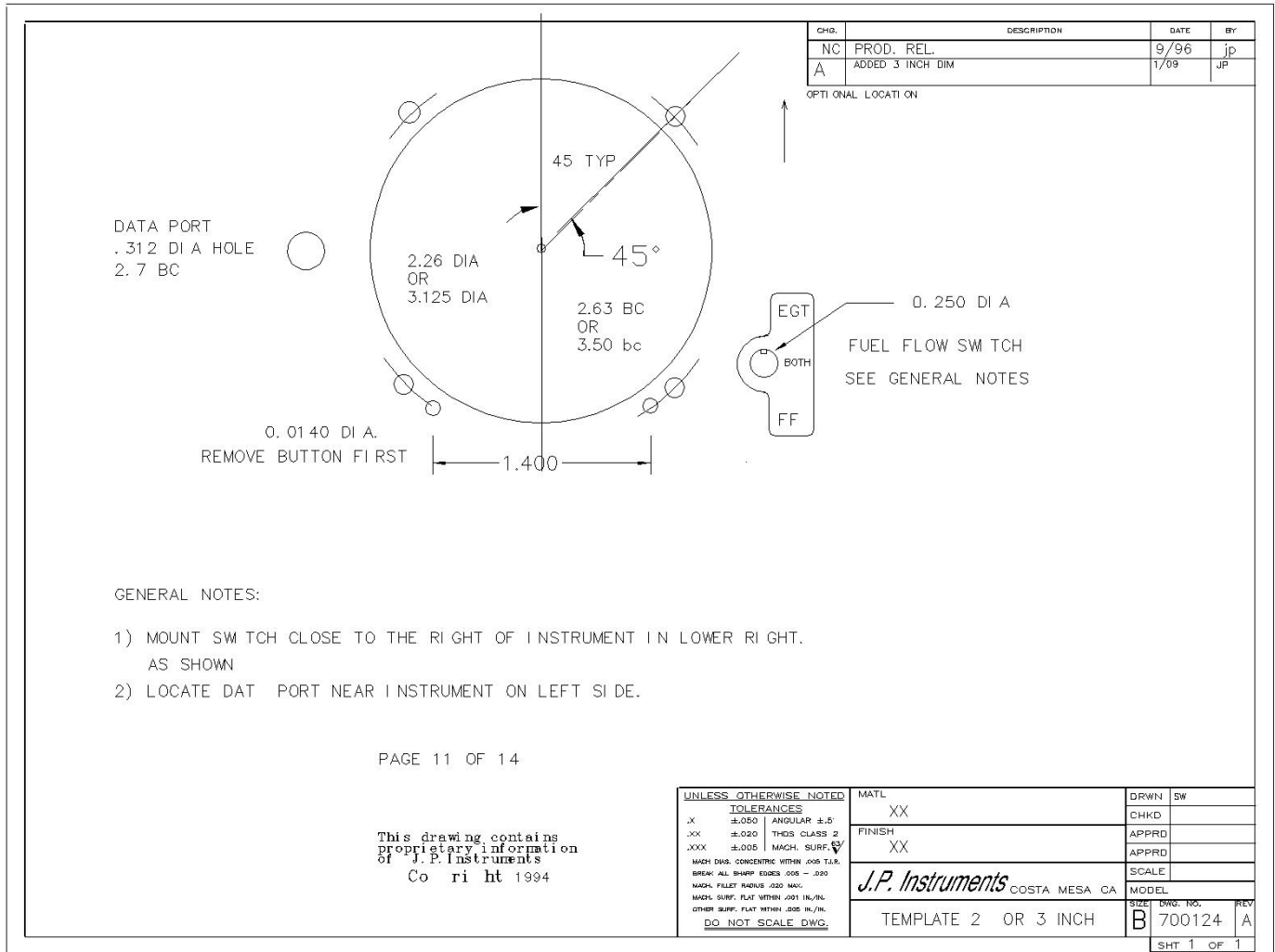
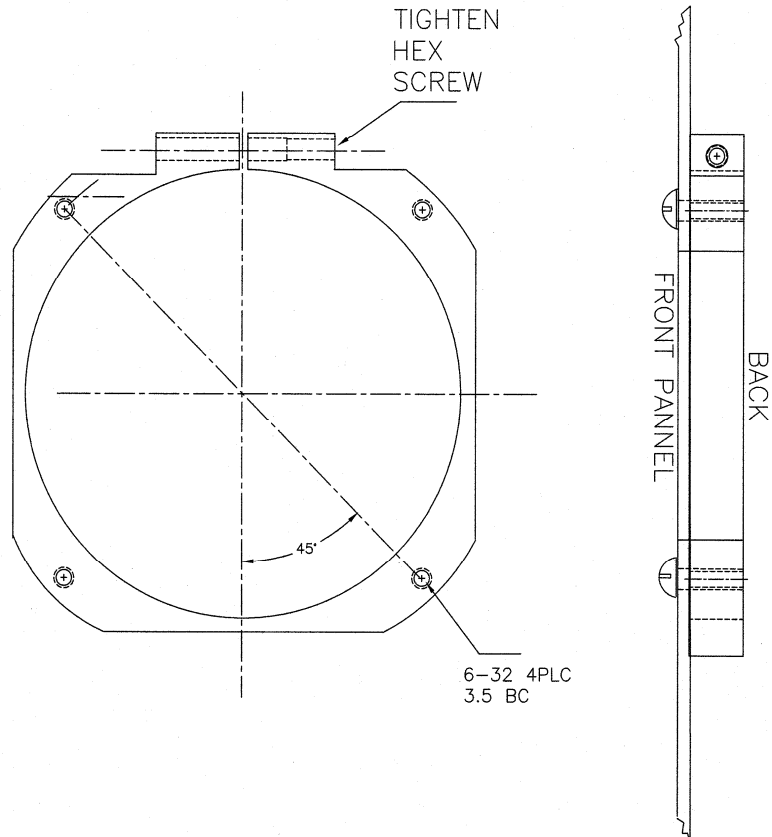
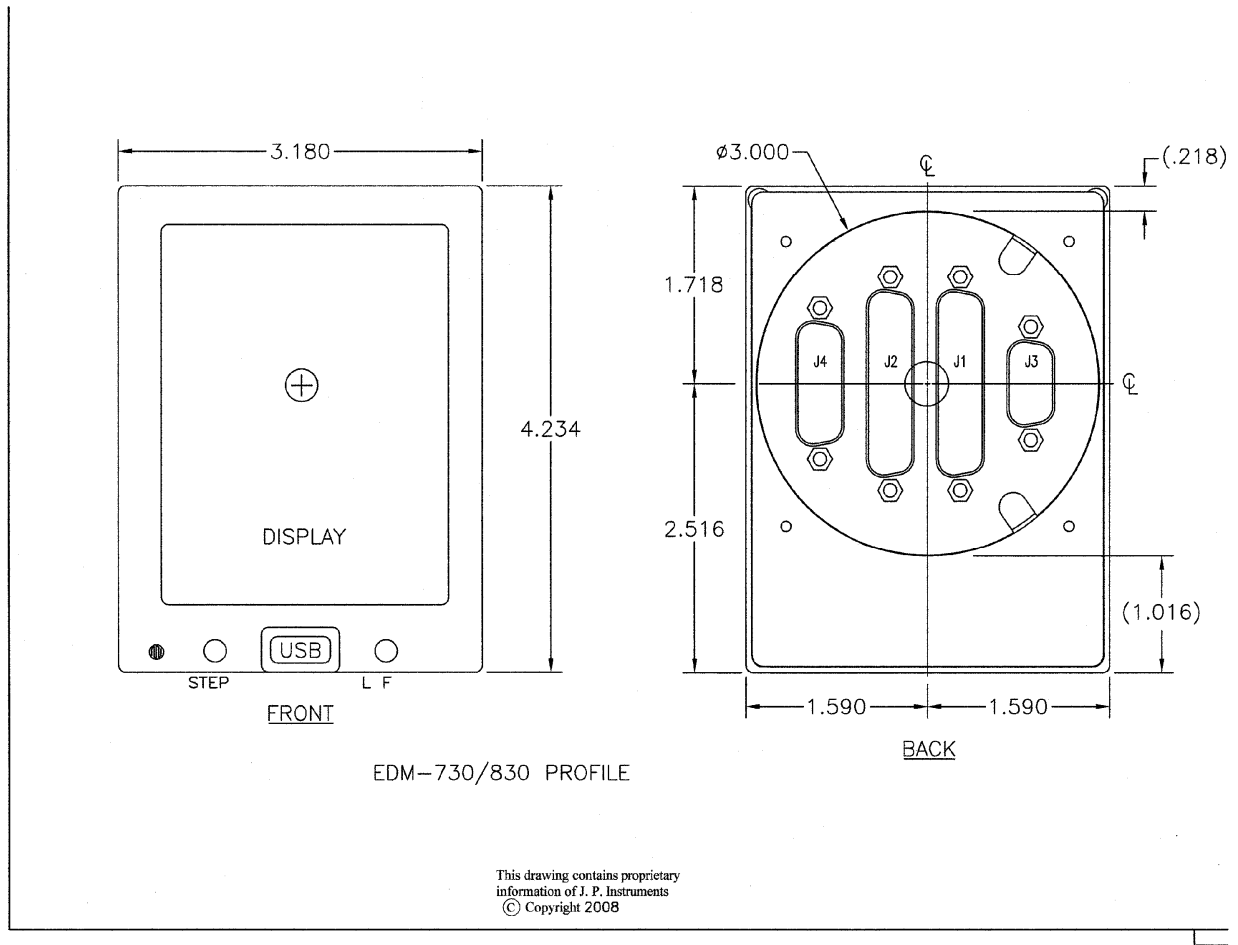


FIG-1

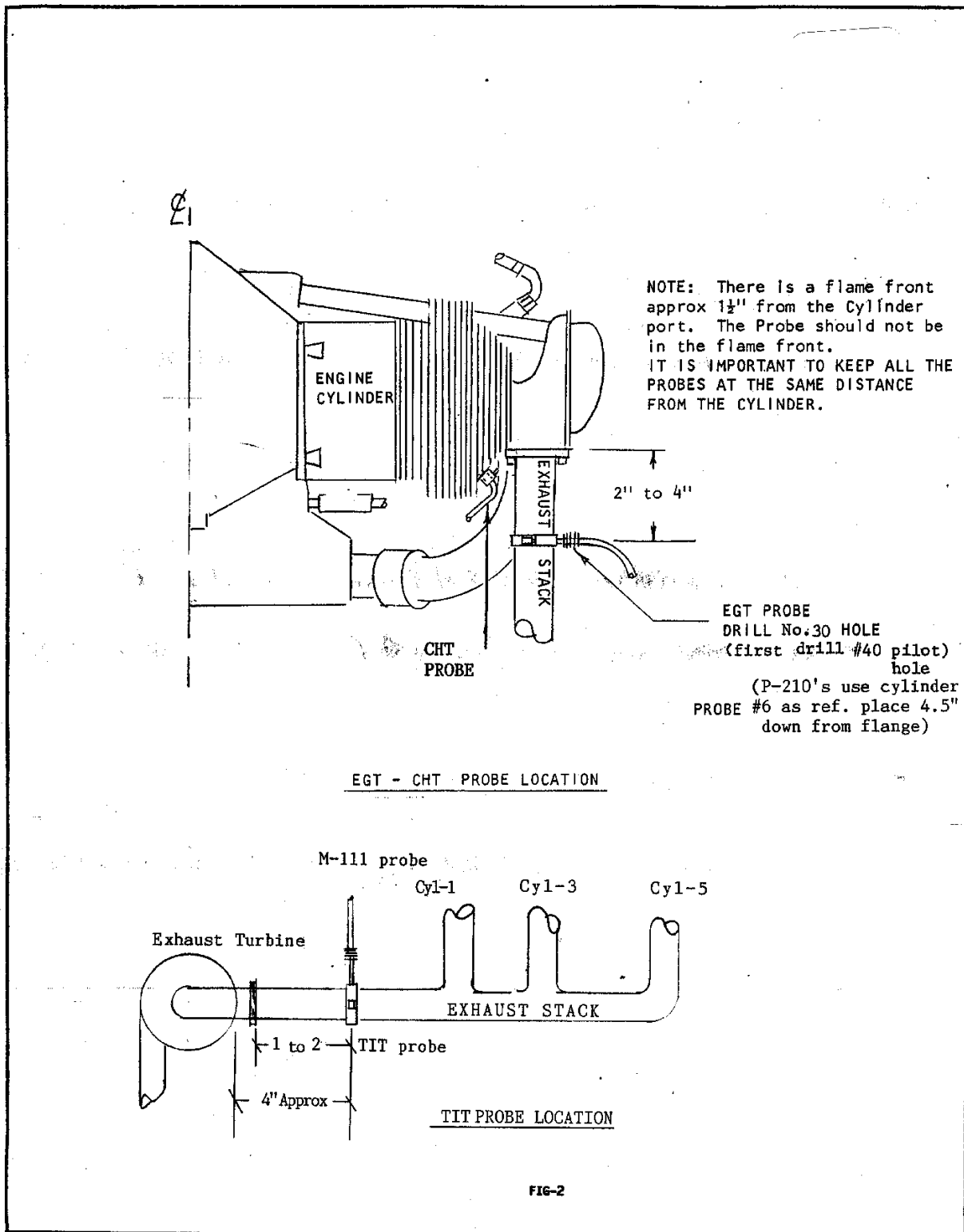


Mounting bracket for the EDM-730/830

EDM-730/830 Model: Mounts in a standard 3.1/8" instrument hole. First place the mounting bracket on the instrument and tighten the clamp hex screw until you can just remove the instrument from the bracket. The Mounting bracket is then placed behind the instrument panel hole and screwed (6-32 x 1/2" screws) in place using the existing holes. Three screws should be used leaving one hole vacant on either side of the hex screw. Locate the hex screw in a location that you can easily get to from the rear of the panel. The body of the instrument is 3.0 inches and 2.0 inches deep less connectors.



EDM-730/830 Layout



PROBE INSTALLATION INSTRUCTIONS

The K/MM-111 Probe will fit an 1/8 (.125) to 1/4 inch dia. hole in the exhaust stack that is approximately 3 to 4 inches from the cylinder exhaust port. Installation is extremely simple and requires no special tools or welding.

Assembly is accomplished by inserting the stainless steel thimble thru the hole in the clamp, inserting the probe in the thimble and applying the sealing washer between the thimble and the exhaust stack in such a position that the radius of the washer follows the curvature of the stack.

Insert the probe in the exhaust stack so that the tip of the probe is in the approximate center of the exhaust stack. Try not to go over center. Make certain that the slot in the thimble is positioned **LONGITUDINALLY** with the length of the exhaust stack or the probe will not lock firmly. Tighten the clamp firmly, which will lock the probe thimble assembly and probe in position.

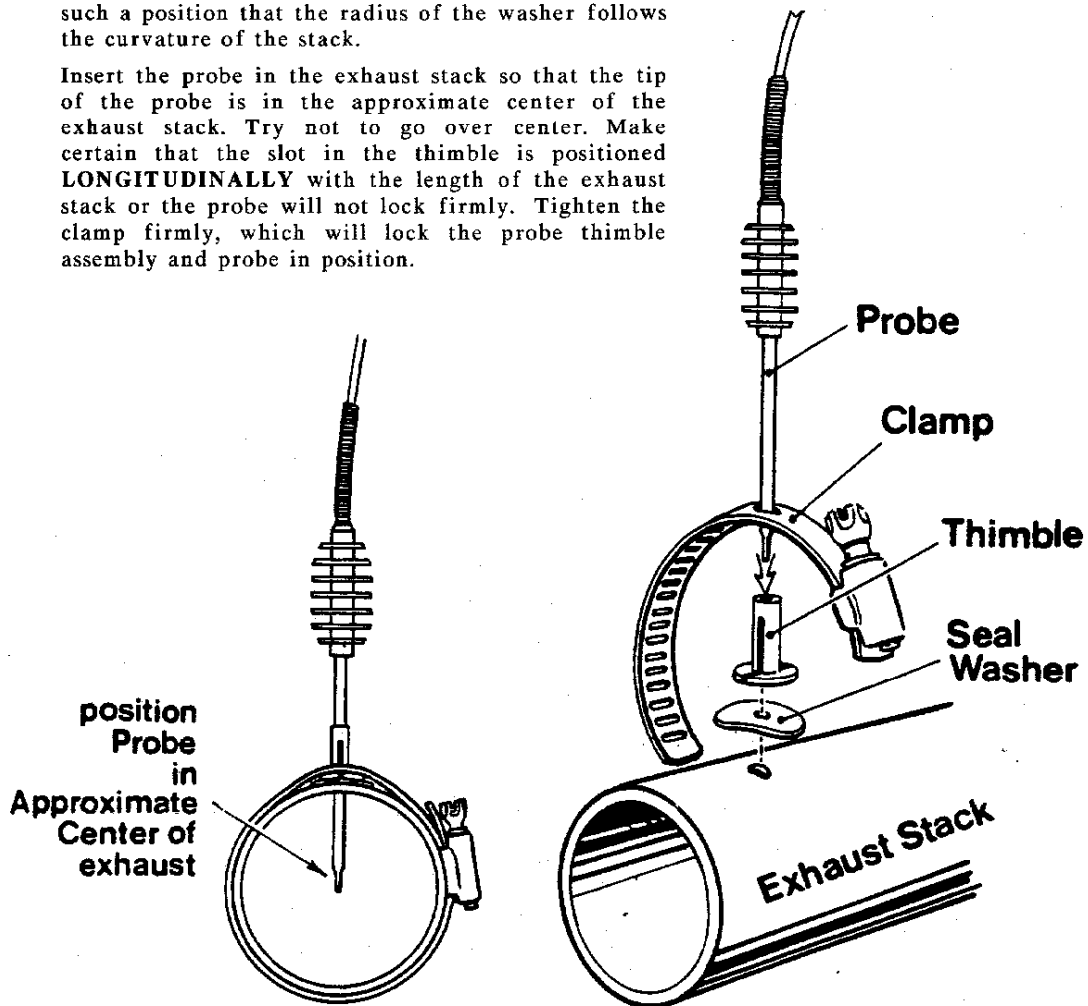
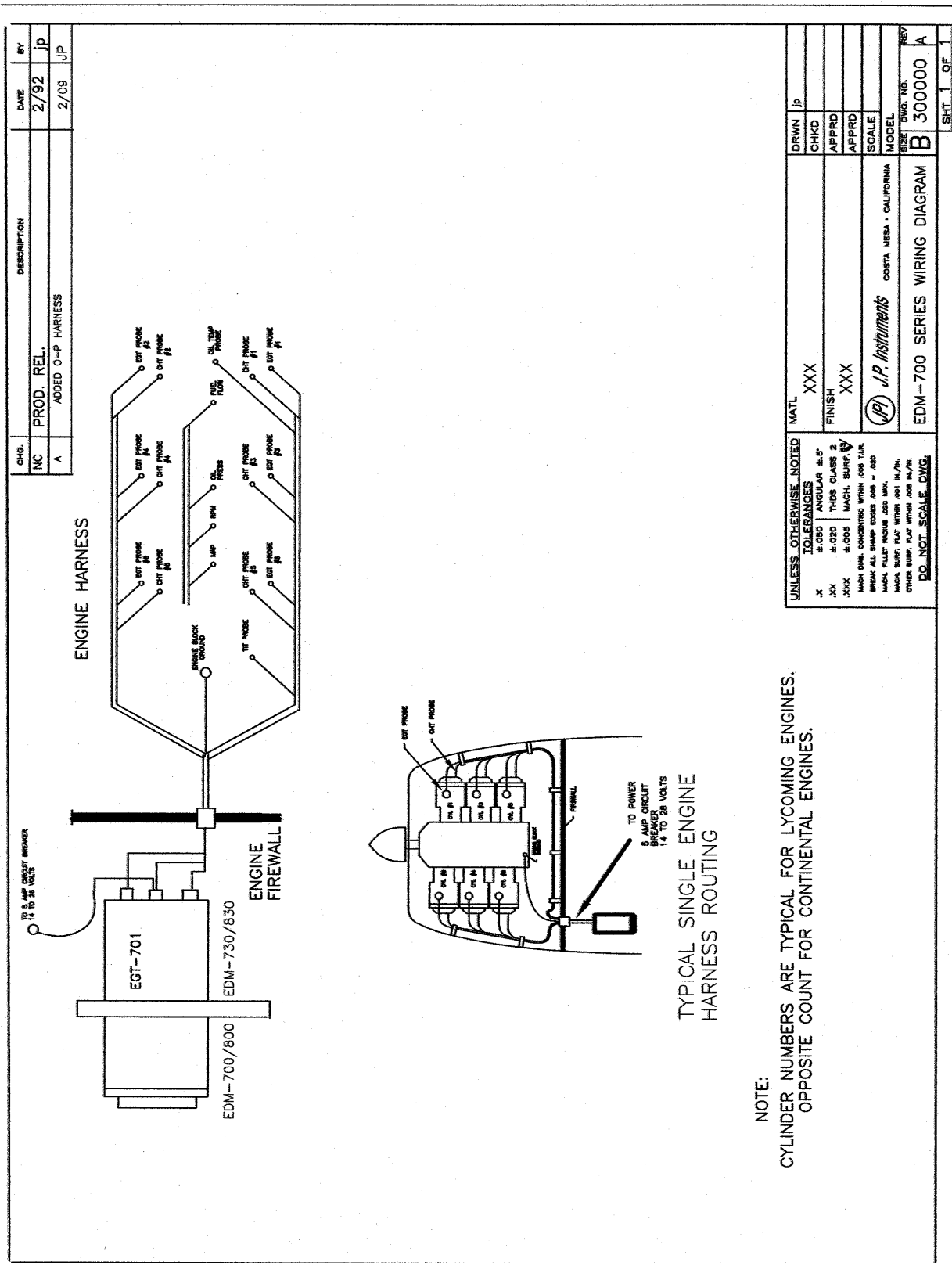


FIG-3



NOTE:
CYLINDER NUMBERS ARE TYPICAL FOR LYCOMING ENGINES.
OPPOSITE COUNT FOR CONTINENTAL ENGINES.

UNLESS OTHERWISE NOTED		MATERIAL	
X	TOLERANCES	XXX	DRWN jp
±.050	ANGULAR ±.5°	FINISH	CHKD
XXX	THIS CLASS 2	XXX	APPRD
±.005	MACH. SURF. ✓	XXX	APPRD
MACH. DIM. CONFORMANCE WITH JCS TUL.			SCALE
MACH. DIM. CONFORMANCE WITH JCS TUL.			MODEL
MACH. DIM. CONFORMANCE WITH JCS TUL.			SIZE
MACH. DIM. CONFORMANCE WITH JCS TUL.			DWG. NO.
MACH. DIM. CONFORMANCE WITH JCS TUL.			EDM-700 SERIES WIRING DIAGRAM
MACH. DIM. CONFORMANCE WITH JCS TUL.			B 300000 A
MACH. DIM. CONFORMANCE WITH JCS TUL.			REV
MACH. DIM. CONFORMANCE WITH JCS TUL.			SHT 1 OF 1

FIG - 6

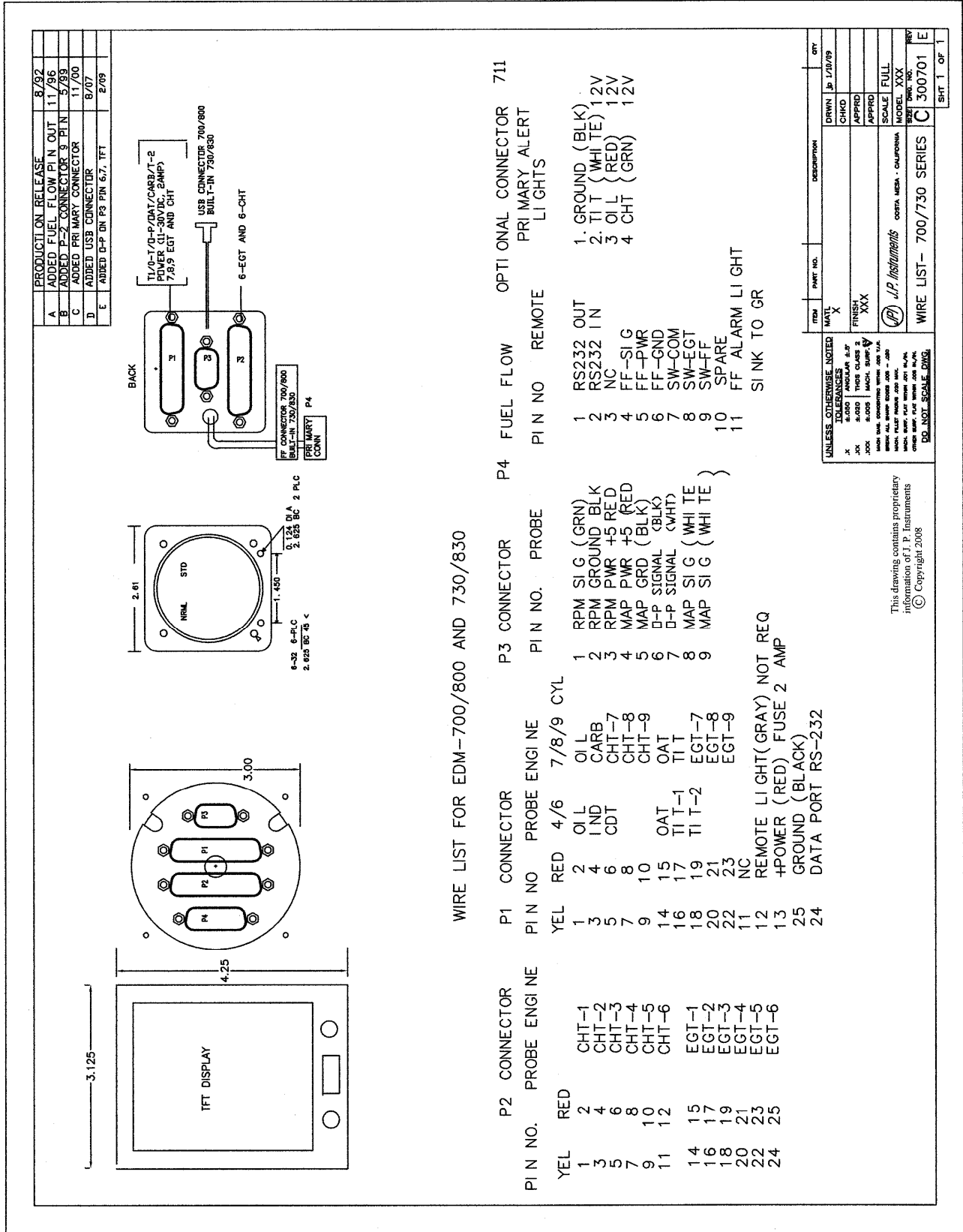


Fig 7

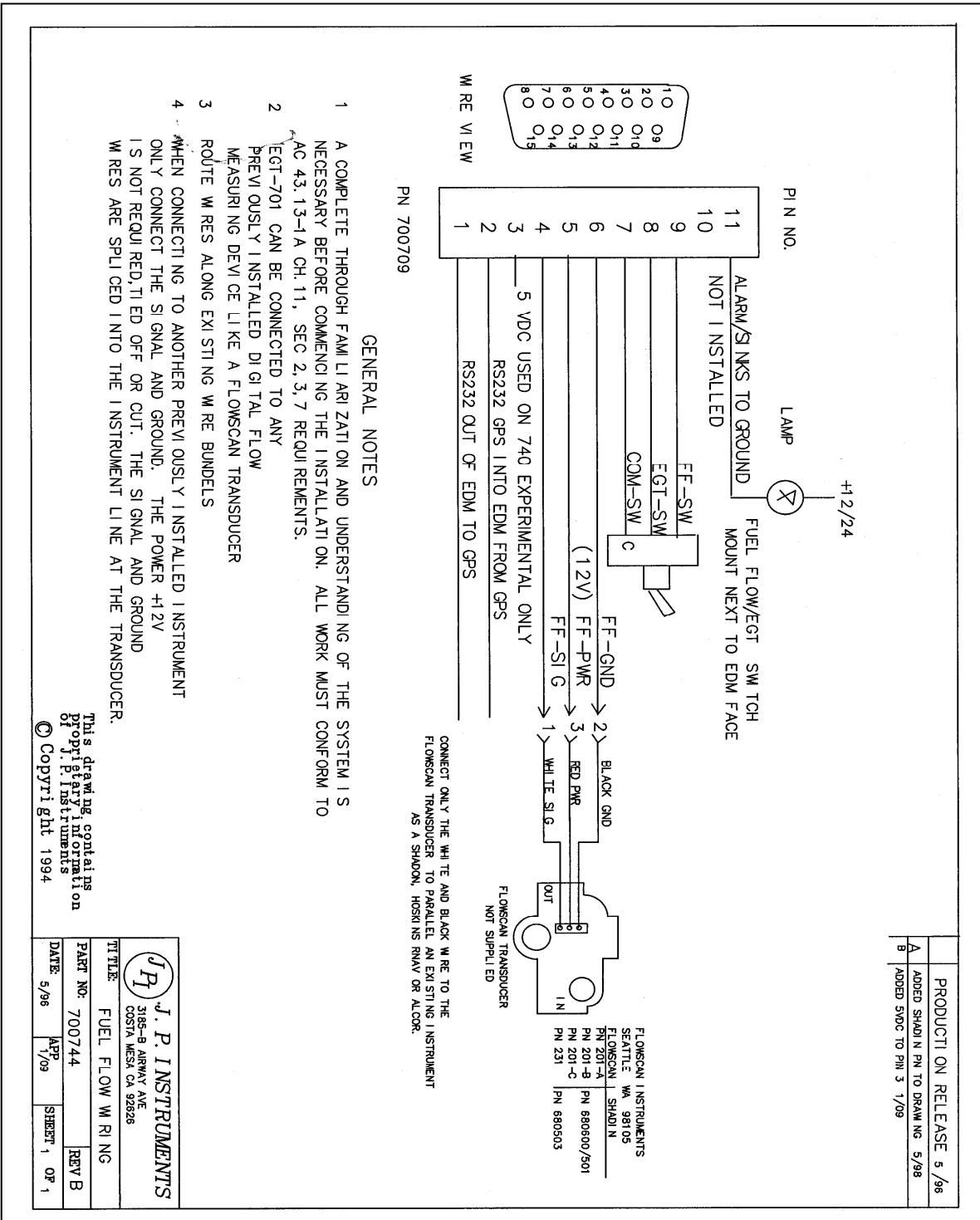


Fig - 9

Instructions for Continued Airworthiness (ICA)

There are no field adjustments and or calibration requirements for the EDM-700/730 series instrument after initial installation. ICA is not required. Maintenance of nonfunctioning or malfunctioning components is limited to removal and replacement of JPI factory supplied new or repaired components as described in the troubleshooting section of the installation instructions