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1) 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 is mounted a uniform distance from the exhaust stack flange. A nominal distance of 2 to 4 inches from the flange is recommended. (see fig-4). 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 where 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. Radial engines like Pratt & Whitney / Wasp should place the probes in the interconnecting exhaust stack (which is approximately 4 inches long) between the exhaust flange and the exhaust accumulator.

Insert the probe in the exhaust or previously drilled hole (see fig-5) so that the tip of the probe is in the center of the exhaust stream, and tighten the stainless steel clamp to a torque of 45 in/lbs.. Cut off the excess strap close to the screw.

2) Turbine Inlet Temperature Probe (TIT)

The standard TIT probe *PIN*M-111-T 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 waste gate side of the turbine. TIT will appear as EGT probe # 7 on six cylinder engines and as EGT probe #5 on four cylinder engines.

3) Cylinder Head Temperature Probe (CHT), Bayonet

Bayonet probe 5050-T has the adapter or threaded section as part of the probe. The bayonet probe has a screwdriver slot to facilitate tightening A drop of lubricant on the threads before installation will help.

NOTE:

Required original equipment that is Red Lined may not be replaced by the SCANNER 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. AC NO: 20-41A, Date 4/5/77, Subject: Substitute Technical Standard Order (TSO) Aircraft Equipment. This Advisory Circular states that TSO'd equipment may replace TSO'd Equipment. Copy available at JPI.

NOTE:

Most factory installed cylinder head temperature gauges utilize a bayonet or threaded resistive type probe that occupies one of the bayonet sockets. This probe is not compatible with the thermocouple probes required for the SCANNER.

4) Spark Plug Gasket CHT Probe

The spark plug gasket probe, *PIN* M-113, replaces the standard copper spark plug gasket on one spark plug in each cylinder. The plug chosen should be the one that receives the most direct cooling air for all Lycoming engines or top plug and the one that receives the least air or bottom plug for Continental engines. The plug gasket should be removed and replaced by the gasket probe. After many removals the probe may be annealed for re-use. Heat and quench in water.

5) Oil Temperature Probe

The Oil Temperature Probe *PIN* 400505-C,-L is installed as a supplemental oil temperature indicator. 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 present 1/8 NPT plug (see fig-6). 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 present 3/8 NPT plug (see fig-7). Oil temperature will be displayed on probe #7 for six cylinder engines and probe #5 for four cylinder engines. Instruments with CHT option will display oil temperature on the CHT channel. The original oil temperature gauge and sensor must remain operative. Check for oil leaks before first flight.

6) Outside Air Temperature Probe, OAT

The OAT probe, *PIN* 400510, is very similar to the conventional mechanical probe: now in use in many aircraft and will fit into the same hole. If no hole exist, a 5/16 hole will be required. It is recommended to place the probe in the airframe away from engine exhaust heat. If placed in sheet metal panel, a 2 inch square backing plate may be required for support. The outside aluminum tube is used to both hold the probe in place and shield it from radiated heat. The OAT probe is connected to EGT channel #7 or #5 for SCANNERS without TIT option. With TIT option on EGT channel #8 or #6.

7) Wiring (12 I 24 volt)

The EGT SCANNER will function on both 14 and 28 volt electrical systems. The SCANNER red lead is connected to the positive avionics buss through a circuit breaker of 3 amps or an in-line fuse of 1 amp. The black lead should grounded to the engine for accuracy. The EGT SCANNER does not require a separate switch, but one can be installed. No connection to the aircraft dimmer system is required because the instrument has its own dimming switch (See fig 8 to 12) for wiring details).

8) EGT and CHT Probe Wiring

The EGT SCANNER is supplied with special Teflon insulated Chromel Alumel type K wire. Each wire is cut to length as required. 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. 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.

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 insure it won't come out. The most common installation problems are poor quality terminations.

9) Routing the Wiring Harness

Route the thermocouple wires from the instrument through the firewall using existing rubber grommets and flame retardant silicone. Be sure to leave a small service loop at the instrument. 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. Secure thermocouple wire along the route to the indicator using original clamps, tape or tie cord if possible.

CAUTION: be sure the controls under the panel are not obstructed by the wiring.

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.

The probe wiring harness is made of Chromel-Alumel alloy wire that must not be substituted or extended with normal copper wire. The power and ground wire are normal copper.

10) Indicator Installation

Locate a 2.25 diameter hole in the instrument panel or cut one per fig-1, where you would like to mount the indicator. The SPACER, supplied, is for flush mounting of the instrument. Mount the indicator in the panel, with or without a spacer, using the four 6-32 X 1" screws supplied. Route the ground wire (black) to the airframe. The positive wire (red) with the in-line fuse should terminate on the instrument panel positive buss line. An optional switch may be mounted in line with the positive lead. The indicator is FAA TSO approved, as a temperature indicator under TSO-C43a Record the installation of the EGT SCANNER per **STC# SA 2586NM**. Make entry in the aircraft log book. FAA form 337 may be required.



Actual size

12) Instrument Operation

Upon firing up the engine the readings should reach 500.F 10 a matter of seconds.

- (M) **MANUAL**, when the toggle switch is in the (M) position the scanner will display whichever cylinder it was on when the switch was changed. To change the display press the STEP switch and the display will index. Normal leaning is accomplished on the leanest cylinder in the Manual mode. The leanest cylinder can be found by peaking each cylinder and noting its fuel consumption. The cylinder with the largest fuel consumption at its peak is the leanest.
- (A) **AUTOMATIC**, this switch position will scan all the cylinder probes every four to five seconds in a countdown (descending) order. Pressing the step switch, In the automatic mode, will index the unit 10 the next cylinder. Alarm only active in the Automatic mode.
- (D) **DIMMING**, is a press to change switch and has two levels Day and Night. It is located in the upper right hand corner of the unit.
- (c) A small **-c-** displayed in the first digit (c 3 7 0) indicates the unit is scanning Cylinder Head Temperatures.
- (.) A period in the second digit (1 . 4 5 0) with temperatures above 1000 F but less than 1990, indicates that, that cylinder has reverse polarity wiring (must be corrected). A display of (1.9 9 0) indicates that the temperature has gone beyond the normal range of 1999 F.
- (!) **TWINS ONLY** - A small light in the first digit (! 1470) before the temperature reading indicates it is scanning the **LEFT** engine
- (V) The voltage option will display **VOLTAGE** when the STEP switch is pressed in and held. Voltage readings are in tenths of volts.

13) Engine Operation

Operate and lean the engine in accordance with the manufacturer's recommendations for different power settings. Always lean to the cylinder that leans first as the mixture control is placed in the lean position.

14) Component Parts List for EGT Probe in poly bag

- 1 Thermocouple type K probe
- 1 Stainless Steel Cramp 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 Vinyl tube 1/2" X 4"

15) Component Parts list for CHT probe

- 1 Bayonet Probe Thermocouple type K Spring loaded
- 1 Or Gasket thermocouple probe type K
- 2 Ring Terminals
- 2 Screws and Nuts 6-32 X 1/4"
- 1 Vinyl tube 1/2" X 4"

16) Components Parts list for Oil probe

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

17) Components Parts list for OAT probe

- 1 PIN 400509, OAT probe
- 2 Ring Terminals
- 2 Screws and Nuts 6-32 X1/4"
- 1 Vinyl tube 1/2" X 4"

18) Component Parts list for Single Engine, EGT only kit

PN EGT-100-	1	-4	-6	-7	-8	-9	(C, O, A, T)
Temperature Indicator	1	1	1	1	1	1	
Spacer PN 5055	0	1	1	1	1	1	
EGT probe MM-111	1	4	6	7	8	9	
CHT probe with option C	1	3	5	7	7	9	
CHT gasket probe	0	1	1	0	1	0	
Oil probe with option 0	1	1	1	1	1	1	
OAT probe with option A	1	1	1	1	1	1	
TIT probe with option T	1	1	1	1	1	1	
Wire PN Wk-24 (8 ft.)	n/a						

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

PN EGT-100-	-4C	-6C	-8C	(O, T)
Temperature Indicator	1	1	1	
Spacer PN 5055	1	1	1	
EGT probe MM-111	4	6	8	
CHT probe PN 5050	3	5	7	
CHT Gasket probe M-113	1	1	1	
Oil probe with option O	1	1	1	
TIT probe with option T	1	1	1	

20) Component Parts list for Single Engine CHT only

PN CHT-100-	-4	-6	-8	(O, T)
Temperature Indicator	1	1	1	
Spacer PN 5055	1	1	1	
CHT Probe PN 5050	4	6	8	
Oil probe with option O	1	1	1	
TIT probe with option T	1	1	1	
Wire PN Wk-24				

21) Component Parts list for Twin Engine EGT only

PN EGT-200-	-4	-6	-8	(O, T)
Temperature Indicator	1	1	1	
Spacer PN 5055	1	1	1	
EGT probe MM-111	8	12	16	
Oil probe with option O	2	2	2	
TIT probe with option T	2	2	2	
Wire PN Wk-24	160'	240'	320'	

22) Weight and Balance Data

TSO C43a, Temperature Indicator	8.3 oz.
EGT probe MM-111	2.0 oz. each
CHT Probe and Adaptor	1.5 oz. each
Wire PN WK.-24	0.1 oz. per foot

23) Trouble Shooting

- **EGT, large span.**
Aspirated (carburetor) engines at normal cruise display a 100 to 175 o F spread between cyls. Injected engines at normal cruise display 50 to 80 o F spread between cylinders. All cylinders are measured by a common circuitry. It is almost impossible to not have identical calibration on all channels.
- **Having problems with one cylinder reading ?**
Swap probe with a good cylinder probe. If the problem goes to the good cylinder the probe should be replaced. If the problem remains the same, it is in the hookup wiring at the instrument. Look for strands from one lead shorting to the next terminal. Look for the wire to be shorting to the airframe.
- **Using an Ohm meter** or continuity checker measure across the probe output leads. A good probe should be low ohms (2 ohms).
- **A dot (.)** in the temperature display (**over 1000 F**) after the first digit like 1.370 F means the hookup wire leads are reverse polarity (Red/Yellow) at the instrument or probe.
- **A steady reading of 90 to 170 F** on only one cylinder indicates the probe is not connected or it is open.
- **If the temperature is changing** more than 500 F in one second it should not be trusted and a loose wire crimp or probe should be suspected.
- **EGT or CHT readings seem to High or Low** or Unsteady. Use a DVM (digital voltmeter) to measure the difference between SCANNER ground and the engine block ground. If the difference is greater than 0.5 volts with the alternator charging. Then remove the SCANNER ground (Black wire) from the instrument panel and connect it directly to the ENGINE BLOCK for GROUND.
- **CHT REVERSE POLARITY** will show up in the Display by causing the small "c" to change to a small "o". Check TC wire color code. When the engine is first started the CHT temperatures will go down to zero and then start up.
- Make sure the Instrument is grounded at the engine for single engine installations

FIG-1 Instrument Panel Cut-out

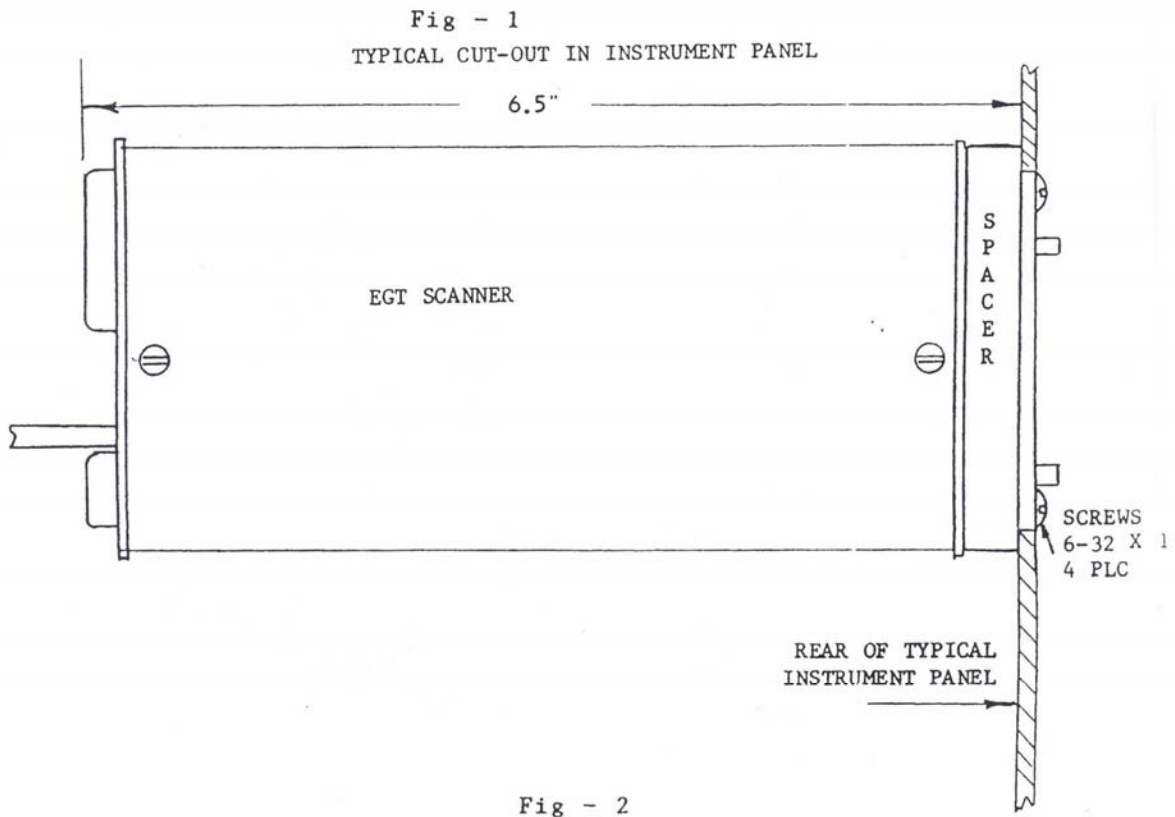
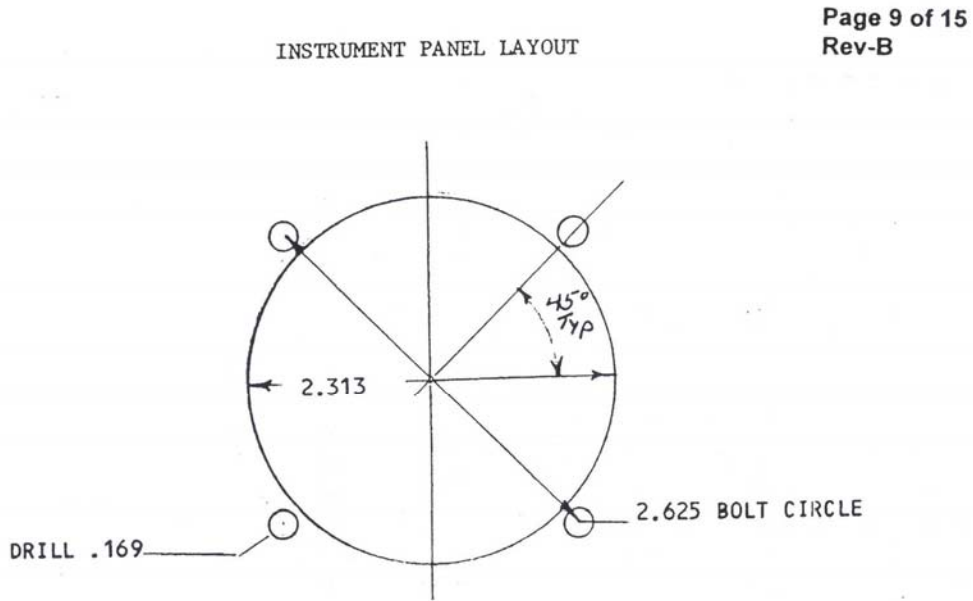
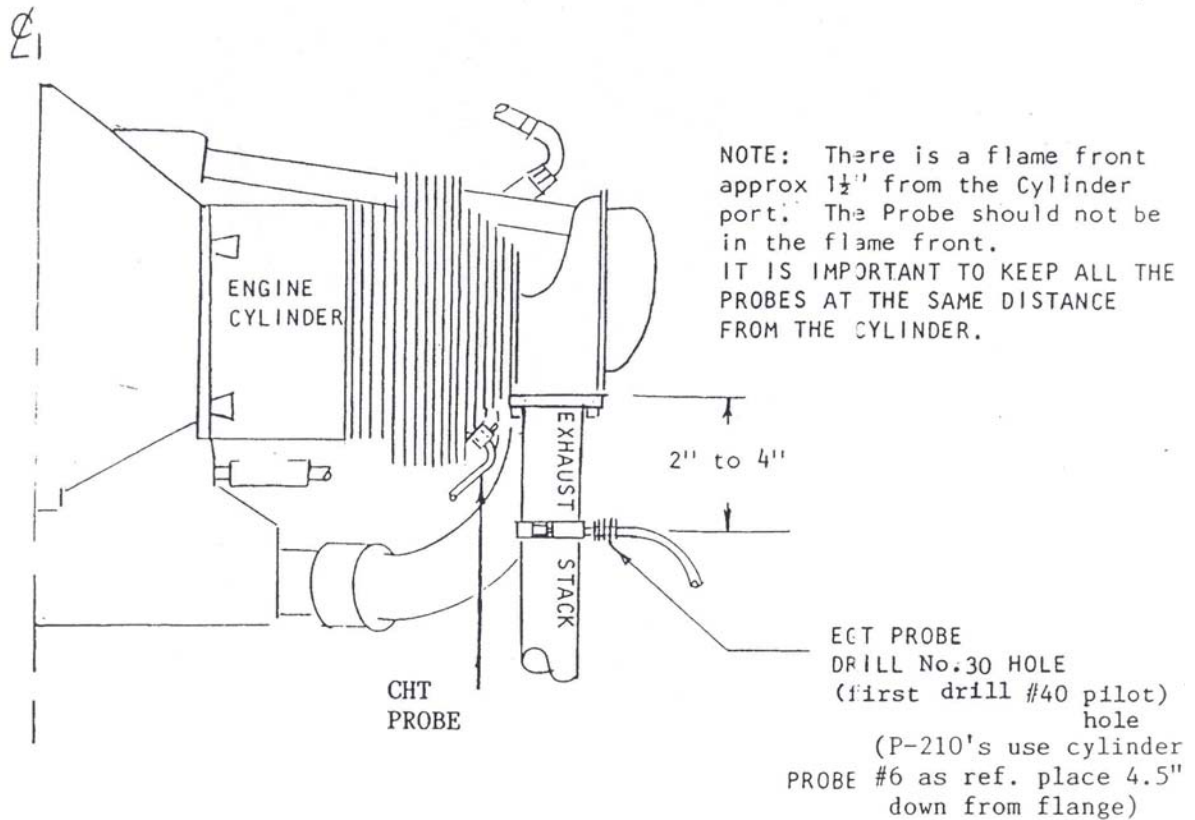


Fig - 2
SCANNER MOUNTING TO INSTRUMENT PANEL

FIG-4 EGT/CHT Probe Placement



EGT - CHT PROBE LOCATION

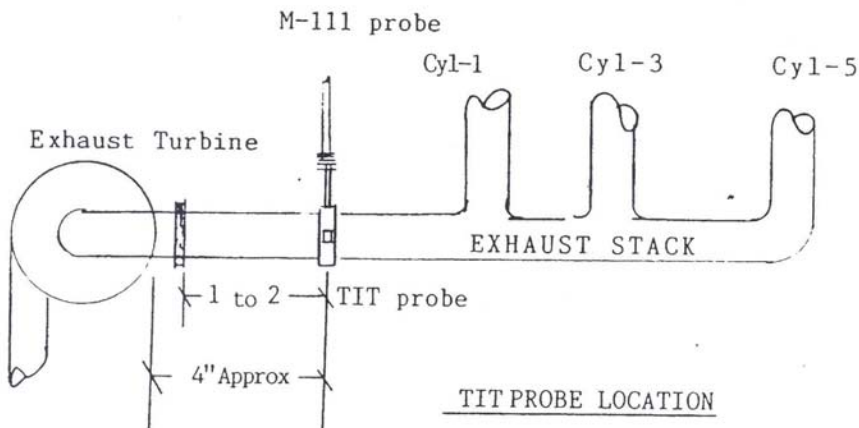


FIG-2

FIG-5 Probe Installation Instructions

The K/MM-II1 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.

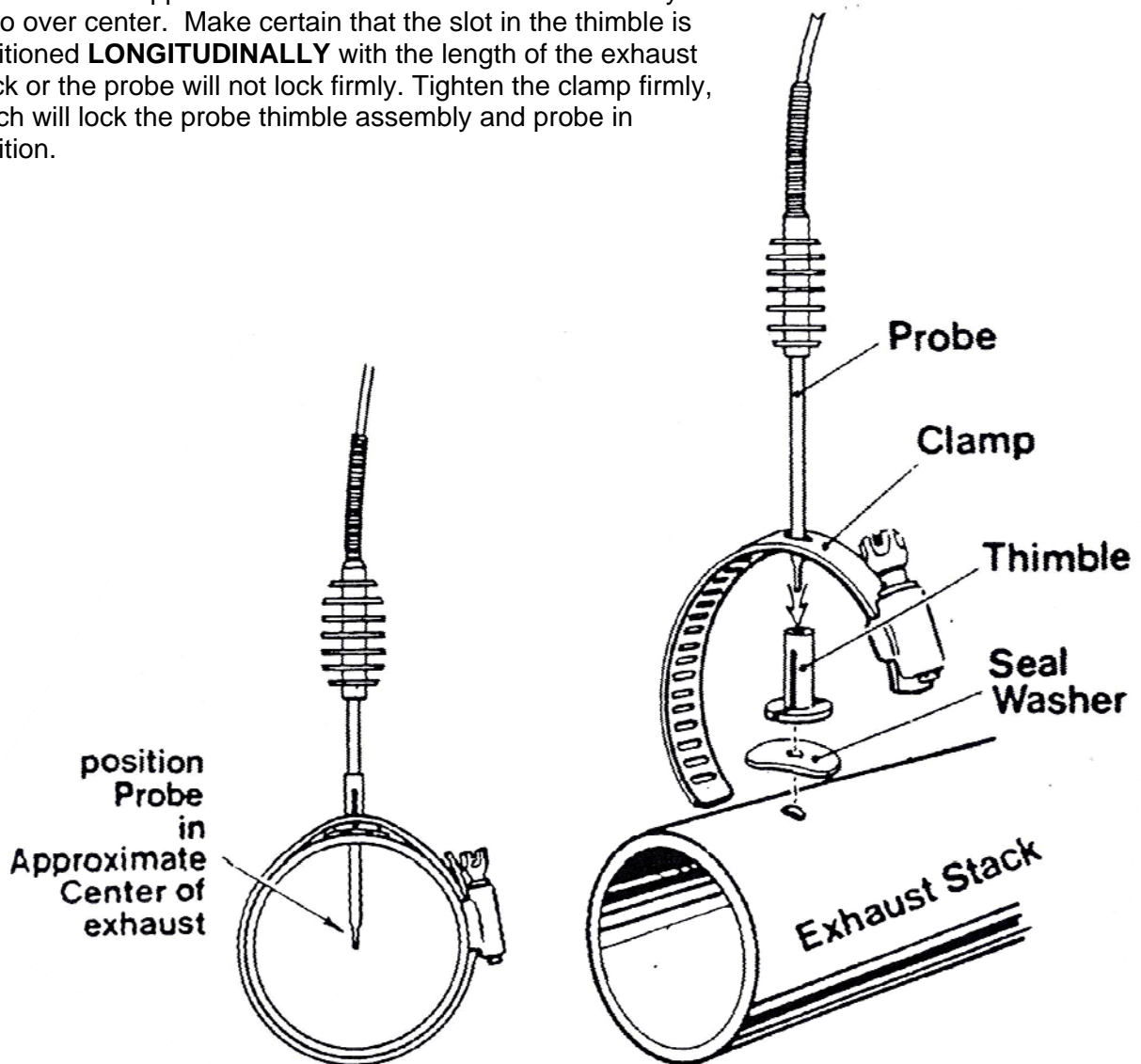
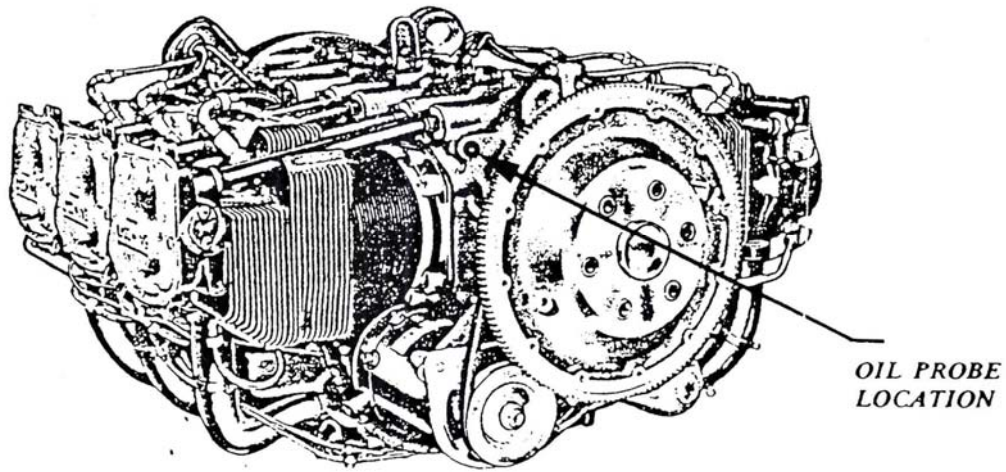


FIG-6 Oil Probe Placement for Lycoming



The oil probe, P/N 400505-L, is installed by removing the 1/8 inch pipe plug located on the front, passenger side of the engine (see diagrams this page) and inserting the JPI probe supplied with the kit. The probe leads are routed back to the cockpit

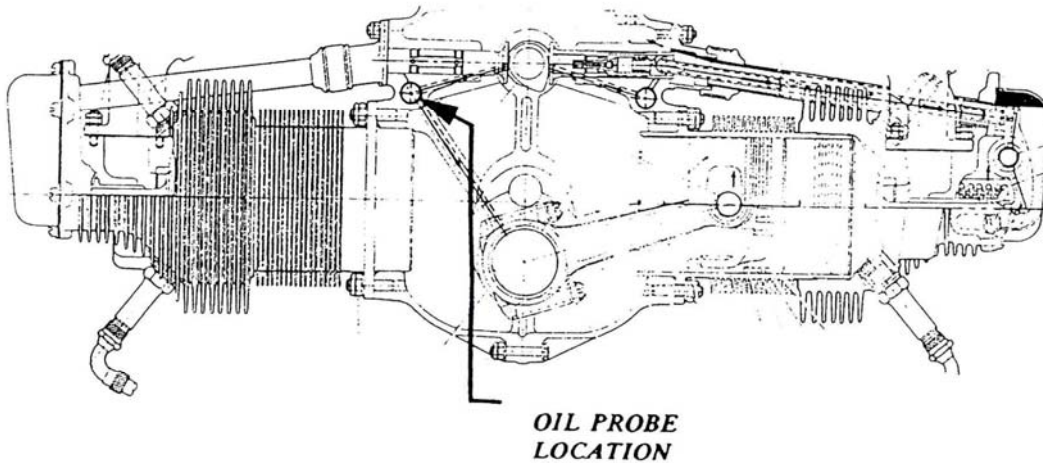
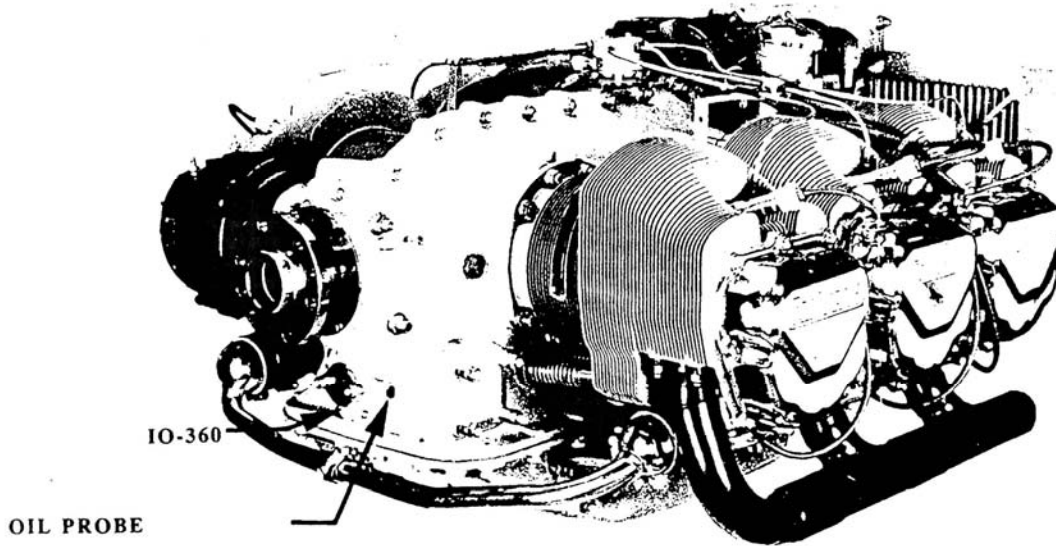


FIG-4

FIG-7 Oil Probe Location for Continental



The oil probe, P/N 400505-C, is installed by removing the 3/8 or 1/8 inch pipe plug located on the front, pilots side of the engine (see diagrams this page) and insert the JPI optional 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 probe wires. The oil probe should be terminated on terminal CHT #7 for 6 cylinder and CHT #5 for 4 cylinder engines.

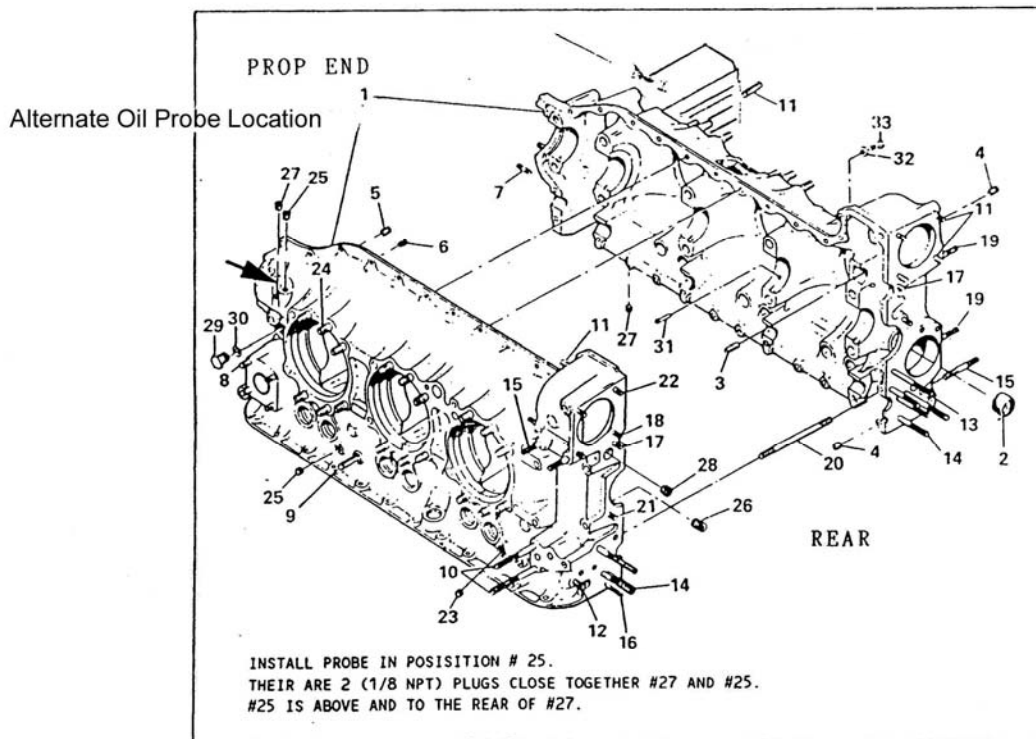


Fig 5

FIG-9 Wiring Diagram for EGT/CHT

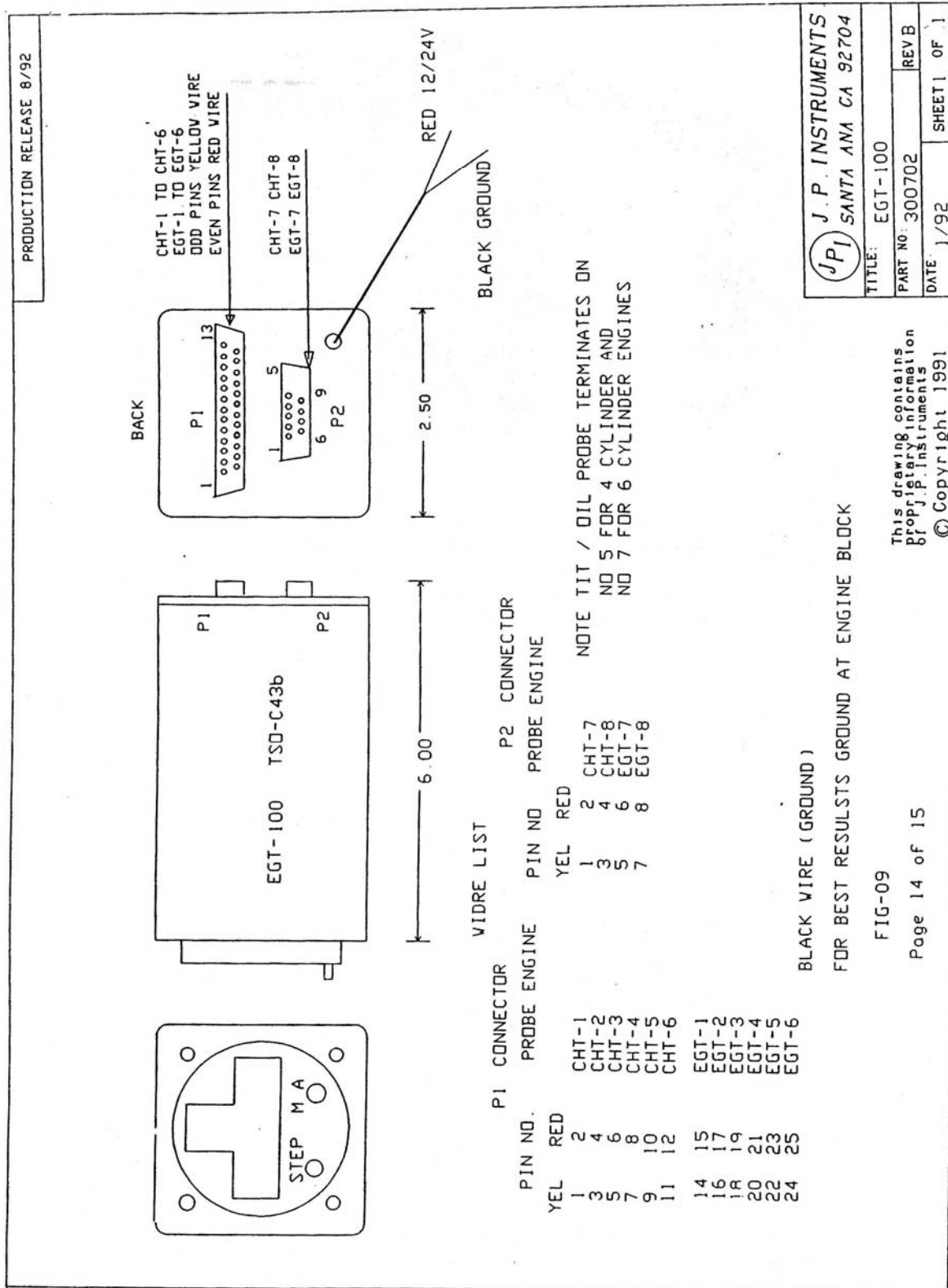
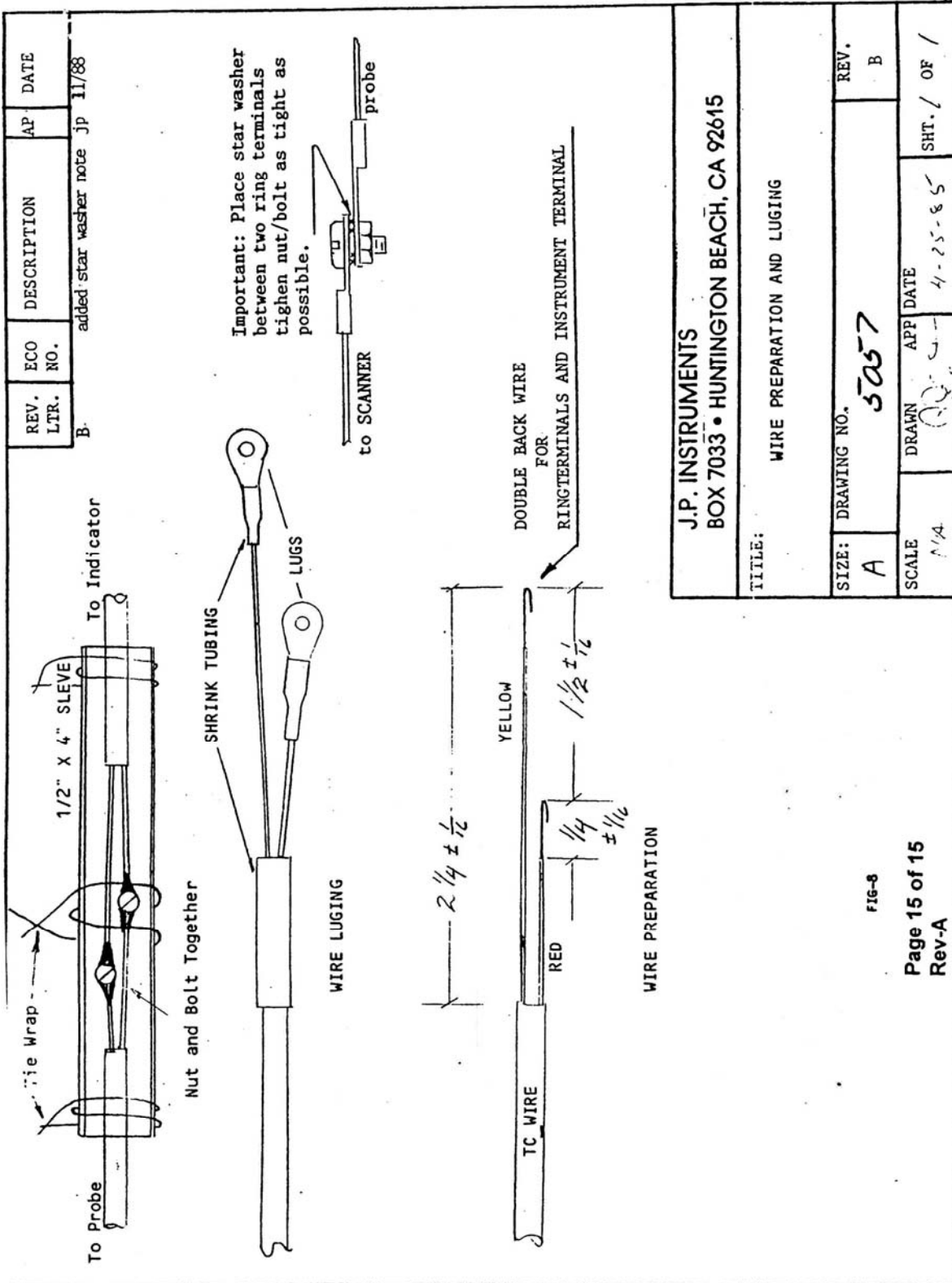


FIG-12 Drawing 5057 - Wire Preparation



REV. LTR.	ECO NO.	DESCRIPTION	AP	DATE
B.		added star washer note	jp	11/88

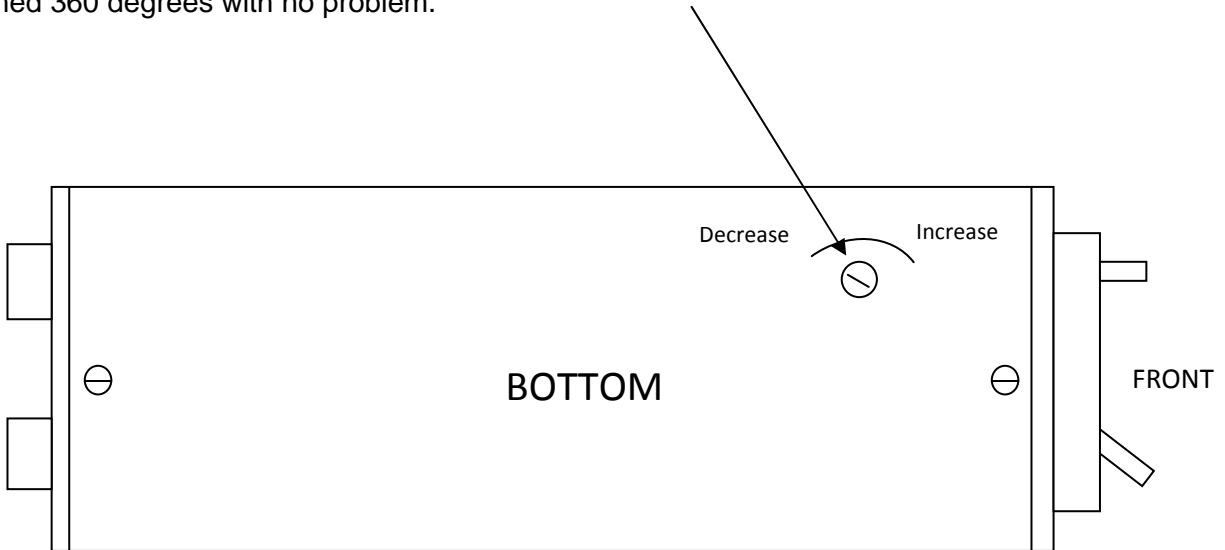
J.P. INSTRUMENTS BOX 7033 • HUNTINGTON BEACH, CA 92615				
TITLE: WIRE PREPARATION AND LUGGING				
SIZE: A	DRAWING NO. 5057	DRAWN	APP DATE	REV. B
SCALE 1/4			4-25-85	SHT. 1 OF 1

FIG-8

Appendix A

Instrument Programming

Insert a small slotted (-) screw driver with a blade of .1" (2.5mm) wide into the program hole. When the screw driver engages the program switch rotate it. Clock wise to increase and counter clock wise to decrease number. This can and should be performed while the instrument is "on". One should see the number change as the screw driver is turned. The program switch can be turned 360 degrees with no problem.



Perform this operation to increase or decrease the number of probes that are scanned. This will change the "CYL" maximum number for both EGT and CHT.