

# Tetra II / Hexad II

EGT & CHT MONITORS

**KSA**

## EFFICIENCY AT YOUR FINGERTIPS

**4 or 6 CHANNEL ANALOG  
DISPLAY TRACKS  
COMBUSTION PROCESS IN  
ALL CYLINDERS  
SIMULTANEOUSLY**

**LEAN IT RIGHT  
THE FIRST TIME**

**EASY MONITORING—INSTANT  
ENGINE DIAGNOSIS**

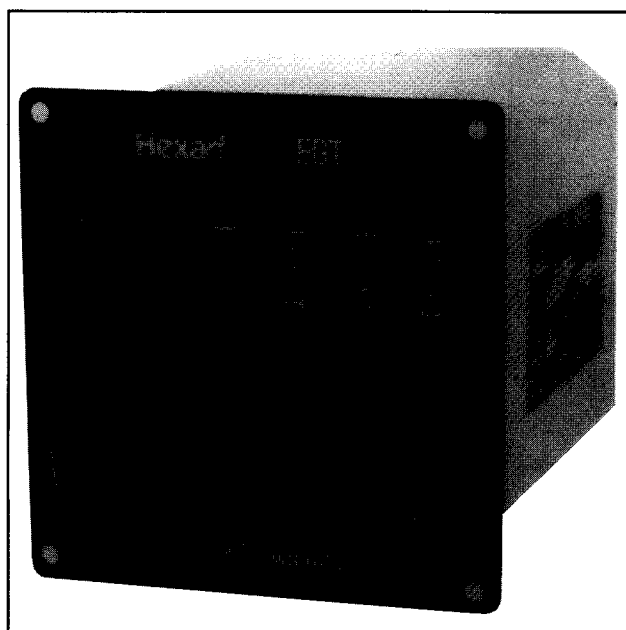
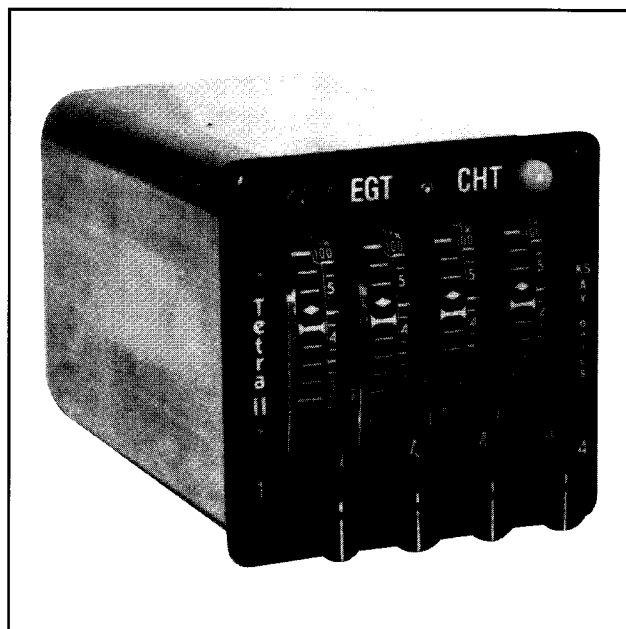
Mixture control is only a part of Tetra and Hexad's capabilities! Unique expanded EGT scale control, proven with thousands of KS Avionics' "Mixture-Mizer" customers since 1967, allows all the pointers to be aligned in flight. Changes are instantly apparent. Combustion problems are revealed immediately. You no longer have to turn a switch when a problem occurs, you have the full picture instantly.

**EXCLUSIVE CHILL RATE  
ALERTING—INDICATES DAMAGING  
CYLINDER COOLING**

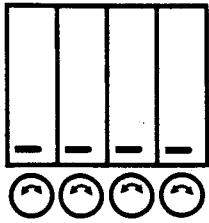
KS Avionics includes this valuable feature with feature with CHT monitoring of all cylinders. The pilot selects EGT or CHT for display at the flick of a switch, but is continually alerted to any high CHT **and** excessive cylinder cooling rate. This advance in engine monitoring gives pilots, for the first time, automatic warning of improper engine operation in most flight regimes.

**INFINITE RESOLUTION  
ANALOG METERS**

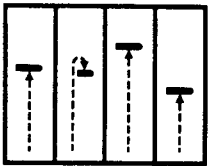
Allows you to precisely lean to any point on the rich **or lean** side of peak EGT.



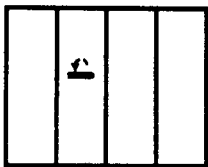
EASY FOUR STEP LEANING OPERATION:



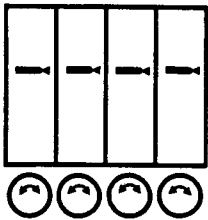
Align the EGT monitor pointers low on the scales using the control knobs.



Lean the mixture. All the pointers should rise. The first pointer that reverses is that for the leanest cylinder. In this case cylinder #2.\*



Use that pointer for the final adjustment, 0-50 deg. rich of peak EGT or lean of peak EGT if your engine manufacturer sanctions operation in this range.



Align the pointers over the  $\blacktriangle$  symbol and enjoy your flight. Changes in the EGT on any cylinder are easily noted.

\* In this example cylinder #2 is shown to be the leanest. In practice it could be any of the cylinders, and NOT NECESSARILY THE HOTTEST. Ideally all the pointers would reverse together at the same mixture setting, unfortunately this is the rare case.

TETRA II/HEXAD II- EGT AND CHT MONITORING ON EACH CYLINDER

These "top of the line" systems include CHT monitoring for each cylinder and a switch for displaying either EGT or CHT on the dual scale meters. Green and red bands can be provided on the CHT portion of the scales. A high CHT on any cylinder will activate an alert light on the gauge and a high cylinder cooling rate will pulse the light. The self test button on the unit will slowly "run up" the meter needles tripping the high alarm. High CHT and cooling rate trip levels may be readily adjusted.

TETRA/HEXAD - EGT ONLY

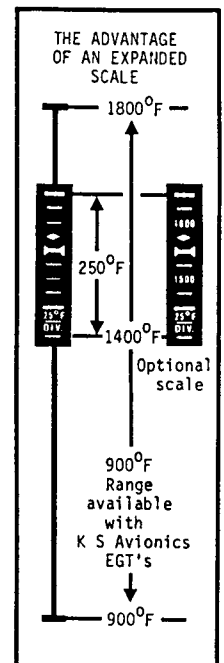
Fewer bells and whistles, but continuous EGT monitoring on all cylinders

THE EXPANDED SCALE AND CONTROL KNOB:

A brief explanation of the functioning of this method of exh. gas temperature monitoring will illustrate its versatility and give some idea of the many ways it can be put to use.

On each channel, the sensitive 250 deg. F. scale range may be shifted with the control knob to monitor temperatures ranging from 900 - 1800 deg. F. When the knob is turned clockwise, it raises the pointer (effectively lowering the scale, see diagram at right) thus allowing lower temperatures to bring the pointer on scale. You can easily trouble shoot ignition problems at low RPMs.

By aligning the index lines on the knobs parallel, the true differences in EGT between cylinders are displayed. With the index lines vertical, the scales are calibrated from 1400 to 1650 deg. F., optional scales showing absolute numbers can be provided. Alternatively the knobs may be turned relative to one another until all the pointers are in line on the reference marks  $\blacktriangle$ . Later changes are easily detected. It is this feature that makes TETRA and HEXAD EGT indicators unique. The pilot does not need to remember a pattern of EGT readings for all the cylinders to detect changes in flight.



USE ON TWIN ENGINE AIRCRAFT:

Switching is available for use of a single TETRA II or HEXAD II on a twin. In cruise half the cylinders on each engine may be selected for monitoring EGT & CHT, or all cylinders on either engine can be selected for leaning and fault analysis. This switch arrangement also applies to TETRA and HEXAD.

SPECIFICATIONS:

Indicator size: TETRA/II-Fits std. 3 1/8" hole, or octagonal hole 2.5" wide X 2.5" high, case size 2.5" sq., 3.75" long, both rear mount.

HEXAD/II Fits std. 3.4" ARINC cutout, case size 3.2"sq., 3.5"long, front or rear mount.

TETRA II and HEXAD II require remote amplifier 5.75"X6.625"X0.90".

Power required: 14V, 90ma. max. or 28V, 120ma. max.

Weight: TETRA - 1.6 lb. TETRA II-2.5 lb.  
(total system) HEXAD - 2.2 lb. HEXAD II-3.4 lb.

These units are fully compensated for changes in cockpit temperature (-30 deg.C. to 50 deg. C.) and meet the performance specifications of TS0 C43.

**WARRANTY: Indicators warranted against defects for life.  
Two years or 1000 hours, all other parts**

TETRA II AND HEXAD II OPERATING INSTRUCTIONS

CYLINDER HEAD TEMPERATURE INDICATION:

The TETRA II and HEXAD II are equipped with a toggle or slide switch centered above the indicators. In the right "CHT" position these gauges indicate cylinder head temperature, in 100's of degrees F on the right side of the scales. In the left "EGT" position, the indicators monitor exhaust gas temperature as outlined on the reverse of this instruction sheet. The markings on the left of the scale are to be used.

CYLINDER HEAD OVER-TEMPERATURE ALERTING:

The TETRA II and HEXAD II monitor CHT regardless of the position of the selector switch. The yellow alert light will come on when the CHT of any cylinder exceeds a set temperature. This temperature can be checked by putting the selector switch to "CHT" and pressing the red test button. This causes the pointers to slowly rise. The level of the highest pointer when the light comes on is the trip temperature.

- \* The trip temperature can be adjusted by taking a small jeweler's screwdriver and turning the small screw (clockwise to increase) in the hole to the left of letters "EGT" on the faceplate. Press the test button to check the new level (selector switch in "CHT" position). Pressing the test button with the selector switch in "EGT" position will cause the pointers to rise but will not damage the instrument.

CYLINDER HEAD RAPID COOLING ALERTING:

The yellow alert light will pulse when the cylinders are being cooled faster than a preset rate. From our consultation with the flight test department of a major aircraft manufacturer we have reached the conclusion that a cooling rate more than 40 degrees F per min. is excessive and can result in cumulative cylinder damage, especially if occurring at high CHT levels. With this instrument, pilots can be made aware of and modify operating procedures which result in too rapid cooling. It should be pointed out that the landing portion of a normal flight profile can result in cooling rates of more than 40 degrees F/min., i.e. if it is necessary to throttle back to idle on final approach. At this point in the flight, the CHT should be brought to as low a level as possible by successive power reductions so that the cooling rate, on throttling to idle, is as low as possible.

- \* The cooling rate, at which the alert will trip, can be adjusted with the engine at ambient temperature and the master switch on by taking a small jewellers screwdriver and turning the small screw head in the hole above the number "4" on the TETRA or below the "5" control knob on the HEXAD. This screw is to be turned slowly counter-clockwise until the alert light flashes, then after a 5 second wait, slowly clockwise until the light stops flashing and then continuing a measured amount beyond this point. Three clockwise turns will increase the trip rate one degree F per second, a trip rate of 40 degrees F/min. is thus achieved by two clockwise turns.

The alert light will pulse on initial turn-on of the master switch and continue thirty seconds more or less depending on initial engine temperature and how fast CHT rises after start up. The pulsing on the powering-up of the instrument serves as a functional check of the rate alerting circuitry as it is not exercised by the test button.

The TETRA C and HEXAD C models operate as outlined above but only the single right hand indicator is controlled by the selector switch.

- \* On units with remote circuit box, P/N A920 these controls are accessible thru box cover.

EGT OPERATING INSTRUCTIONS FOR ALL TETRA AND HEXAD MODELS

GENERAL: The Tetra and Hexad EGTs give a complete and instant picture of the EGT on all cylinders. They eliminate the uncertainty inherent in the use of a single probe, or even a switched probe EGT, to adjust mixture as they show the leanest running cylinder each time the mixture is leaned.

USE OF THE CONTROL KNOB: The purpose of the control knobs is to allow a wide range of temperature to be displayed on the sensitive 250°F scale, and to set the pointers for leaning and cruise monitoring (see below). The pointers can usually be brought "on scale" from a fast idle to runup power by turning the knobs fully clockwise. If the pointers go off the top of the scales, they can be brought down onto the scale by turning the knobs counter-clockwise. Setting the index lines on the knobs parallel will show the true differences in cylinder EGT. Adjusting the indexes vertical sets the bottom of the scale at 1400°F and the top at 1650°F for absolute EGT indications.


MIXTURE ADJUSTMENT: The use of the Tetra and Hexad EGTs for mixture adjustment is exactly as detailed in the basic Mixture Mizer operating instructions. The steps listed below ensure that the leaning procedure is always applied to the leanest cylinder. Experience may dictate variations on the procedure outlined here but an approach that works well is as follows;

1. Turn the knobs as necessary to align the needles with each other near the bottom of each scale.
2. Begin leaning the fuel mixture, the needles will begin to rise roughly in unison and will stay grouped together until one stops rising and falls behind the others. This is the leanest cylinder. Stop leaning after the leanest cylinder needle has fallen slightly.
3. Very slowly richen the mixture until the leanest cylinder's EGT peaks, note where the peak has occurred and then adjust 0° - 50°F rich of peak or lean of peak according to the engine manufacturers instructions.
4. Align the needles on the reference graduation (▶◀) and press the red button to extinguish alarm lights tripped in the steps above (Hexad A).

ENGINE FAULT DETECTION: In cruising flight with the needles aligned, any deviation between cylinders will become apparent. If a difference is noted as the flight progresses the first problem to be suspected is carburetor or induction system ice so apply heat and see if the difference is gone after the heat is removed.

Other faults and their effect on EGT readings are discussed on the MIXTURE MIZER analyzer operating supplement instructions also enclosed.

INSTALLATION INSTRUCTIONS  
TETRA II / HEXAD II

1. Locate the EGT probes, P/N A002B, not less than 2" or more than 6" below the exhaust stack attachment flange. 3" to 4" is optimum, and try to mount all probes equal distance from exhaust flanges. On curved stacks, assume probe tip is on stack centerline for determining distance to exhaust flange. Carefully center punch the probe hole locations such that the portions of the probes external to the exhaust pipes will not interfere with any parts of the engine or cowling. Drill holes with a #30 drill.
2. Carefully insert probe and clamp snugly with screwdriver.
3. Install CHT probes, P/N A602B, in threaded wells on cylinders. Torque probe bodies to 25-30 inch pounds. On a cylinder where the well is taken by an existing, required CHT probe, install probe, P/N A602G, in place of the spark plug gasket and torque plug to engine manufacturer's specification.
4. Connect the EGT and CHT probes to the extension leads, P/N A003, and fasten the extensions to the engine by means of clamps held by valve cover screws or by tying the extensions to intake tubes. If the extension goes up to a valve cover, provide some slack for a "drip loop" (  ) so that oil and engine cleaning solvents will drip off probe lead and not run into the end of the probe. It is important that the probe lead or extension wire be first clamped or tied to the engine before being tied to the engine mount or airframe, to keep "working" of the probe lead as it comes out of the body to a minimum. AVOID CONTACT OF LEADS WITH CYLINDER HEADS OR EXHAUST PIPES. USE SLEEVING OVER LEADS IF TYING TO IGNITION HARNESS If leads can not pass through firewall with other wiring, drill a 3/8" hole in firewall and use a neoprene grommet for each 4 or 6 leads, seal with MIL-P-8116 sealing compound.

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5. Mount indicator, A901-4(\*) or A901-6(\*), in a convenient location on the instrument panel. Use the template provided if required. Mounting the indicator on the right side of the instrument panel may be an advantage because the vertical dials do not suffer parallax, and the apparent distance between the dials is reduced making cylinder to cylinder comparisons easier.
6. Mount Amplifier, A920-4 or A920-6, within 30 inches of indicator, unless a special length cable from the indicator has been ordered. Secure amplifier with #6 machine screws. It is best to mount the Amplifier in cockpit environment. Mount amplifier away from blasts of hot or cold air.
7. Wiring amplifier:

The 5 wire AMP plug attaches to the 5 pin header on corner of amplifier and is wired to the aircraft as follows:

RED wire -----Power, 14 or 28 volts DC

There is a 1 amp fuse on the amplifier circuit board under the aluminum cover.

BLACK wire -----Ground

ORANGE wire -----Auxiliary alert +

GREEN wire -----Auxiliary alert -

Output of auxiliary alert 20 ma. maximum, voltage same as aircraft supply. Alert terminates after 3 to 4 seconds.

VIOLET wire -----Alarm kill

If use of radio transmitter sets off the CHT alarm, connect this wire to microphone key connection (tip of microphone jack).

Refer to page 3 for the reminder of the connections to the amplifier.

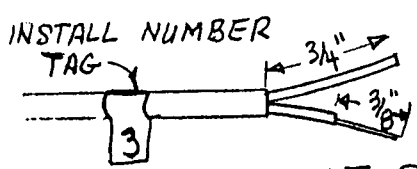
8. After a few hours use, tighten the EGT probe clamps, as the brass adapter will seat and slightly loosen the clamp on first use.

\* Denotes lower limit of red range on CHT scales of indicator: "A" 392°F, "B" 460°F, "C" 475°F, "D" 500°F, "E" 525°F. Insure that color ranges on indicator installed are appropriate for aircraft.

INSTALLATION INSTRUCTIONS REVISION D  
TETRA II HEXAD II

AMPLIFIER (P/N A920-4 OR A920-6) WIRING

TRIM EACH EXTENSION TO APPROPRIATE LENGTH, CALIBRATION OF INDICATOR IS NOT EFFECTED

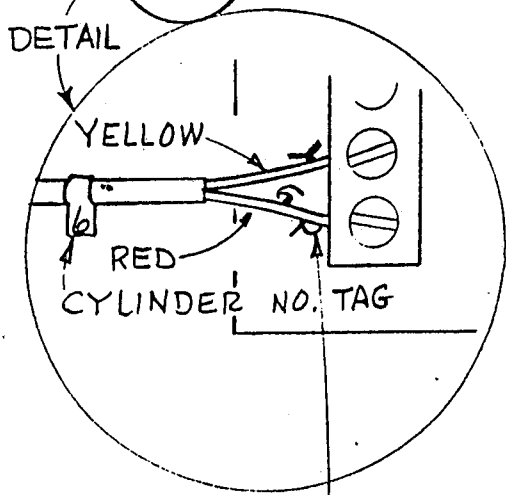
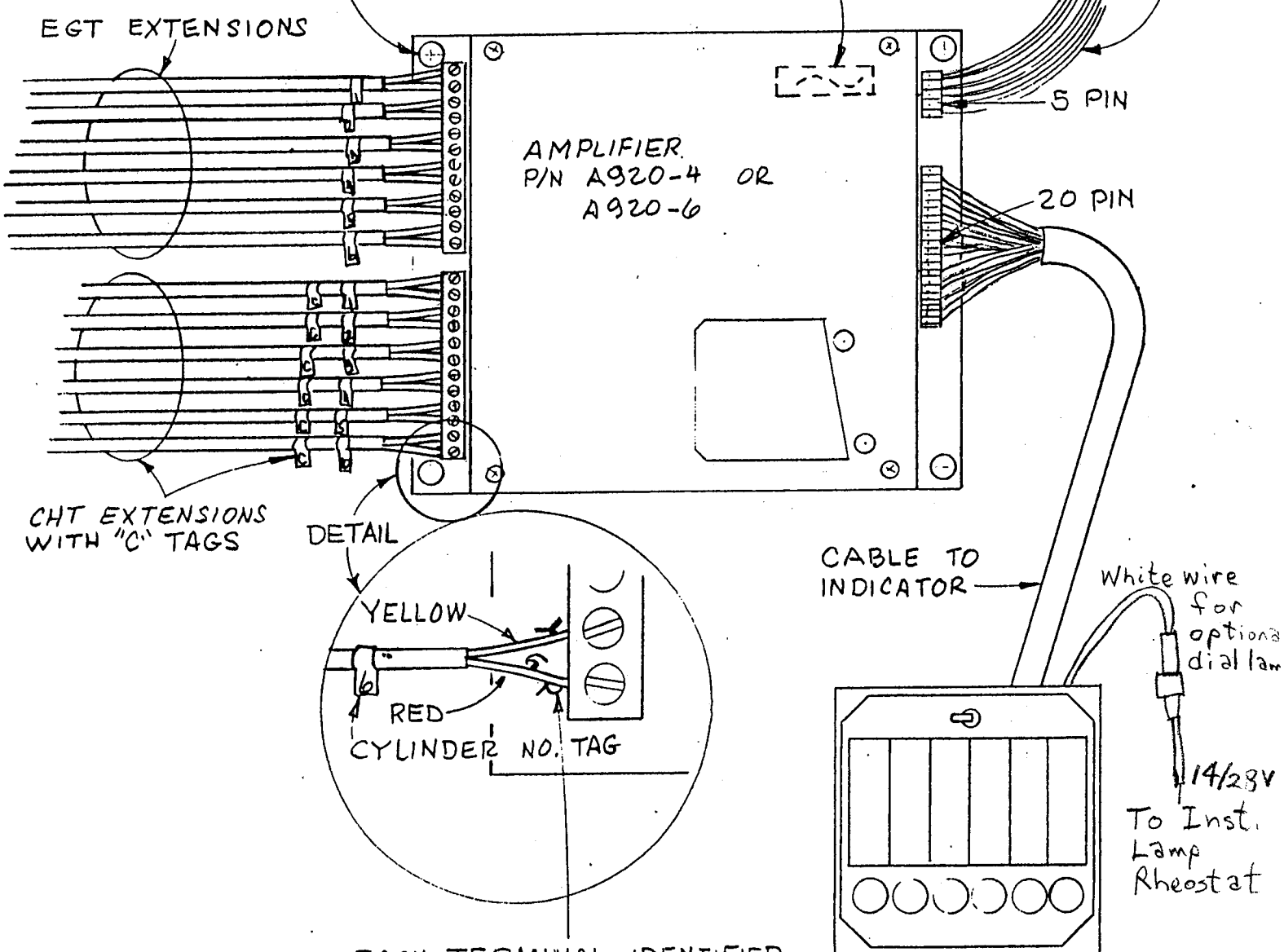


STRIP TEFLON JACKET 3/4", STRIP EACH LEAD 3/16", AND FOLD EXPOSED WIRE BACK ON ITSELF.

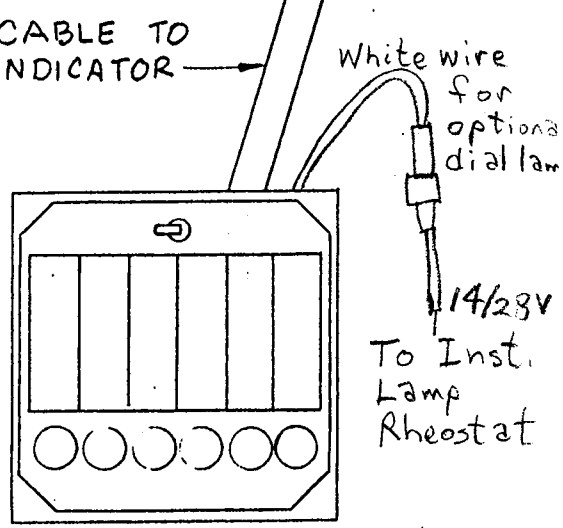
MOUNT BOX WITH 2 OR MORE #6 SCREWS ON CORNERS

1 A. FUSE UNDER COVER HERE

LEADS ON POWER HARNESS CONNECTED AS ON PAGE 2, PARA. 7



EACH TERMINAL IDENTIFIED ON CIRCUIT BOARD EDGE AS TO CYLINDER NO. AND WIRE COLOR (YELLOW OR RED).



INDICATOR P/N A901-4(T), TETRA II A901-6(\*), HEXAD II

(\* ) DENOTES LOWER LIMIT OF RED RANGE ON CHT SCALE OF INDICATOR : (A) 392°F, (B) 460°F, (C) 475°F, (D) 500°F, (E) 525°F.