PLASI 2000

Pulse Light Approach Slope Indicator

OPERATION
& INSTALLATION MANUAL

Manual Number PLG002 12 October 2004

APPLICABLE TO
DA500099-1, DA500099-2
PLASI 2000 SYSTEMS

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SECTION I - INTRODUCTION

1.0 Receiving Your System

Thank you for purchasing DeVore Aviation's state-of-the-art single box aircraft visual approach aid. Upon receipt of the PLASI 2000 system, please inspect all containers and parts for shipping damage. Report any shipping damage to the carrier and file the required claims. Review packing slips and contents to ensure all components of the system have been received. A copy of the manufacturer's acceptance testing for the system should be included with the paper work. Contact DeVore Aviation Corporation of America, Product Support Dept., immediately if any components are missing or if you have any questions regarding the installation or operation of your PLASI 2000 system. Use the contact numbers and addresses on the front of this manual.

1.1 Purpose

This document contains the information necessary to install and operate the PLASI 2000 visual approach aid. The installation and operational information herein covers the fixed leg installation for single approach path airports.

For service and maintenance information, refer to the Service, Maintenance and Illustrated Parts Manual, Number PLF002**.**

Some installation details are left to the judgement of the installer, since local conditions, space limitations, obstructions, type of airports, and local codes are significant factors. Local electrical codes, length of power lines, desired location of outlets, etc., are items of an individual nature which can only be described in a general way. It is the responsibility of the installer and airport operator to ensure that all local and country codes and regulations are complied with.

1.2 Description of System

The PLASI 2000 is a single box, ground installed, self-contained device which, without any aircraft installed devices, projects a signal for vertical glide path information including on-glide path, high and low signals, providing obstacle clearance and reduced noise approaches. The pilot receives this information with minimum need for analysis and interpretation.

The range of the PLASI 2000 provides for an easy aircraft adjustment to a steady state glide path position for a desired touch down at the airport.

1.2.1 Single Approach Path - Fixed Legs System

Due to prevailing winds, location and heights of buildings and other objects in the area, or for environmental considerations, there may be only one approach / departure path for a airport. For a single approach path installation, the PLASI 2000 unit is mounted on fixed legs. Each leg contains a frangible fitting designed to break away and minimize damage to an aircraft that may strike the unit.

1.2.2 Projection Signal

From the landing pilot's view, the PLASI 2000 generates and projects four horizontal bands of light, only one of which can be seen by the pilot at a given instant . Both the upper and lower bands are pulsing bands created by the unit's pulse generator system. See Figure 1 & Figure 2.

Above Glide Path:	An upper band of white light pulsing at approximately 2.25 pulses per second is an angular wedge 2.5° high by 16° wide which gives above glide path indication. The apex of the projected wedge emanates from the PLASI 2000 unit.
On Glide Path:	The center band is a steady white light projected as a 0 .35° high angular wedge, by 16° wide. This center band defines the correct glide path.
Slightly Below Glide Path:	In between the steady white on glide path signal and the pulsing red below glide path signal is a solid red sector of 0.175° height by 16° width. This is the slightly below glide path signal.
Below Glide Path:	A lower band of pulsing red light projects a 2.5° vertical by 16° wide wedge and provides the below glide path information.

The visual presentation is accomplished through the use of optical components, moveable shutters, a red filter and a tungsten halogen projector lamp. The rate of change of pulse length provides rate of deviation from or rate of closure with the glide slope.

1.2.3 Failsafe Systems

The PLASI 2000 system is a "failsafe" design which ensures that any malfunction of the beam projection system will not result in an incorrect signal being displayed to approaching aircraft.

There are three potential failure modes of the projected signal.

The first is loss of power to the unit or the projector lamp, which will result in complete loss of signal with no hazard.

The second is failure of the pulse generator drive system and resulting loss of one or both pulse signals. This type of failure will be detected by electronic sensors (pulse detectors) and the unit will shut down, resulting in complete loss of signal with no hazard.

The third failure is if the unit is knocked out of alignment. The tilt switch will be activated and will shut down the unit, resulting in complete loss of signal with no hazard. The tilt switch is pre-set at the factory on the inclinometer arm and requires no adjustments.

Corrective actions for the type of failures given above can be found in the PLASI 2000 System Service, Maintenance & Illustrated Parts Manual Number PLF002, Trouble Analysis Chart.

1.2.4 Additional Design Features

To maximize lamp/projection reliability, the unit is designed with a voltage limiter for lamp voltage control, a photo detector to reduce lamp voltage for nighttime operation, and a four-position changer which automatically rotates a new lamp into place upon the failure of the lamp in use. The unit is also equipped with heaters for cold weather operation. For more information on these features, see Section IV.

1.3 Notification to Agencies of PLASI 2000 Installations

Any installations of PLASI 2000 units in the United States at public use airports should be reported to the following:

National Flight Data Center
AAT430
Washington, D.C. 20591.

Installations should also be coordinated with the appropriate FAA Flight Standards Regional Office in the geographical areas of the planned installation.

For installations outside of the United States, the installing agent should coordinate the PLASI 2000 installation with their local Civil Aviation Agency

SECTION II - PLASI 2000 LOCATION CRITERIA

2.0 PLASI 2000 Location Criteria

2.1 Location of PLASI 2000

The exact location of PLASI 2000 on the airport site will vary depending on the type and physical layout of the airport, the location and number of approach paths, and other variables such as adjacent structures, lighting systems, taxiways, etc.

The PLASI 2000 should normally be located in a position to minimize interference with ground maneuvering and flight operations.

Each PLASI 2000 installation will differ depending on site conditions but user safety and aerospace compatibility shall be prime considerations. Consult the controlling Civil Aviation Authority for any requirements regarding aircraft visual approach aids.

2.1.1 Single Approach Path System - Fixed Legs

For a single approach path, the PLASI 2000 should be permanently located in a fixed position relative to the approach path and aligned outward into the approach path on a line parallel to the approach heading within +/- 0.5°.

For this type of fixed installation, the PLASI 2000 is mounted on frangible support legs and the legs are bolted to a concrete slab as described in Section III.

2.2 Determining Obstruction Clearance

A major consideration in installing the PLASI 2000 at a airport site is insuring that the approach paths on which the PLASI 2000 signal will be utilized are clear of obstructions. It is necessary to identify the location and height of critical objects in the approach path by necessary surveys, or from local authorities (Figure 2).

With all the obstructions identified within the 16° wide beam spread, plot the approach path on a profile map. A line should be drawn from the proposed location of the PLASI 2000 at an angle to clear the highest obstacle by not less than 1.2 degrees*. This line will then establish:

(a) An obstruction clear surface 8° on both sides of the approach path centerline and extending outward into the "Airport Approach Surface".

(b) The minimum aiming angle of the PLASI 2000.

*1.2 degrees has been determined from half the angle of the on course signal plus 1 degree.

2.3 Visual Glide Path Angle

The visual glide path angle shall meet the following general criteria in addition to the obstruction clearance requirement of Paragraph 2.2.

2.3.1 Threshold Crossing Height (TCH)

The TCH is the height of the on-course signal at a point directly above the intersection of the runway centerline and the threshold. (See Figure 3a.) The minimum allowable TCH varies according to the height group of aircraft that uses the runway, and is shown in table below. The PLASI 2000 approach path must provide the proper TCH for the most demanding height group that uses the runway.

Representative Aircraft Type	Approximate Cockpit - to - Wheel Height	Visual Threshold Crossing Height	Remarks
<u>Height group 1</u> General aviation Small commuters Corporate turbojets	10 feet or less	40 feet +5, -20 10 meters +2, -6	Many runways less than 6,000 ft long with reduced widths and/or restricted weight bearing which would normally prohibit landings by larger aircraft.
<u>Height group 2</u> CV-340/440/580, F-28 B-737, DC-9, DC-8	15 feet	45 feet +5, -20 12 meters +2, -6	Regional airport with limited air carrier service.
<u>Height group 3</u> B-727/707/720/757	20 feet	50 feet +5, -15 15 meters +2, -6	Primary runways not normally used by aircraft with ILS glide-path-to-wheel heights exceeding 20 feet
<u>Height group 4</u> B-747/767, L-1011, DC-10, A-300	Over 25 feet	75 feet +5, -15 22 meters +2, -4	Most primary runways at major airports

2.3.2 Glide Path Angle

The visual glide path angle for aircraft is normally set at 3°, or the angle specified by the airport operator. This angle may be increased up to 12° maximum to provide an obstruction clear surface, if so determined per Paragraph 2.2.

The commissioned angle should be specified in a NOTAM and also published in the Airmans Information Manual for installations in the USA. For installations in other countries, contact the appropriate regulating authority for civil airports.

The PLASI 2000 unit can be adjusted for approach angles from one (1) to twelve (12) degrees.

2.3.3 Co-location of PLASI 2000 and ILS

PLASI 2000 can be co-located with an ILS such that the point of intersection of the visual glide-path angle on the runway shall be within plus or minus 30 feet of the point on the runway where the projected straight line path of the ILS glide path touches the runway centerline (the base of the glide slope antenna tower). The projection of the centerline of the PLASI 2000 on course signal is thus coincident with a centered needle on the ILS glide slope cockpit indicator, while the upper and lower edges of the "on course" (steady white light) PLASI 2000 signal represents 1 1/4 dots above and 1 1/4 dots below the ILS "on course" cockpit indication. This holds true independent of the distance from the threshold. Obstructions in the approach zone shall be analyzed in accordance with the criteria specified in Paragraph 2.2 to ensure that no conflict exists in aiming the PLASI 2000 to coincide with the ILS glide path.

This procedure must be modified for runways that serve aircraft in height group 4 due to the distance between the pilot's eye and the ILS antenna. For these locations, the distance of the PLASI from the threshold shall equal the distance to the ILS glide slope source plus an additional 300 feet +50, -0 (90m +15, -0).

2.4 Location of PLASI 2000 (See Figures 3a - 3d)

2.4.1 Longitudinal Location

The PLASI 2000 may be located a minimum of 475 feet from the threshold except for those cases specified in Paragraph 2.3.3. The exact location of the PLASI 2000 will depend on the desired touchdown point and also on the desired glide path angle. Where the terrain drops off rapidly near the approach threshold and severe turbulence may be experienced, the PLASI 2000 should be located at a maximum permissible distance from the threshold in order to keep aircraft at the maximum permissible threshold crossing height. It may be necessary to adjust the above location because of interference with cross runways, taxiways, etc., or where critical runway lengths make it desirable to have a touchdown as close to the threshold as possible. The location, however, must be consistent with threshold crossing height and obstacle clearance requirements.

2.4.2 Correction for Runway Longitudinal Gradient

On runways where there is a difference in elevation between the runway threshold and the runway elevation at the PLASI 2000, the location of the light unit may need to be adjusted with respect to the threshold in order to meet the required obstacle clearance and TCH. Where such a condition exists, the following steps (shown in Figure 3c) are taken to compute the change in the distance from the threshold required to preserve the proper geometry.

1. Obtain the runway longitudinal gradient. This can be done by survey or obtained from "as-built" drawings or airport obstruction charts.

2. Determine the ideal (zero gradient) distance from the threshold in accordance with the instructions above.

3. Assume a level reference plane at the runway threshold elevation. Plot the location determined in (2) above.

4. Plot the runway longitudinal gradient (RWY).

5. Project the visual glide path angle to its intersection with the runway longitudinal gradient (RWY). Then solve for the adjusted distance from threshold (dimension d on Figure 3c) either mathematically or graphically.

6. Double-check to see that the calculated location gives the desired threshold crossing height.

2.4.3 Lateral Location

The centerline of the PLASI 2000 unit should be located not less than 50 feet from the edge of the runway (See Figure 3b). Tolerances should be used only to avoid construction such as drainage ditches, catch basins, manholes, etc.

2.4.4 Vertical Location

The PLASI 2000 unit should be located vertically so that a horizontal plane passing through the light beam center of PLASI 2000 shall be within plus or minus one foot of a horizontal plane passing through the crown of the runway.

At locations where snowfall is likely to obscure the light, the unit may be installed up to a maximum height of 6 feet above ground level. Consideration should be given, however, to locating (within specified tolerances) the unit farther from the runway edge to ensure adequate clearance for the largest type of aircraft expected to use the runway. Since raising the unit also raises the visual glide path, the PLASI 2000 should be relocated a distance closer to the threshold sufficient to compensate for this. The distance the unit shall be moved is determined from the following formula:

$$d = \frac{h}{\tan omega}, \text{ where}$$

d = distance in feet PLASI 2000 should be moved toward threshold

omega = visual glide path angle

h = the difference between the elevation of the PLASI 2000 from the elevation of a point on the runway centerline which intersects the glide slope

Figure 3d shows height correction for 3 and 4 degree glide slope angles.

2.5 Angular Alignment

The PLASI 2000 shall be aligned outward into the approach path on a line parallel to the approach path centerline within a tolerance of +/- 0.5° for approaches where no obstacle clearance problems exist.

If obstructions intrude into the PLASI 2000 beam near the outer edge of the beam, then it is permissible to offset the PLASI 2000 up to +/- 3° to provide lateral obstacle clearance.

2.6 Aiming

The PLASI 2000 should be aimed at the desired glide path angle and should be set to within plus or minus three minutes of the established vertical aiming angle. Reference installation details in Paragraph 3.4 Aiming.

Aiming angle can be increased up to a maximum of 12° if required to clear obstructions per Figure 2.

SECTION III - INSTALLATION

3.0 PLASI 2000 Installation

3.1 Electrical Requirements

3.1.1 Power

Wire diagram Figure 4a shows 120VAC, 120VNeutral

The PLASI 2000 is placarded for 120 VAC, 50 or 60 Hz and a maximum required power of 1.4 KW. The actual continuous daytime power required is 1110 watts.

The unit must be supplied with a nominal 120 volts ±10%, 50 or 60 Hz, single phase alternating current. If an increase in voltage is required at the unit to meet the nominal voltage, a buck-boost transformer may be installed in the power line to increase voltage by up to 25%.

3.1.2 Wire Size

Figure 4a and Figure 4b provide recommended wire sizes for 120 volt or 240 volt power sources for various run distances. All wire sizes should be compatible with power transmission and voltage drop requirements.

To reduce wire size, higher voltages may be utilized, and then a step-down transformer installed at the PLASI 2000 site to reduce voltage to the required nominal 120 VAC ±10%.

3.1.3 Electrical Connections

This paragraph is to be performed after the PLASI 2000 is installed on its support pad.

NOTE: If required by local codes, a "breakaway" type plug and receptacle connector may be installed. The installation should be at the ground exit point of the main power cable near the unit. Connectors shall conform to FAA Advisory Circular ACl50/534526, Specification for L823 Plug and Receptacle, Cable Connectors. (See FAA Advisory Circular ACl50/53451 for listing of approved connectors).

3.1.3.1 Fixed Leg Installation

The power, neutral and ground wires are routed up through the service feed-through in the base plate. The power (120VAC) and neutral leads are electrically connected to their respective studs as identified on the terminal block. The ground lead is secured to the ground stud just forward of the terminal block. See Figure 12.

All internal components are grounded to the PLASI 2000 base plate. For proper safety, a ground lead must be attached internally to the ground stud. If a ground lead is not routed with the incoming power lines a local ground rod may be used to provide the unit with a proper ground.

3.2 Support Pad

3.2.1 Location

The exact location for the PLASI 2000 support pad should be determined per Section II and should be designed for stability based on local soil and weather conditions.

3.2.2 Construction

The generally accepted support pad for most conditions where permafrost is not a problem is a concrete slab 6 to 8 inches thick and extending a minimum of 12 inches (30 cm) outside the PLASI 2000 housing. The 12 inch (30 cm) extension is to provide a margin of protection from moving vehicles. Attach hardware should be imbedded in the slab as required per Paragraph 3.2.3.

Where permafrost is a concern, integral piers extending two feet below the permafrost line should be used to stabilize the 6 to 8 inch thick concrete slab.

Reference Figure 5, DeVore Drawing DA500099 for details.

3.2.3 Attachment Hardware

The positioning of the attach hardware into the concrete is critical. Reference Section II for the correct horizontal angular alignment (Paragraph 2.5).

If an existing structure is to be used, the PLASI 2000 fixed leg mounting system must be attached to the existing structure with an equivalent retention system as described below.

The system requires four (4) ”L” or “J” support studs per frangible leg embedded about 4 inches (10 cm) into the concrete slab at the time the slab is poured. (See Figure 6.) Another method of attachment would be to position the unit as desired, drill holes in the concrete and insert anchor bolts.

3.3 Mounting

3.3.1 Fixed Leg System

The PLASI 2000 is attached to the concrete slab by three support legs, as shown in Figure 6. Each leg contains a frangible fitting designed to break away and minimize damage to any aircraft that may accidentally strike the unit.

NOTE: Legs shown in Figure 6 are for standard environmental (average) conditions. If additional leg height is required, due to more critical terrain or snow conditions, longer legs can be supplied upon request. The installer may cut leg extensions locally from standard 2 inch diameter electrical metal tubing (EMT).

1. Place the mounting flange of each support leg over the pre-installed support studs or position the legs as desired, drill holes in concrete and insert anchor bolts.

2. Install attach hardware and tighten all nuts to secure the legs.

3. Remove the top nut and washer (one of three) from each support leg.

4. Reposition the remaining two nuts on each support leg mid way along the legs threaded section.

5. Carefully set the PLASI 2000 unit on the support legs inserting the threaded section of each leg through the appropriate holes in the units base.

6. Install washers and nuts on the support studs. Hand tighten only.

7. The unit is now in position for final aiming adjustment as described in Paragraph 3.4 Aiming.

3.4 Aiming

3.4.1 Lateral Leveling of PLASI 2000

1. Remove outer shell.

2. Locate horizontal level between the two webs.

3. Adjust the nuts on the two front support legs (Point A in Figure 9) until the unit is level. Make certain that the spacers of the PLASI 2000 unit are resting on the lower adjusting nuts.

4. Tighten the two lower jam nuts on both front legs. Lightly tighten the upper nuts.

5. Unit is ready for vertical aiming.

3.4.2 Vertical Aiming

1. On the level arm tilt switch assembly located on the inside of the unit, set the zero index mark to the desired approach angle on the degree scale (Point C in Figure 10) by loosening the level arm clamp bolt and moving the level arm assembly.

2. Re-tighten the clamp bolt.

3. Adjust the vertical angle by adjusting the nuts on the rear support stud (Point B in Figure 9) until the bubble in the beam level (Point D in Figure 10) is centered.

4. Tighten the two lower jam nuts.

5. Tighten the upper nuts on each of the three support legs to 50 (plus or minus 10) inch pounds torque.

6. Recheck the horizontal and lateral bubble levels. Readjust, if required.

7. On PLASI 2000 models, a vernier scale system has been incorporated into the Level Arm/Tilt Switch assembly to permit finer settings of the approach angle. The level arm contains a vernier scale which is graduated into .020 degree increments, which permits angular settings as small as 1.2 minutes accuracy (see Figure 11). The main scale is divided into .2 degree increments. Therefore, if the zero degree markings on the sliding vernier is used as the index mark, the degree settings can be set to .2 of a degree. For finer settings to an accuracy of .020° (1.2 minutes), the vernier scale is utilized.

8. When utilizing the vernier in a measuring position where the zero degree mark on the sliding vernier scale is not exactly in line with a division line on the main degree scale, the graduation value just preceding the zero mark must be supplemented with the value of the vernier indications. This latter value is displayed as the number of that single vernier line, which exactly coincides with the graduation line on the scale. In the Figure 11 illustration, that line of the vernier is the seventh division (as indicated by starred area), resulting in a combined indication value of 7.68° (7° plus 0.6°, plus four .020°graduations, or .08°, giving a total of 7.68°).

9. If it is necessary to set an approach angle of between 10° and 12°, then the upper portion of the vernier scale is used for the measurement (Figure 11). In this case, then the upper 10 division mark is used as the zero index point and the readings are measured from the upper 10 mark to the zero mark.

3.4.3 Checking Accuracy of PLASI 2000 Projection

The PLASI 2000 is a single box system which maintains its approach angle and the various flight sectors (flashing white, steady white, etc.) are mechanically locked in place.

In multiple box systems, the approach sectors are dependent upon the relationship of one box with respect to the other boxes, any one of which can move, thereby modifying the signal. While the tilt switch is a controlling factor with regard to the operation of the PLASI 2000 and limits the movement of the system to the tilt switch settings, there is another more important check on the approach angle which should be made. Ensure when leveling the system that the bubble is centered for the approach direction with the unit set and locked at the approach angle selected. Since the sectors are automatically set in the PLASI 2000 and are not dependent on their relation to another box, it is only necessary to check that the bubble is centered for the approach angle established.

The Service and Maintenance Manual, Number PLF002, Paragraph 2.2, "Field Check to Verify PLASI Approach Path Angle", defines the procedure to independently confirm that the approach angle is set correctly. This Field Check is to be performed at installation and at intervals of six months thereafter.

Nevertheless, the appropriate controlling civil aviation agency may still require some type of flight check.

3.5 Operational Check and Final Adjustment

3.5.1 Lamp Installation

CAUTION: WHEN OPENING SOCKET, DO NOT ALLOW CLAMP TO SNAP CLOSED.

1. Open socket.

CAUTION: WHEN HANDLING LAMPS, DO NOT TOUCH GLASS SURFACE. BODY CHEMICALS CAUSE GLASS LAMP ENVELOPE TO BECOME OPAQUE. HANDLE WITH CLEAN CLOTH OR GLOVES. IF TOUCHED, CLEAN GLASS WITH ALCOHOL OR SIMILAR CLEANING AGENT.

2. Install new BVA (900W, 120V) lamps. Pull Socket lever closed to secure.

3. Reset lamp table by rotating table clockwise until Number 1 lamp is in the operating position.

3.5.2 Inspection

1. Inspect the PLASI 2000 supports to ensure that they are installed in accordance with the drawing and that all mounting bolts are tight.

2. Check electrical connections to ensure that they are tight and correct.

3. Inspect optical surfaces for cleanliness. The front window is subject to soil from external sources. Clean optical surfaces with standard glass cleaning solutions and dust with lint free tissues or cloth.

4. Check that lamps are properly installed (See Paragraph 3.6.1) and that No. 1 lamp is in operating position.

3.5.3 Operation

1. Pull the 10 amp circuit breaker to its "off/open" position. (Figure 8).

2. Turn "ON/OFF/REMOTE" switch to the "OFF" position in PLASI 2000. (Figure 8).

3. Apply the main power to the unit by closing the switch controlling power at the basic power source for the PLASI 2000.

4. Check line voltage at PLASI 2000 to insure correct voltage is being applied to the unit. Test across 120VAC (Red) and Neutral (Black). See Figure 12.

5. If voltage is correct (120VAC +/-10%), close the circuit breaker.

6. Place the on/off/remote switch in the desired position. Switch shall be in "ON" position for direct on/off control at the PLASI 2000 unit, or in "REMOTE" position if PLASI 2000 is being controlled by remote wire or radio control.

7. Select desired daytime lamp voltage at the voltage limiter, either 100 volts (long lamp life setting) or 108 volts (higher intensity for longer day time range).

8. If light intensity requires adjustment, go to Section IV.

9. Replace the outer shell.

3.6 PLASI 2000 System Operational Controls

Operational control requirements for PLASI 2000 vary depending upon the manner in which the airport desires to use the unit. The location of the radio receiver controller and manual control unit is optional. They may be located adjacent to the PLASI 2000 or at some alternate convenient location. The manual control unit will normally be installed in the control tower or operations office. If these are located more than 100 meters from the PLASI 2000 system, the extended control cable modification option must be ordered.

3.6.1 Manual Control

For continuous 24 hour operation, manual "on/off" control of the PLASI 2000 is provided directly at the unit by means of a selector switch. The PLASI 2000 "ON/OFF/REMOTE" Control Select Switch shall be in the "ON" position for this type of on/off control.

Circuit wiring connections are shown in the PLASI 2000 wiring diagram (Figure 7a and Figure 7b).

SECTION IV - FEATURES

4.0 PLASI 2000 Standard Features

4.1 Voltage Limiter

The “Voltage Limiter II”, part number DA1293-1, provides the projector lamp in use with a daytime stabilized voltage of 100 volts or 108 volts. The airport operator selects the 100 volt or 108 volt setting at the time of installation. The selection is made by switching a small toggle switch located inside the PLASI 2000 unit on the top left hand side of the voltage limiter. (see Figure 5a).

The 100 volt setting would be used at a airport with a short final approach (under two miles). The 100 volt setting will more than double lamp life. If this lower setting is selected, a flight evaluation should be conducted under sunny conditions to ensure that the PLASI 2000 signal is still adequate in range for the particular airport approach conditions.

The voltage limiter also provides for adjustment of the system’s light intensity.

4.2 Automatic Night Dimming

The PLASI 2000 System is equipped with a Photo Sensor to provide automatic dimming for night time operation. The Photo Sensor is mounted in the Base Plate facing down at about the center of the Unit.

The night voltage has been preset at the factory. If local conditions dictate an increase or decrease in night intensity, the Lamp voltage may be adjusted at the Voltage Limiter (Figure 5a). Sufficient approaches should be flown at night to determine the proper night voltage setting for local environment.

NOTE: Daytime Lamp voltage may be checked at "Lamp" test point, but daytime Lamp voltage is not adjustable, only selectable between 100volts and 108 volts.

Adjustment:

1. Locate the potentiometer R116 on the Voltage Limiter. (Figure 5a)

2. Trigger the Photo Cell to night operation by covering the Photo Cell Unit. The Photo Cell is time delayed, therefore, it will take 45 to 75 seconds for the Unit to trigger down.

3. Place a set of voltmeter test leads across the red (TPJ-3) and the white (TPJ-2) test points on the “Voltage Limiter II” Unit. (Figure 5a)

4. Adjust the R116 potentiometer to the desired voltage or Lamp brightness. Do not adjust below 48 Vrms.

5. Remove cover from the photocell.

4.3 Tilt Switch

If the unit is knocked out of alignment the tilt switch is activated and shuts down the unit. This results in complete loss of signal with no hazard. The tilt switch is pre-set at the factory and requires no adjustments.

4.4 Pulse Detector

As part of the failsafe system, the PLASI 2000 unit is equipped with pulse detectors which monitor the signal generating shutter chains. If the upper or lower shutter chain fails, the PLASI 2000 unit shuts down.

4.5 Automatic Lamp Changer

The automatic lamp changer rotates the lamp table and a new lamp into place in approximately two seconds, if the one in use should fail. The lamp table holds four lamps.

4.6 Heaters

The Heaters, which consist primarily of six 35 watt heaters installed inside of the PLASI 2000 unit (Figure 13), maintain components of the PLASI 2000 at operating temperatures during periods when the PLASI 2000 is used only intermittently, and when ambient temperatures are near or below freezing levels. This permits the PLASI 2000 to operate immediately upon “turn on” by remote control signal and eliminates any need for a "warm-up" period for the unit. When ambient temperatures inside the PLASI 2000 are above 45°F, the heating system is not required and the control module turns off the heaters. When the temperature drops to below 45° F, the heater system will again operate.

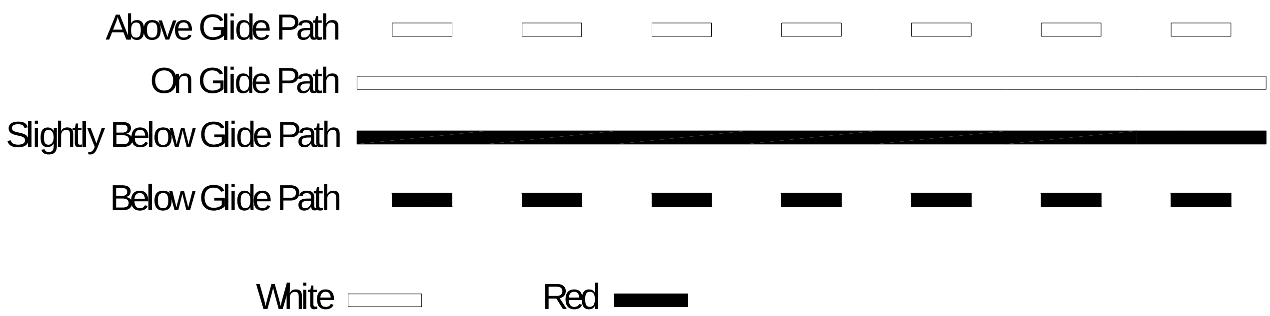


Figure 1 Signal Format

Signal (Beam) Angle

Width 16° minimum
Height Above Course Signal: Pulsing white light 2.5°
On Course Signal: Steady white light .35°
Below Course Signal: Steady red light .175°
Well Below Course Signal: Pulsing red light 2.5°

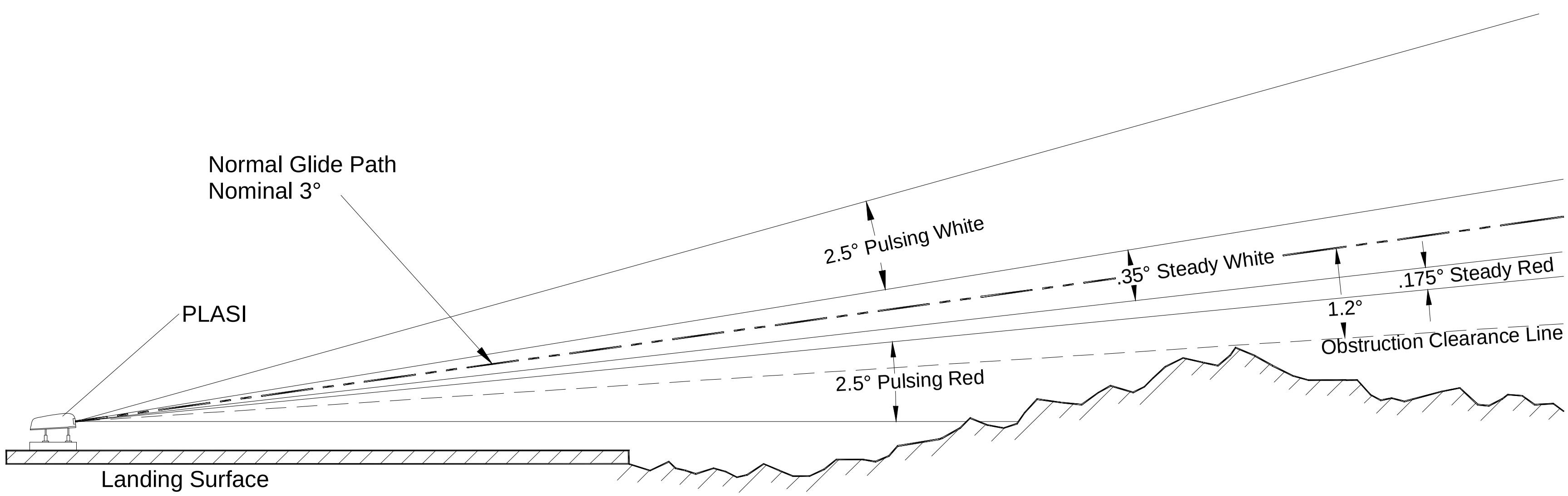


Figure 2 PLASI 2000 Signal Projection

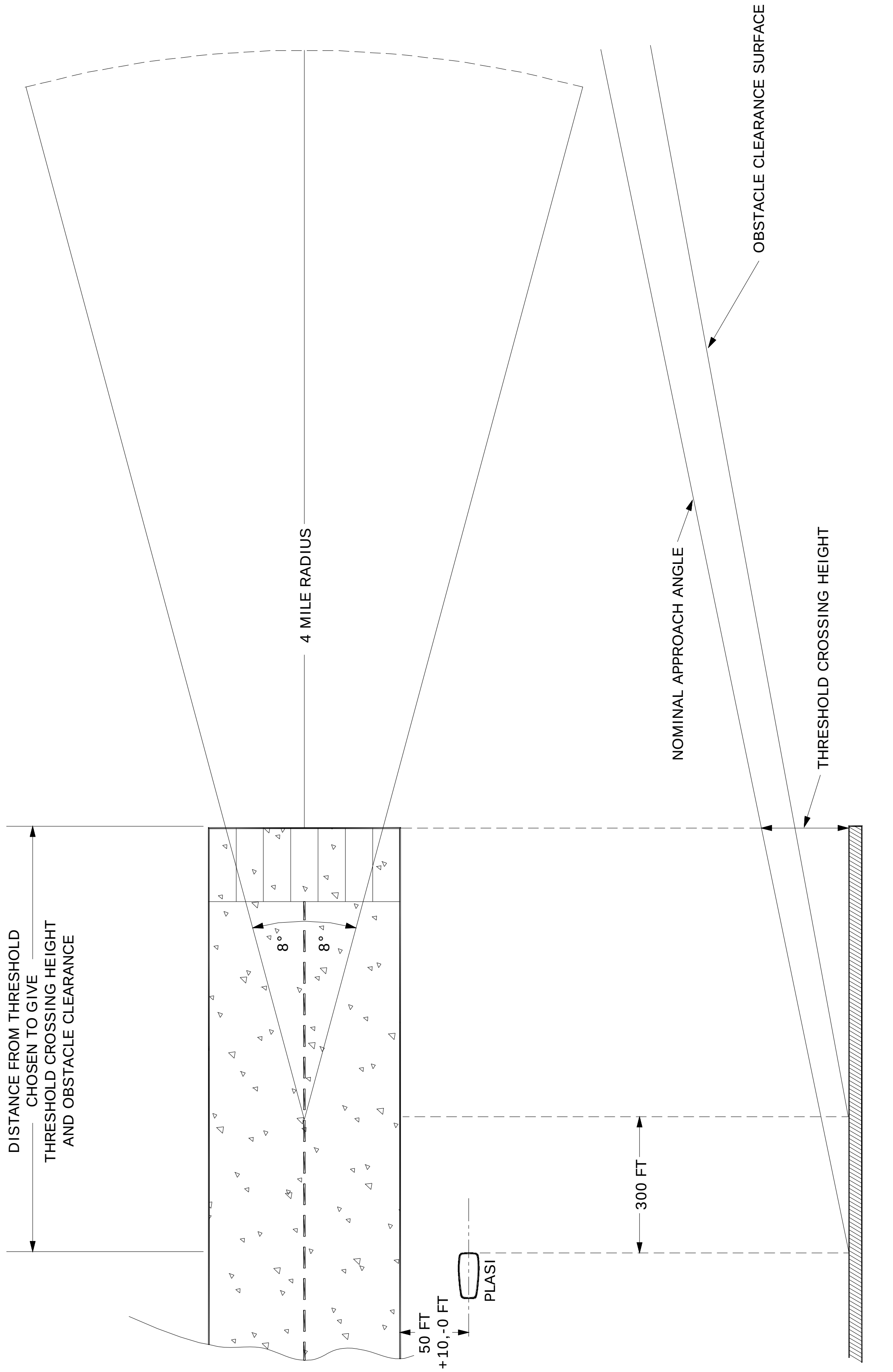
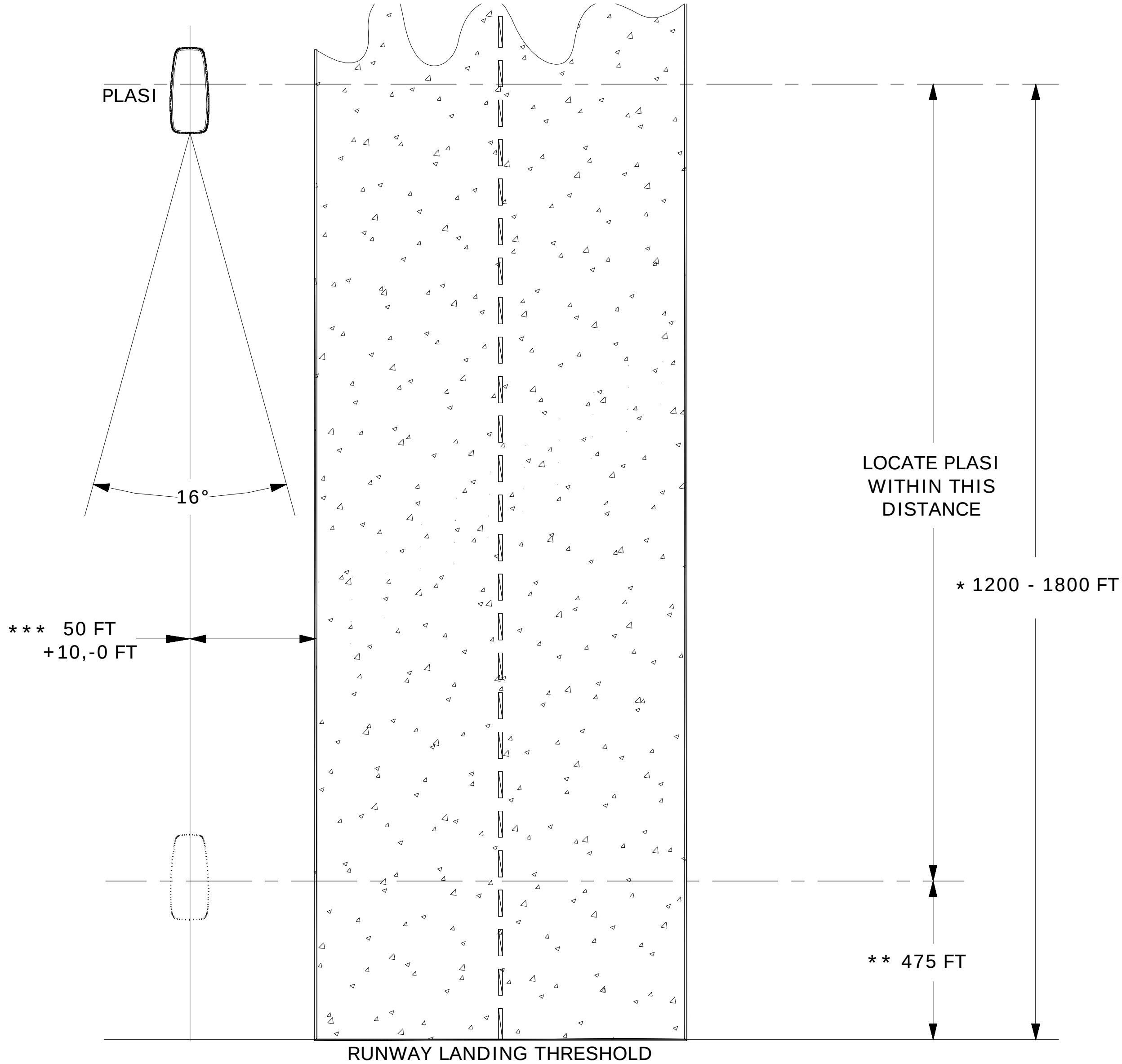


Figure 3a PLASI 2000 Obstacle Surface Angle = On Course Signal Minus 1.2 Degrees



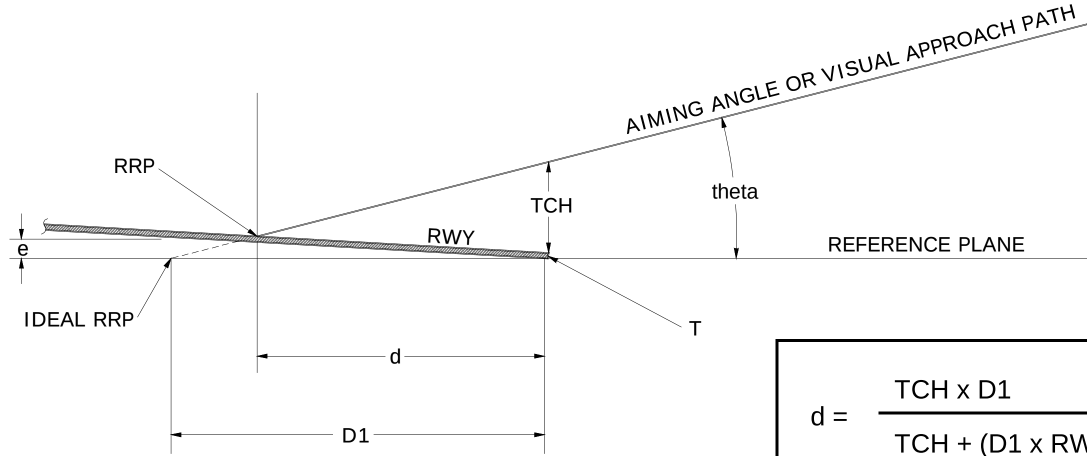
*** May be reduced to 30' for small general aviation runways used by non-jet aircraft

* Up to 1800' for wide bodied aircraft as required.

** For extremely short runways, this dimension can be reduced, and/or the PLASI 2000 glide path angle increased, if there are "absolutely" no obstacles in the approach path

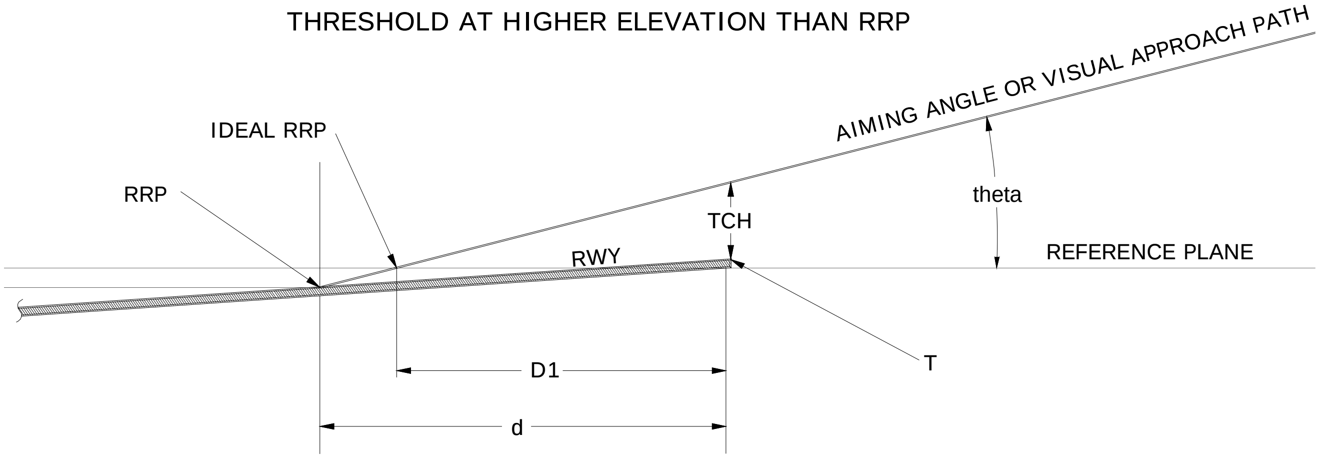
Figure 3b PLASI 2000 System Layout

THRESHOLD AT LOWER ELEVATION THAN RRP



$$d = \frac{TCH \times D1}{TCH + (D1 \times RWY)}$$

THRESHOLD AT HIGHER ELEVATION THAN RRP



$$d = \frac{TCH \times D1}{TCH - (D1 \times RWY)}$$

Symbols
- D1 = ideal (zero gradient) distance from threshold
- RWY = runway longitudinal gradient (decimal)
- TCH = threshold crossing height
- T = threshold
- e = elevation difference between threshold and RRP
- RRP = runway reference point (where aiming angle or visual approach path intersects runway profile)
- d = adjusted distance from threshold
- theta = aiming angle

Figure 3c Correction for Runway Longitudinal Gradient

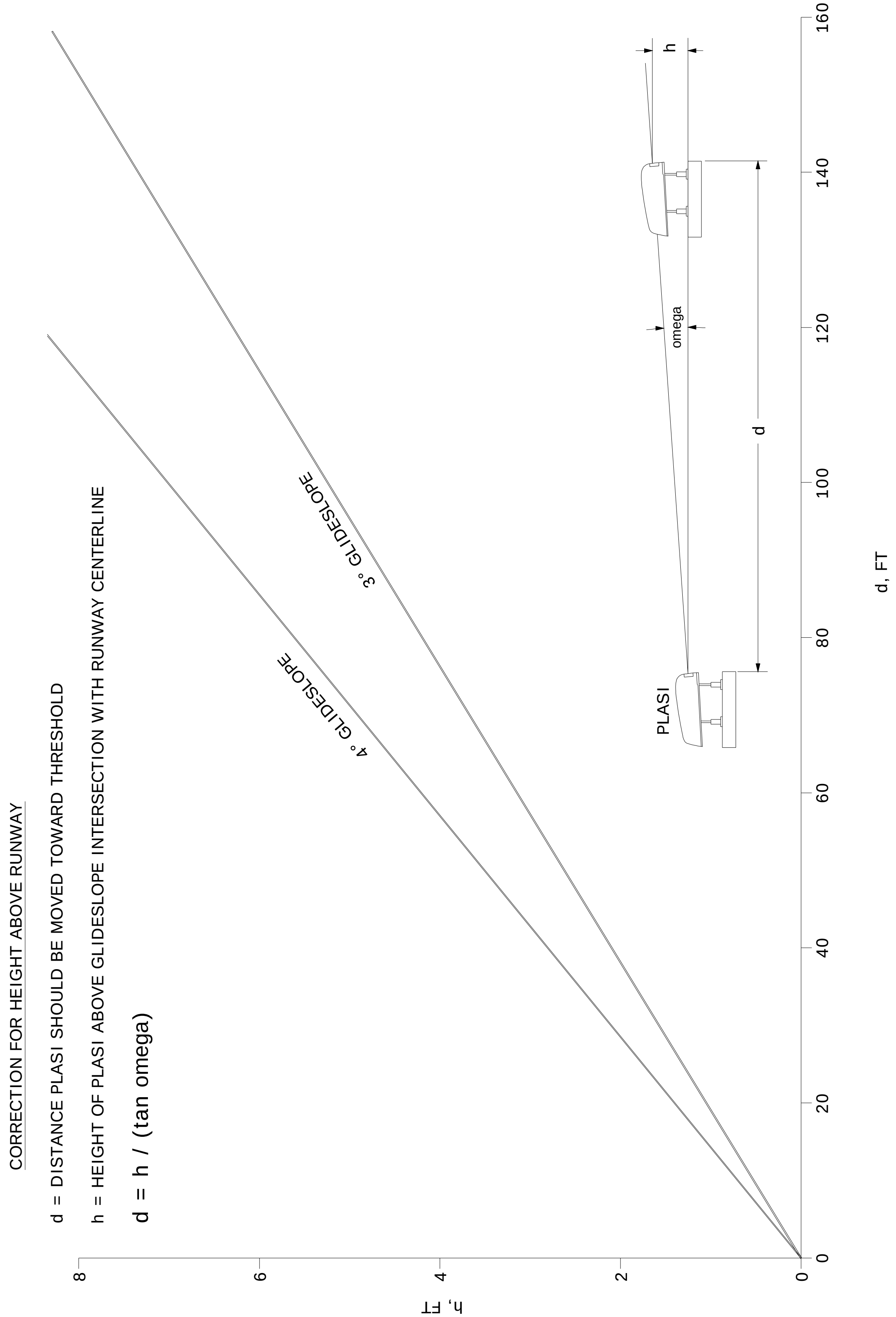


Figure 3d Correction for Height Above Runway

Example:
Power Source distance to PLASI is 1000 feet
2 AWG wire required without B/B transformer
10 AWG wire may be used with B/B transformer

Chart based on:

1600 Watts
13.3 Amps @ 120 Volts
Voltage drop at regulator 5%of line nominal

Buck/Boost transformer capable of increasing line voltage by 25 Volts

INSTALLATION MUST BE MADE IN ACCORDANCE WITH LOCAL ELECTRICAL CODES

Note: This data based upon PLASI I power consumption but is also applicable to PLASI 2000

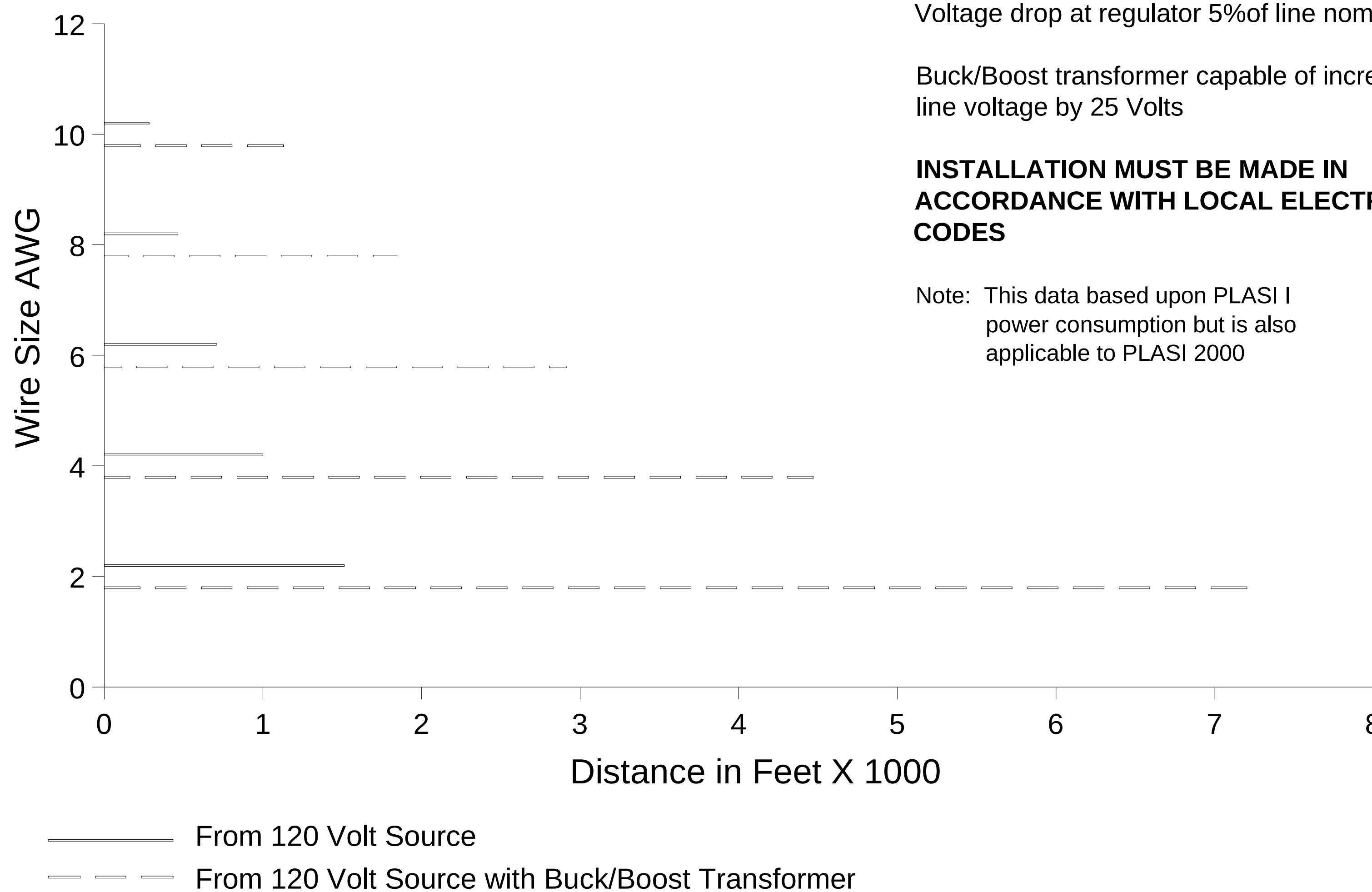


Figure 4a PLASI 2000 Electrical Installation Recommended Wire Size from 120 VAC Source

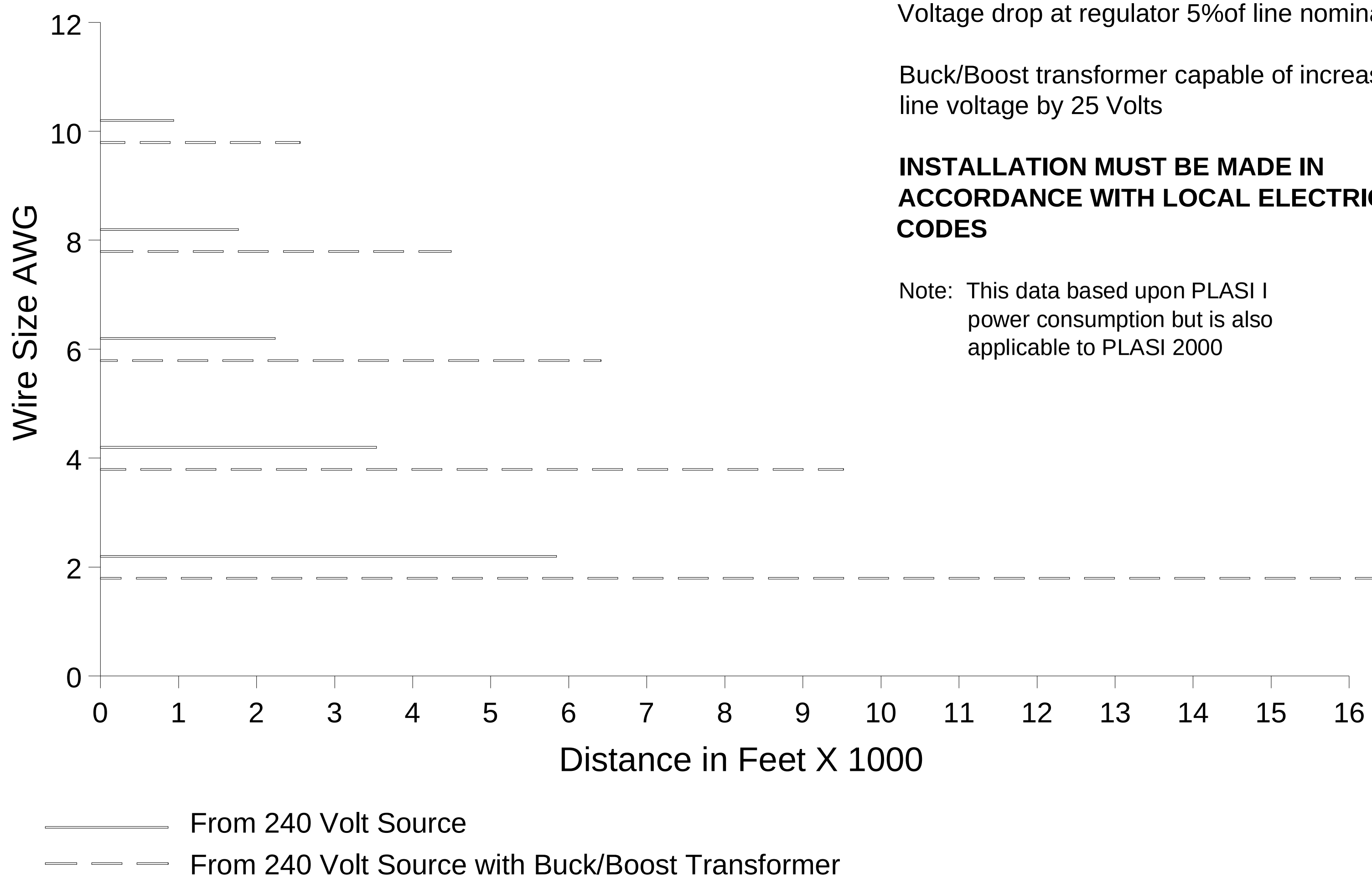


Chart based on:

1600 Watts
6.7 Amps @ 240 Volts
Voltage drop at regulator 5%of line nominal

Buck/Boost transformer capable of increasing line voltage by 25 Volts

INSTALLATION MUST BE MADE IN ACCORDANCE WITH LOCAL ELECTRICAL CODES

Note: This data based upon PLASI I power consumption but is also applicable to PLASI 2000

Figure 4b PLASI 2000 Electrical Installation Recommended Wire Size from 240 VAC Source

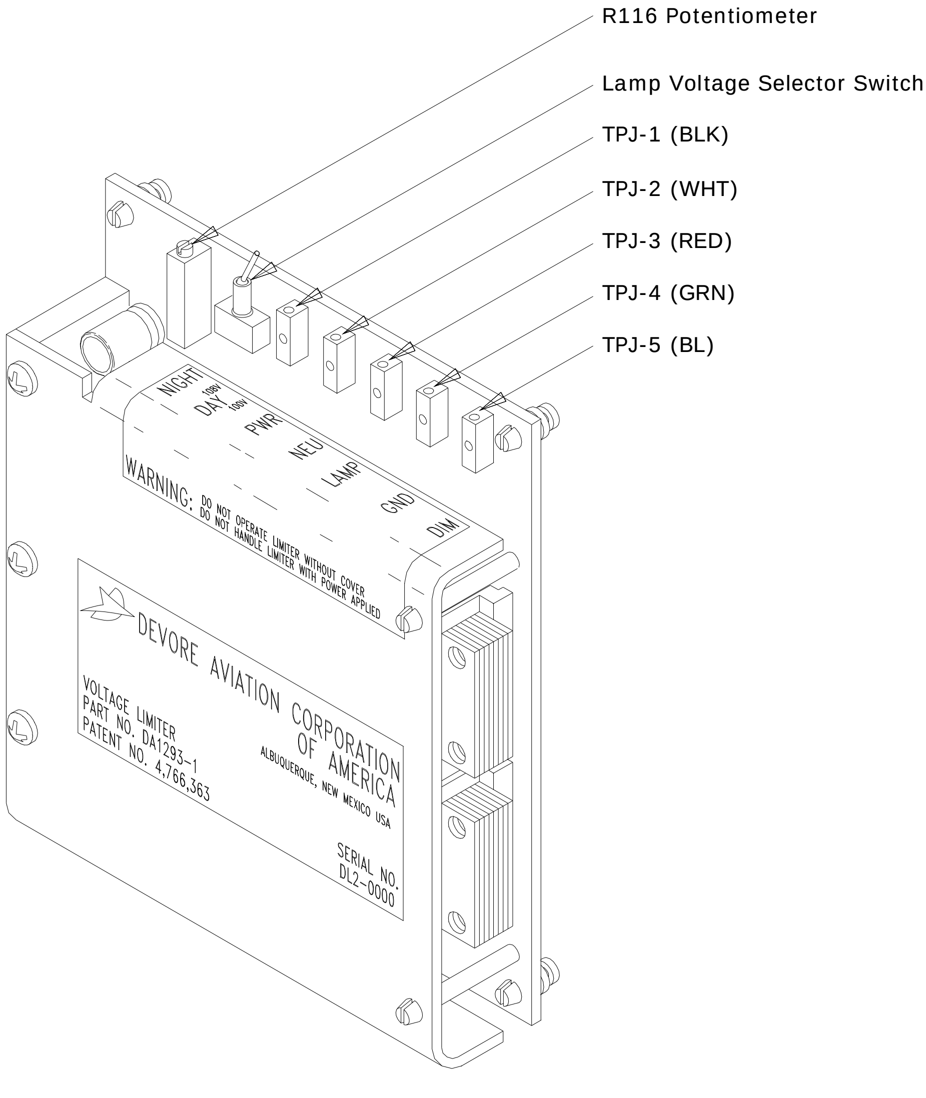


Figure 5a Voltage Limiter

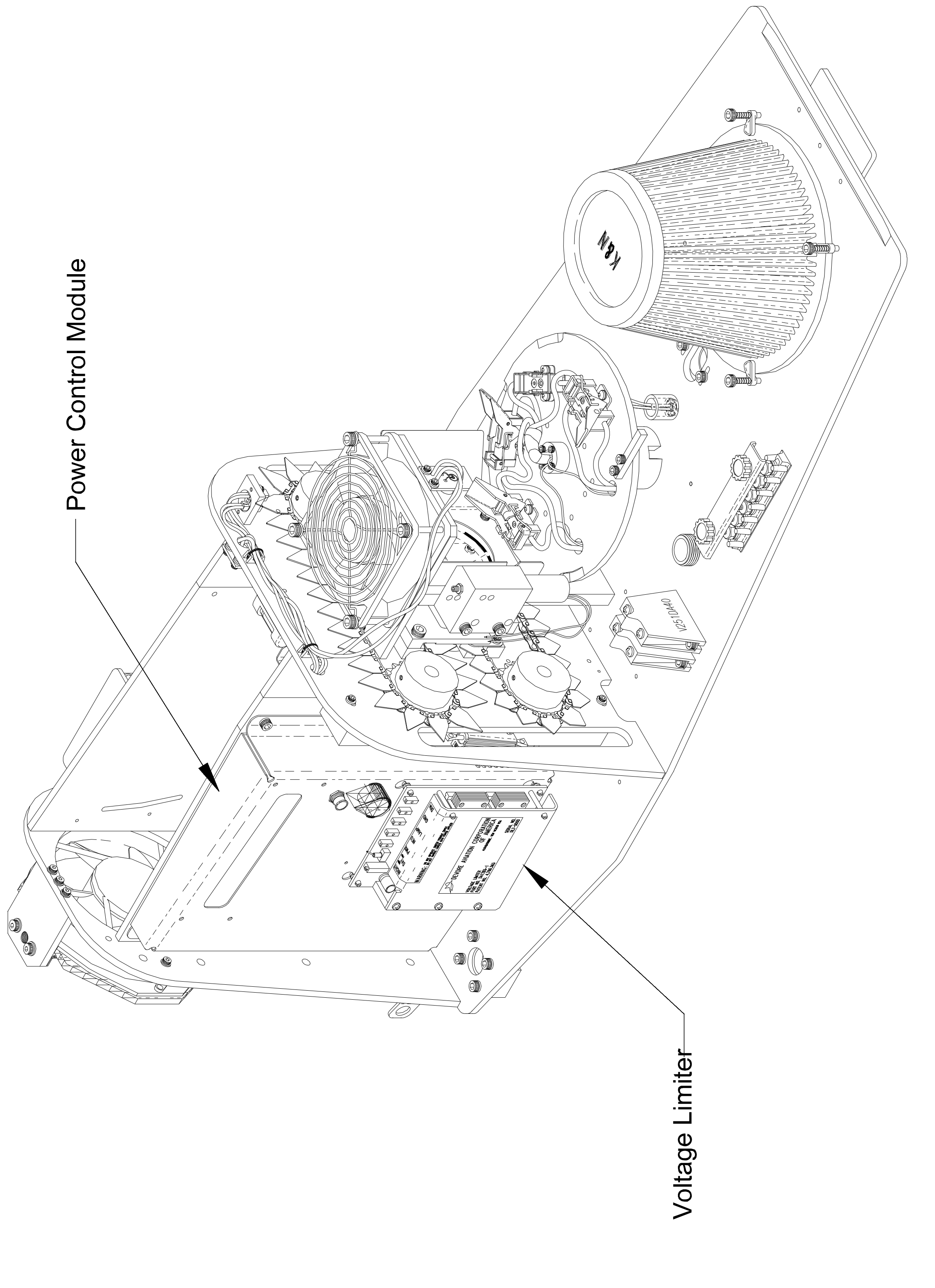


Figure 5b Voltage Limiter/Control Module Location

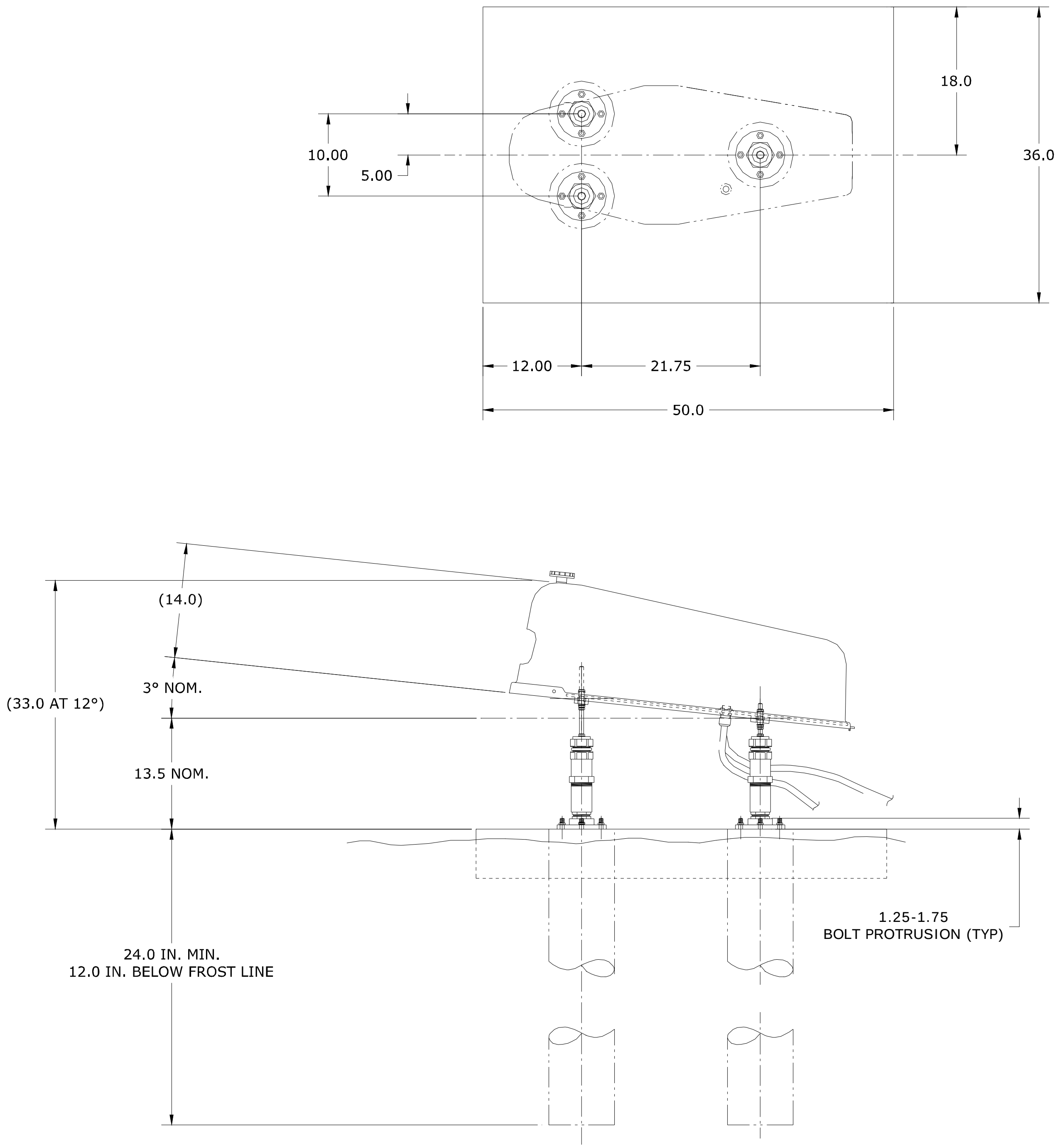


Figure 6 PLASI 2000 System Installation (Pad Mount)

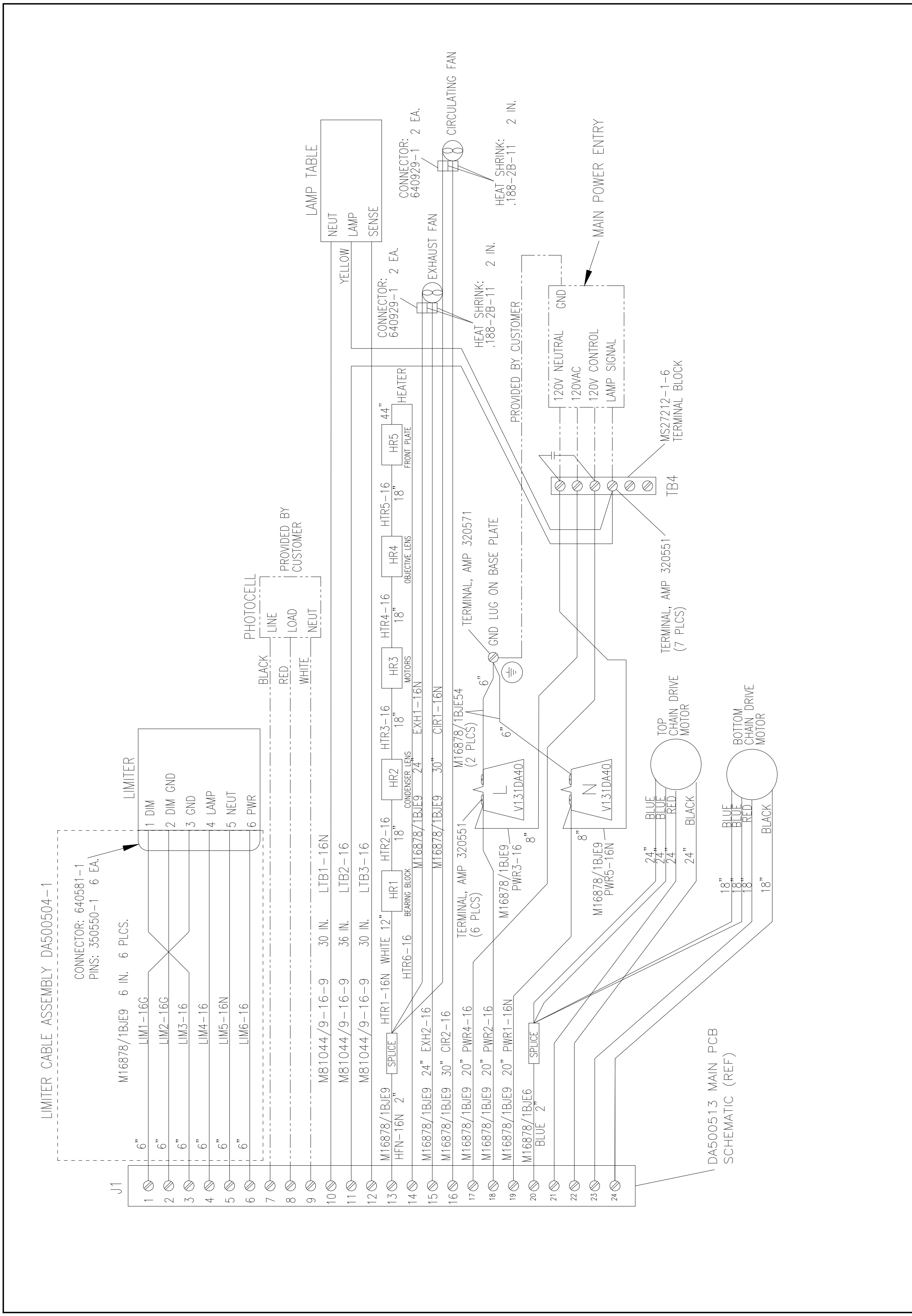


Figure 7a J1 Wiring Diagram

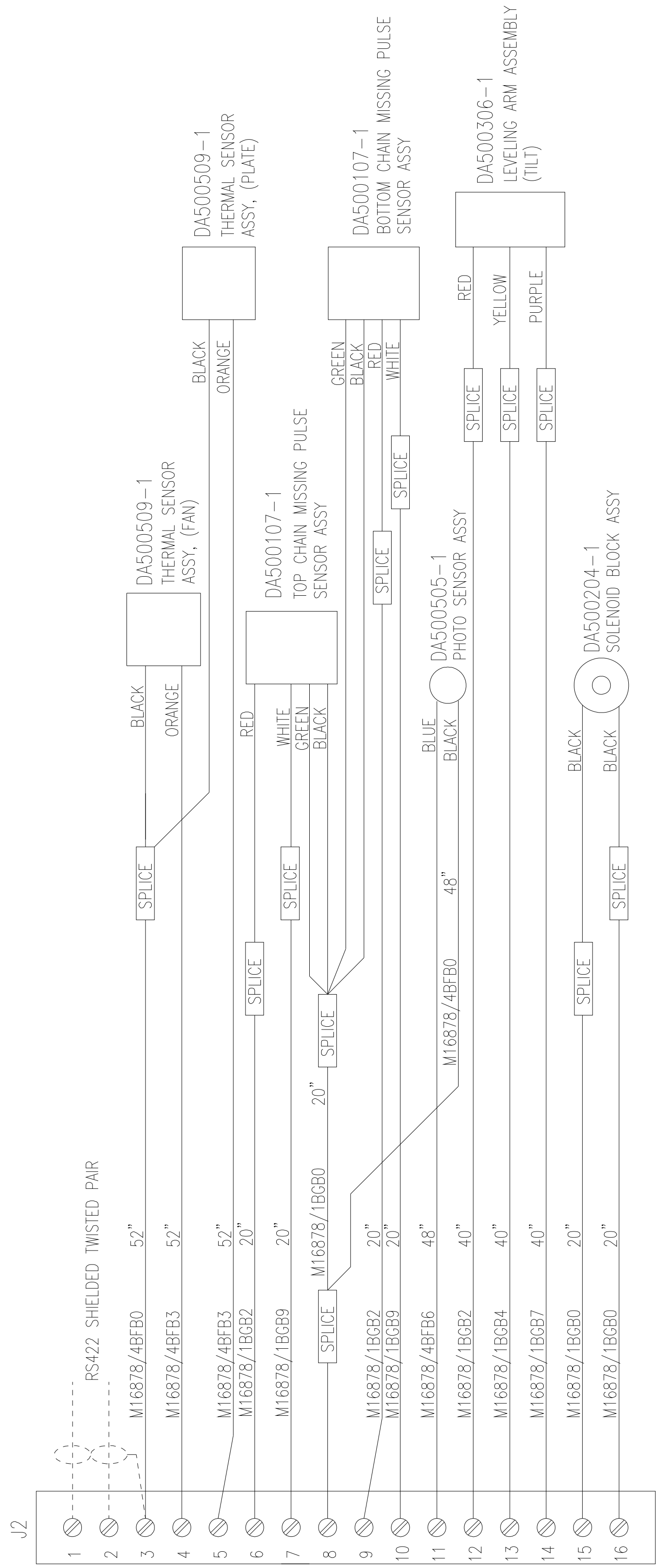


Figure 7b J2 Wiring Diagram

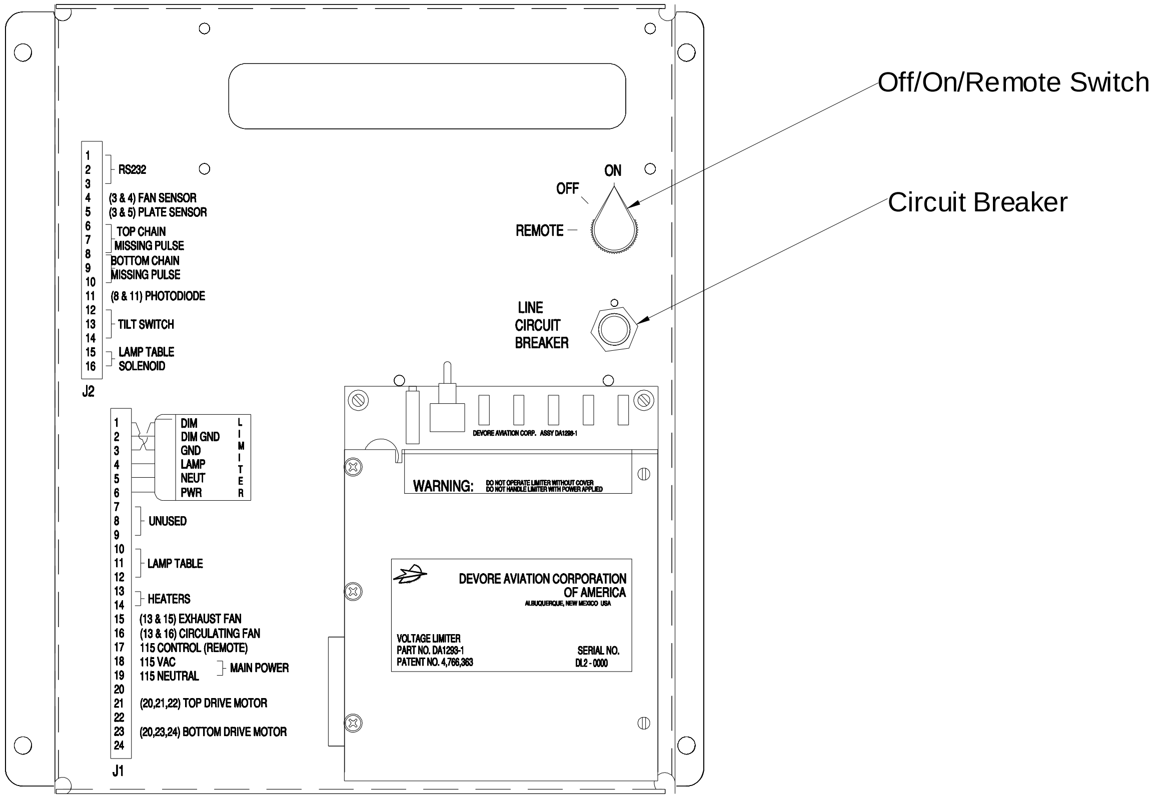


Figure 8 PLASI 2000 Control Panel

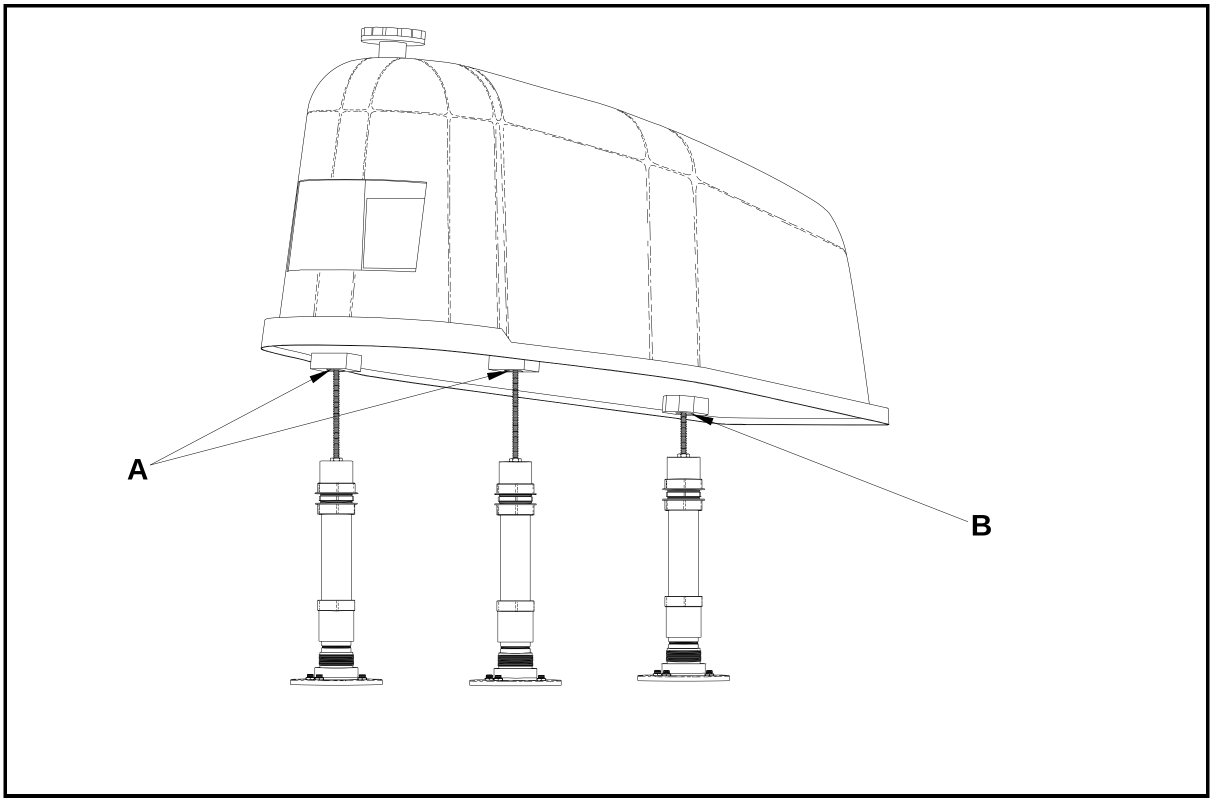


Figure 9 Aiming, Lateral & Vertical

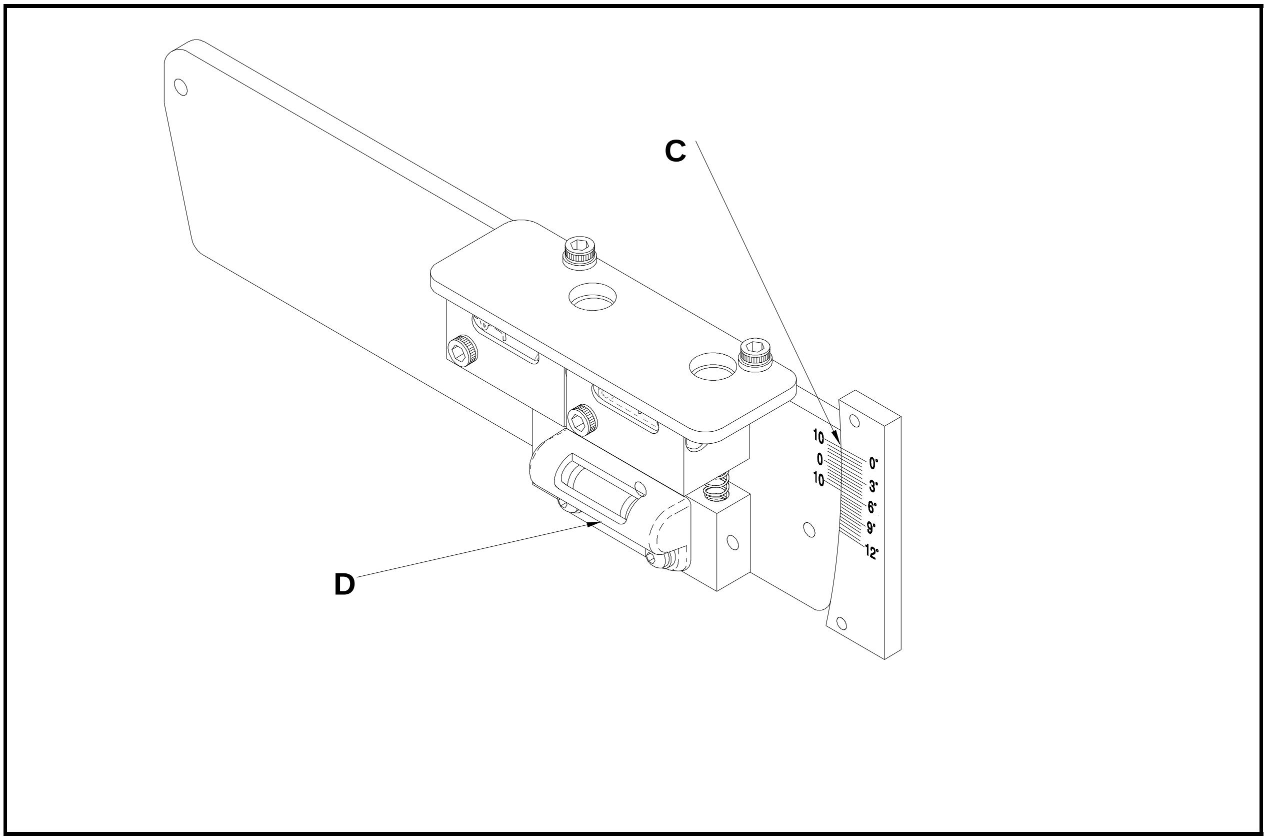


Figure 10 Aiming, Bubble Level & Vernier Scale

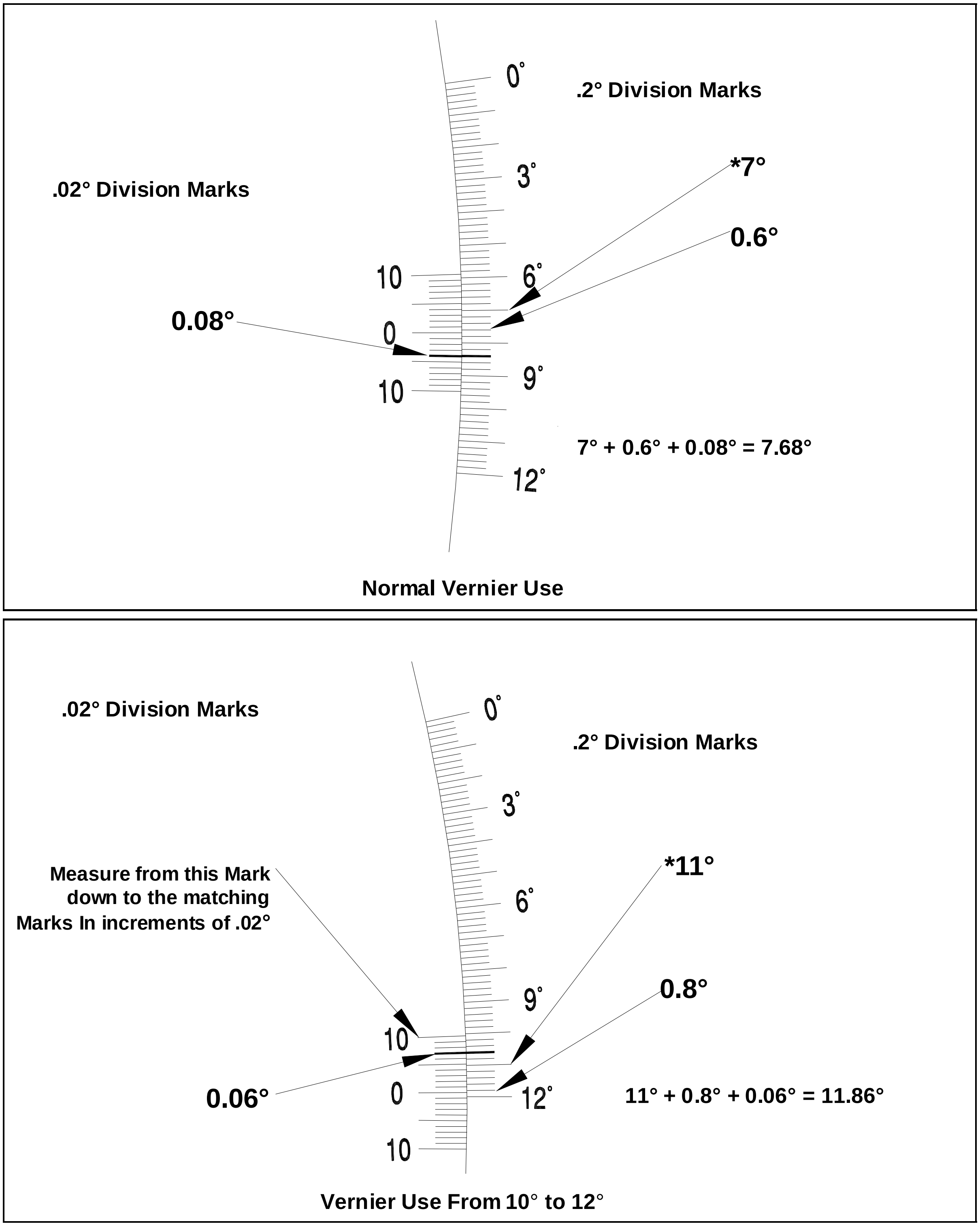


Figure 11 Aiming, Vernier Scale

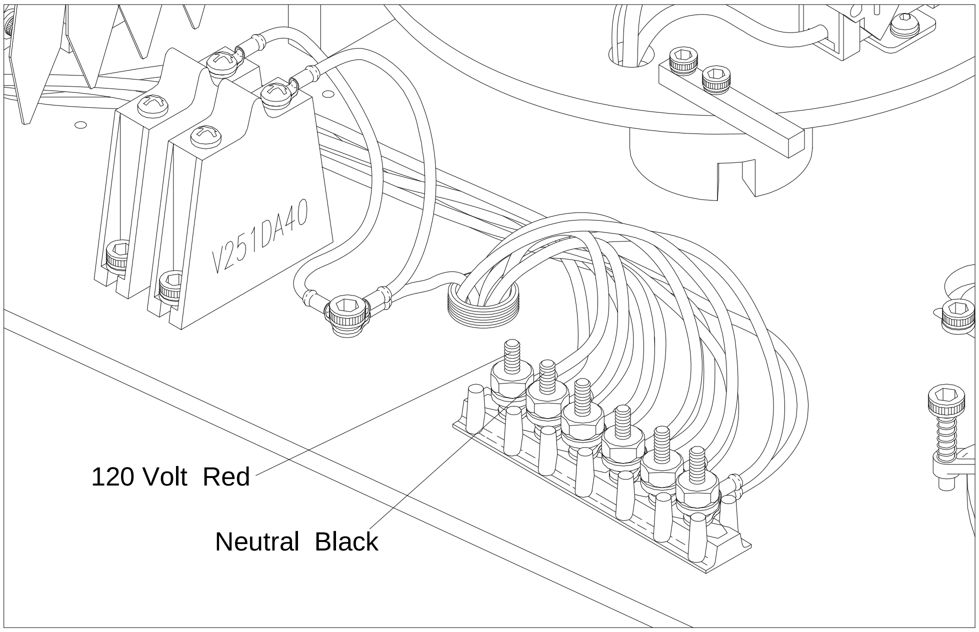


Figure 12 Voltage Test Positions

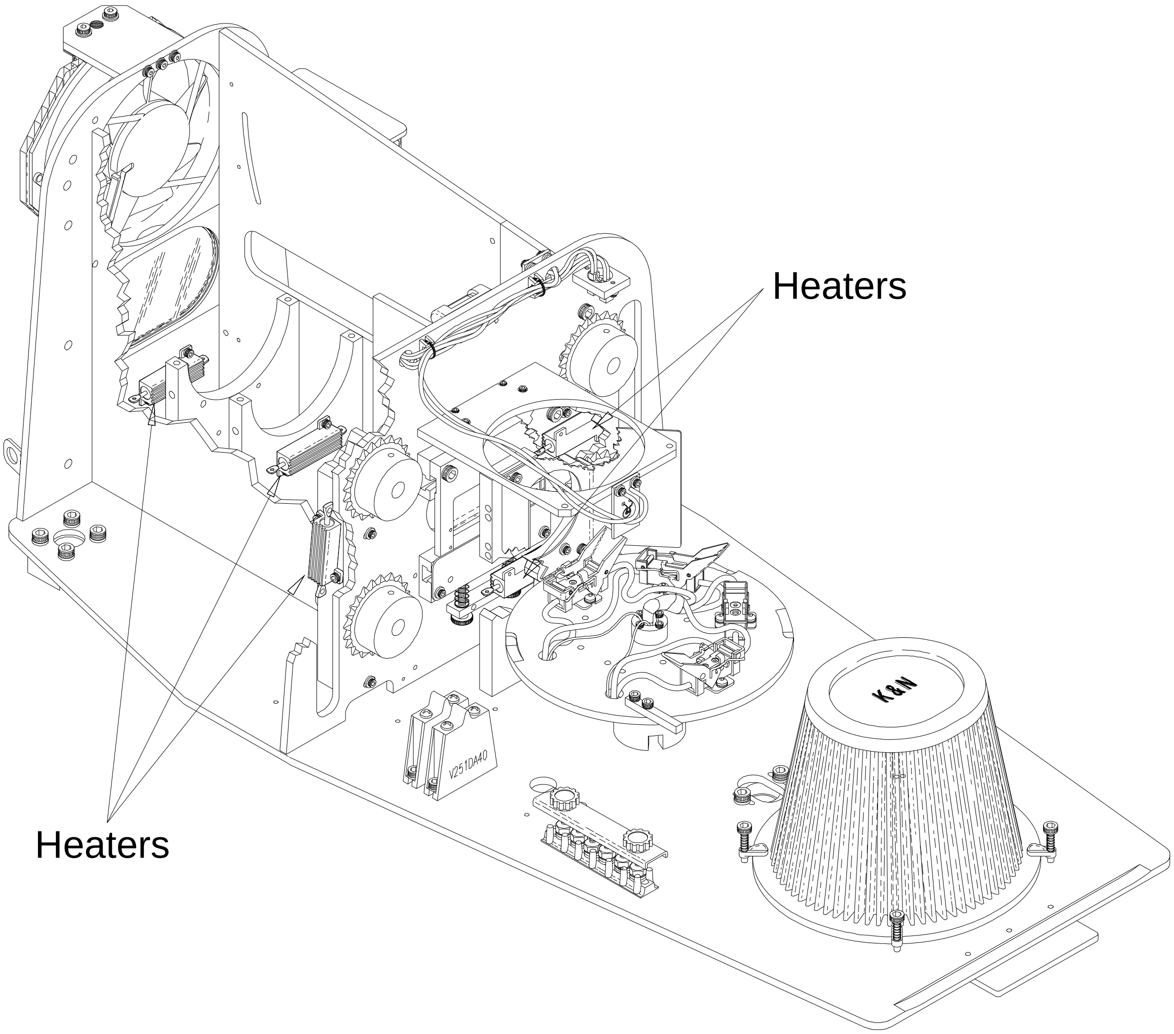


Figure 13 Heater Locations