and separation from the sun are ideal. With practice, acquisition should become easier and you will be familiar with those conditions conducive to successfully making a Venus shot.

12.11.2. During the day when the sun is high, the moon or Venus, if they are available, can be used to obtain compass deviation checks. In polar regions during periods of continuous twilight, the moon and Venus will be available if their declination (Dec) is the same name as the latitude.

**12.12. Duration of Light.** Sunrise and sunset at sea level and at altitude, moonrise and moonset and semiduration graphs will not be discussed in detail in this chapter. It is imperative; however, to preplan for any mission where twilight occurs during the course of the flight, especially at the higher latitudes where twilight extends over longer periods of time. An excellent discussion, with appropriate examples, is provided in the *Air Almanac* and should be sufficient for those missions requiring detailed planning.

***Section 12D—True Heading Celestial Observation***

**12.13. Basics.** The periscopic sextant, in addition to measuring celestial altitudes, can be used to determine true headings (TH) and true bearings (TB). Any celestial body, whose azimuth can be computed, can be used to obtain a TH. Except for Polaris, the appropriate volume of Pub. No. 249 is entered to obtain Zn (true bearing). In the case of Polaris, the *Air Almanac* has an azimuth of Polaris table. It does not require information from the Pub. No. 249 tables. The two methods used to obtain THs with the periscopic sextant. The TB method requires precomputation of Zn. Postcomputation of Zn is possible with the inverse relative bearing (IRB) method. The procedures are as follows:

**12.14. True Bearing (TB) Method:**

12.14.1. Determine GMT and body to be observed.

12.14.2. Extract GHA from the *Air Almanac*.

12.14.3. Apply exact longitude, at the time of the shot, to GHA to obtain exact LHA.

12.14.4. Enter appropriate Pub. No. 249. table with exact LHA, latitude, and Dec. Interpolate if necessary and extract Zn and Hc (Figure 12.12). If Polaris is used, obtain the azimuth from the Azimuth of Polaris table in the *Air Almanac* and use your latitude instead of Hc (Figure 12.13).

12.14.5. Set Zn in the azimuth counter window with the azimuth crank and set Hc in the altitude counter window with the altitude control knob.

12.14.6. Collimate the body at the precomputed time and read the TH of the aircraft under the vertical crosshair in the field of vision. If you are using precomputation techniques, a TH is available every time an altitude observation is made.

***NOTE:*** Shot must be taken at precomp time.

**Figure 12.12. True Bearing Method (Except Polaris).**

1. Precompute the Zn of the body.
2. Using the azimuth crank, set the Zn of the body in the azimuth counter window.
3. Using the altitude control knob, set Hc in the altitude counter window.
4. Locate the body by turning the sextant until the approximate TH of the aircraft falls under the vertical crosshair. Body should be in the field of vision. Bring body into collimation.
5. Read exact TH under the vertical crosshair. (060°)

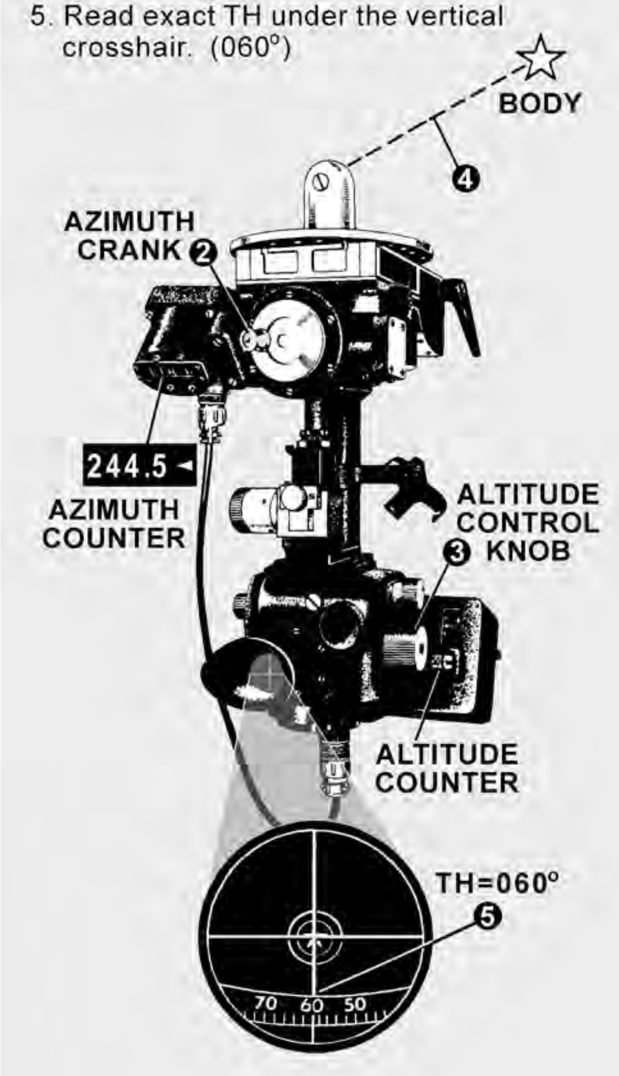
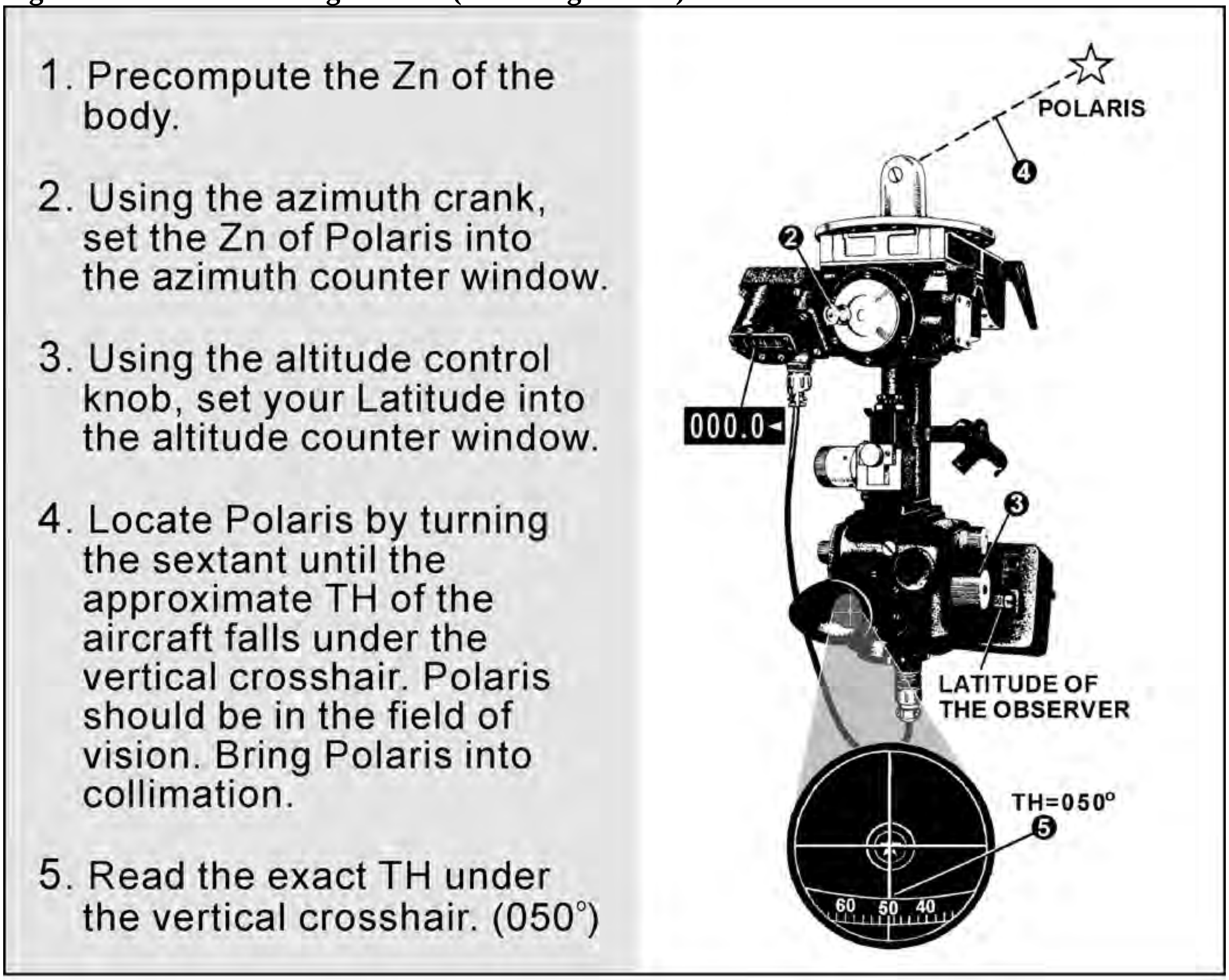


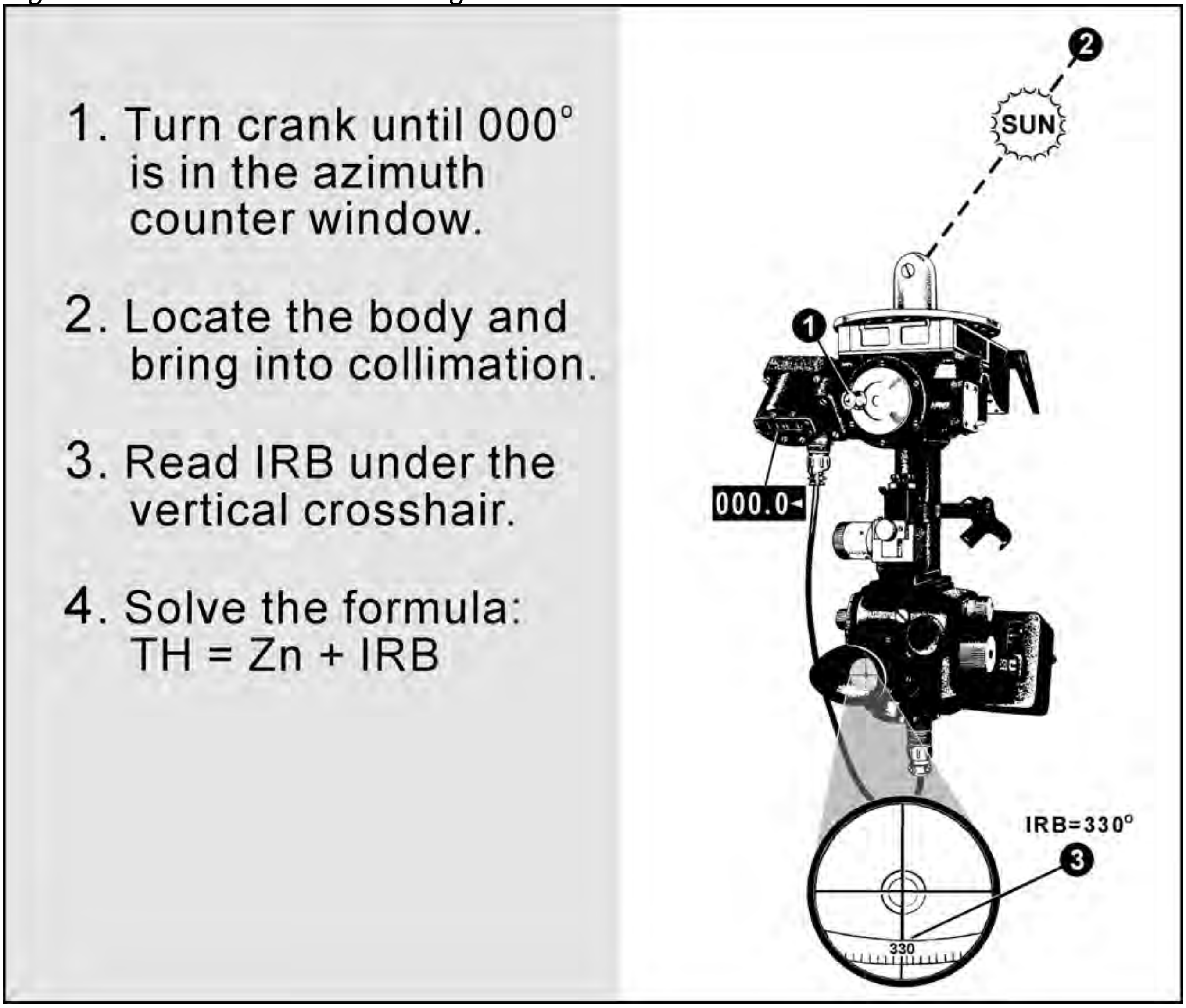
**Figure 12.13. True Bearing Method (Including Polaris).**




### 12.15. Inverse Relative Bearing (IRB) Method:

12.15.1. Set 000$^o$ in the azimuth counter window with the azimuth crank (Figure 12.14).

**Figure 12.14. Inverse Relative Bearing Method.**




12.15.2. Collimate the body. At the desired time, read the IRB under the vertical crosshair in the field of vision.

12.15.3. Compute Zn of the celestial body and use the formula:

TH = Zn + IRB

***Section 12E—Celestial Navigation in High Latitudes***

**12.16. Basics.** Celestial navigation in polar regions is of primary importance because (1) it constitutes a primary method of determining position other than by DR and (2) it provides a reliable means of establishing direction over much of the polar regions. The magnetic compass and directional gyro (DG) are useful in polar regions, but they require an independent check, which can be provided by a celestial body or other automatic systems such as INS or GPS.