PART 1

SECTION 3 — AI23D

CHAPTER 1 — INTRODUCTION TO AI23D

(Completely revised at AL5)

Contents

Illustrations

General

1. The AI is an I-band radar and analogue computer system which, by means of a CRT (B-scope) display, enables the pilot to carry out an attack in three phases, search acquisition and track. The AI scanner searches a sector of sky ahead of the aircraft during the search phase and can detect targets up to 80 NM range. When a target is recognised, action is taken in the acquisition phase so that the radar locks on to the target in range, azimuth and elevation when the track phase is selected; the target is then continuously tracked automatically. With radar lock-on established, an approach course to a position suitable for weapon firing is calculated, and firing instructions given, by the computers; this information is presented on the B-scope.

2. Other facilities which improve the system capabilities are available to the pilot via the AI; these are:

a. E/F-band (2850-3150 MHz) homing, selected when the ground radar systems are being jammed, to obtain a display on the B-scope which enables the aircraft to home on to the jammer (Part 1, Section 3, Chapter 5).

b. The radar ranging mode, in which the light fighter sight (LFS) is brought into use for a visual attack during which the AI provides 'in range' indication (Part 1, Section 4).

c. The vis-ident mode, a short range function of the normal AI which enables a close radar approach to the target to be made.

Cathode Ray Tube

3. Radar information is displayed on a CRT. The display is produced by controlling a beam of electrons which 'paint' a spot on the fluorescent screen of the tube. The beam can be deflected vertically and horizontally to paint the spot on any part of the screen. The brightness of the spot depends upon the number of electrons in the beam. These are varied in number by a brilliance control or by inputs to the CRT which give a 'bright up' at the moment the spot is traversing that point on the screen where some information is to be displayed. The display is basically a B-scan, ie the spot moves vertically very rapidly appearing to be a line (range timebase) along which range information is displayed, and horizontally in synchronism with the scanner to display the bearing of the beam. A CRT that displays a B-scan is generally referred to as a B-scope.

Range and Bearing Indication

4. *Range Indication.*

a. Because electro-magnetic waves travel at a constant velocity (3×10^8 metres/sec $\doteq$ 300 metres/microsecond) and, over the short distances involved, can be considered as travelling in a straight line it is possible to assess the range of the target if the time interval between a transmission and the reception of its echo is measured. A pulse system is convenient, and is used, for this purpose.

b. In a pulse system, the transmitted pulses of radio energy are repeated at intervals. The interval between pulses is long by comparison with pulse length so that the echo from one transmission is received before the next transmission takes place. One of the factors on which pulse repetition frequency (PRF) depends is, therefore, the maximum range covered by the equipment. The AI works out the range and bearing each time the echo from a transmitted pulse is received; such a system is known as monopulse and, with the AI tracking the target, this occurs approximately 1000 times per second. A switching device enables the same aerial to be used for transmission and reception.

c. The time taken to paint the vertical range timebase is equal to the time required by a pulse to travel to the operating range of the equipment and its echo to return. The trace therefore represents the operating range (0 to 10 NM, 0 to 40 NM, or 40 to 80 NM). The timebase paint is started each time a pulse is transmitted except on the 40 to 80 NM range where the start of the timebase is delayed. At the completion of the period the beam is instantaneously re-directed towards the bottom of the screen. When an echo is received a 'bright up' of the spot occurs at a point along the timebase equivalent in time to the target range. Vertical scales adjacent to the screen enable the range to be read off.

5. *Bearing Indication.* The narrow beam of energy produced by the dish-shaped reflector in the scanner assembly (Chapter 3 of this Section) is of sufficient concentration to give a good return from a target only when the beam is pointing directly at it. By directing the scanner in azimuth and elevation, the sky can be searched within the limits of scanner movement and the direction of a target, when found, is ascertained by pointing the beam at it and measuring the angular position of the scanner in azimuth and elevation relative to the radar axis. A horizontal scale below the B-scope indicates beam angle in azimuth by the position of the range timebase against it. Vertical azimuth lines, superimposed on the face of the B-scope, facilitate azimuth readings in the search phase.

MAIN UNITS

General

6. Of the several units employed in the AI system, the main ones are briefly described below. The major components of the system are more fully discussed in subsequent chapters of this section and reference is made to the appropriate chapters in the following paragraphs. Layout of components in the aircraft is tabulated and illustrated in Part 1, Section 2, Chapter 1.

Radar Unit

7. The radar unit is pressurised and heat generated by the equipment is dissipated via a heat exchanger through which cooling air flows. A pressure switch isolates the transmitter from power supplies and lights a warning on the B-scope chassis if pressure

fails; the transmitter can be brought back into use at the risk of damage if the pressure override switch is operated and the transmitter switch is set to off and then returned to its on position.

8. *Transmitter* (*Chapter* 2). This unit transmits a 1 microsecond pulse at a rate which fluctuates irregularly around a mean 991 pulses per second (normal PRF) or 744 pulses per second (low PRF). At the same time, trigger signals are produced which initiate a number of actions that require to be related to the start of a transmission, eg triggers the range timebase, mutes the receiver, initiates markers.

9. *Scanner Assembly* (*Chapter* 3). The scanner is limited to a scan of ±50° in azimuth and ±30° in elevation, both relative to the AI roll axis, and carries the E/F-band homer and AI aerials. The AI aerial transmits energy pulses and, from the returns, produces signals which are passed to the receiver (Chapter 2). The assembly is space-stabilised in roll by the MRG within limits of ±110°, except after Launch Warning in a fully radar controlled Red Top attack and during radar ranging, when the roll axis is locked (Chapter 3).

10. *Receiver* (*Chapter* 2). The receiver produces outputs from the echoes returned which are ultimately displayed as target range and bearing and used for scanner control during the track phase (Chapter 3).

11. *Ranging Units* (*Chapter* 4). These units automatically track the target in range during the track phase and also provide the computer red with range and range rate information.

12. *Computer Red* (*Chapter* 6). The computer red operates in conjunction with the external computer (Chapter 6) to compute information, some of which is displayed as:

a. Steering instructions.

b. Closing speed or angle between aircraft courses.

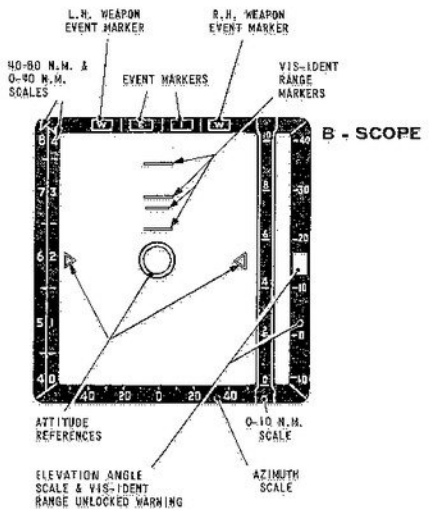
c. Weapon firing instructions.

d. Breakaway signals.

The computer red also aids the Firestreak or Red Top missiles to acquire the target (lock on), by supplying slaving signals which cause the homing eyes to scan the target area (Part 1, Section 7, Chapter 1 and 2).

B-Scope and Visual Recorder

13. The B-scope displays target and steering information, markers, scanner angles, and E/F-band homing information. A recorder unit in the rear fuselage spine contains a duplicate B-scope and cine-camera (Part 1, Section 5): with the AI RECDR switch on and the AI transmitter operating, a film record of all B-scope displays is obtained. Throughout this manual it should be taken that when reference is made to the B-scope display and the surrounding indicators and scales, the visual recorder is also meant. The B-scope is shown at Fig 1.



1—3—1 Fig 1 B-Scope

14. The vertical sides of the screen are flanked by scales, 0 to 40 NM and 40 to 80 NM range scales on the left, and 0 to 10 NM range and scanner elevation scales on the right (Fig 1): a red SNIG (signal not in gate) lamp in the centre of the scanner elevation angle scale flashes if range lock is lost when the vis-ident mode is selected.

15. At the bottom of the screen is a horizontal azimuth scale against which the range timebase paint moves in synchronism with the aerial to indicate target bearing up to 50° to port or starboard. Above the screen are four event markers: the W markers, on the left and right, are associated with the weapons and light individually as the related port or starboard missile homing eye acquires the target. The two centre event markers, E and I, were originally intended for use with data link. Data link, however, is not fitted and these two lights illuminate in conjunction with lamps No 1 and No 2 on the visual recorder to indicate Launch Warning and trigger press under certain conditions.

16. At all times with the AI in use an aircraft attitude line is painted. This line has a gap in its centre and responds to MRG roll and pitch outputs to indicate roll through 360° and pitch up to ±30°: level flight reference points in the form of an engraved reference circle with an arrowhead on either side on a transparent panel covering the B-scope. The transparent panel has an engraved reference circle in the centre and four lines engraved above, representing 300, 500, 600 and 900 yards ranges which are used in conjunction with the vis-ident range circle (para 43) to indicate short ranges in these modes. The reference circle is used as a datum for the steering dot in a computed attack. The transparent panel also has vertical azimuth lines etched at 10° intervals to facilitate azimuth readings in the search phase.

17. A continuous altitude line appears across the swept part of the screen (full width in search, 10° in acquisition) at a range equivalent to the aircraft altitude, except when the 40 to 80 NM scale is selected: in the track phase this appears as a bright-up on the tracking strobe. This is produced by spill-over of some of the transmitted energy which is reflected from the surface directly below the aircraft; it is generally a diffuse line over land or a hard thin line over the sea.

E/F-Band Homer Receiver (External Receiver)

18. When E/F-band homing is selected, homing signals are displayed on the B-scope, and a proportional navigation approach on to an E/F-band jamming target can be achieved, normally in the automatic mode of the Flight Control System (Chapter 5).

Gyroscope Unit

19. This unit (Chapter 2) passes resolved steering signals from the computer red to the B-scope. It also passes these signals to the Firestreak pack slaving unit for missile head slaving.

Marker Unit

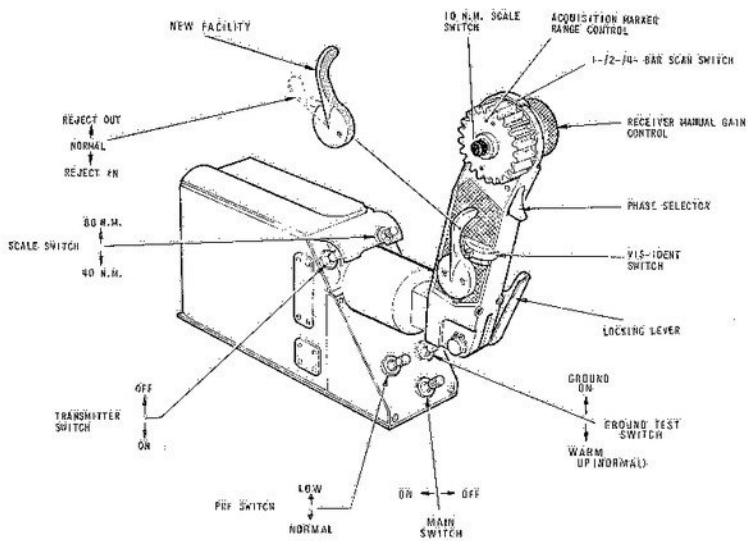
20. Markers (eg, attitude line, time circle, steering dot) are generated by this unit for display on the B-scope at the appropriate time (Chapter 2).

Altitude and Airspeed Unit

21. This is a two capsule component supplying altitude and airspeed information to the external computer and altitude information to the computer red.

Hand Control Unit

22. The hand control unit, illustrated in Fig 2, carries all the controls necessary for operation of the AI. Most of the controls are mounted on the control handle which is itself a control. On the T5 aircraft, the instructor's control unit is opposite handed and does not have a main on/off switch or a ground test switch.



1—3—1 Fig 2 Hand Control Unit

23. *Main On/Off Switch.* In the up (off) position, power is isolated from the AI. When down (on), power supplies are connected.

24. *Ground Test Switch.* This switch, when in the outboard position, permits ground testing of the AI to be carried out prior to engine start, providing the main on/off switch is on and AC and DC ground supplies are connected and switched on. In the inboard position, the switch maintains the equipment in a standby condition after check until the aircraft power supplies are available (Chapter 2).

25. *Transmitter On/Off Switch.* With the switch set to on (down), an earth to the transmitter control unit (Chapter 2) is provided to bring the transmitter into use.

26. *Control Handle.* Fore and aft movement of the handle controls scanner elevation angle in the search and acquisition phases. Lateral movement of the handle positions the acquisition marker in azimuth in the search and acquisition phases and, in addition, controls the scanner in azimuth in the acquisition phase. The elevation cover of the scan pattern is steerable in the search and acquisition phases, through +27° to minus 8° relative to the MRG horizontal; limit stops at 30° above and below the radar axis (Chapter 3) restrict the elevation cover in certain pitch attitudes.

27. *Control Handle Locking Lever.* This lever is spring-loaded and operates a friction lock to retain the control handle in any position set by the pilot. The locking lever and control handle must be gripped together to free the control handle.

28. a. 10 *NM Scale Switch.* This reciprocating push-switch, in its outboard position, switches the AI into 10 NM operation and lights the 0 to 10 NM scale on the CRT. When the switch is inboard, either the 0 to 40 NM or 40 to 80 NM scale is selected depending on the 80/40 NM scale switch position (see para 28 b).

b. 80/40 *NM Scale Switch.* This 2-position switch is only operative when the 10 NM scale is *not* selected. In its *down* position, the switch selects 0 to 40 NM operation and, in its *up* position, it selects 40 to 80 NM operation together with the respective scale lights on the CRT.

29. *Target Reject Out/Reject In Lever.* This lever has six positions; three forward of the centre detent and three (reject out, normal, and reject in) to the rear of the detent. The three positions forward of the centre detent give New Facility operation (see Part 2, Section 1, Chapter 5), and the three rearward positions give AI23D operation. When clear of the detent to the rear, the lever is spring-loaded to a centre position (normal) between two reject positions. During the track phase, these reject positions enable range lock to be transferred from one target to another on the same bearing but at longer (reject out) or shorter (reject in) range. Forward pressure from the *normal* position rejects out and rearward pressure rejects in.

Note 1: In an LFS GW attack, the reject lever will also move the radar ranging brackets in and out.

Note 2: The reject out function can also be performed by the GS CAGE button when the MAS is at GW.

30. *Acquisition Circle Range Control.* Adjusts the position in range of the acquisition circle (Fig 5) and, in the search and acquisition phases, the position of the range gates. Rearward rotation increases range, forward rotation reduces range.

31. 1, 2 *or* 4 *Bar Scan Switch.* This 3-position switch controls the elevation search pattern during the search phase (Fig 4). Switch forward for 4-bar scan (16°), centre for 2-bar scan (9°) and aft for single or 1-bar scan (5·5°).

32. *Phase Selector.* This selects, by separate pressures, the attack phases in the sequence search, acquisition, track, search, etc. These three normal phases of operation are available when the LFS/CRT switch is at CRT.

33. *Receiver Manual Gain Control.* This control adjusts receiver gain, and therefore, the contrast of any echo signals displayed, whilst in the search and acquisition phases.

34. *Vis-Ident Switch.* Switches in the vis-ident facility.

35. *PRF Normal/Low Switch.* This 2-position switch enables normal PRF (down) or low PRF (up) to be selected. The normal PRF is 991 Hz, but where adjacent radars are operating at a similar PRF, there is a possibility of mutual interference degrading performance. To prevent this, a facility is provided to switch to a lower PRF of 744 Hz. The selection of low PRF also causes the second time base returns to move 40 NM out in range. Thus heavy clutter in an area of probable target pick-up may be moved out of the way by selecting low PRF; this is particularly useful when the radar is looking down. There is a nominal reduction in pick-up range when using the low PRF.

E/F-Band Homer Control Unit

36. This unit is used in conjunction with the HDG selector knob in the navigation display to home on to an E/F-band jammer (Chapter 5). The control unit is illustrated in Fig 3.

37. *Gain Control.* A spherical shaped rotary control which adjusts the gain of the external receiver.

38. *Function Switch.* A 5-position OFF, ON, ALIGN, PROP NAV and ATTACK switch, with the following functions:

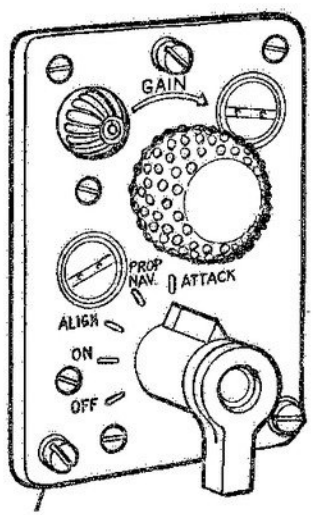
a. *OFF.* Power is supplied to the receiver but it has no output.

b. *ON.* Brings the external receiver into use so that any E/F-band signals are fed to the B-scope. It also supplies the AI receiver with a blanking signal which inhibits outputs produced by echo returns from 0 to approximately 5 NM range, thereby clearing the lower portion of the B-scope for the E/F-band display. A stop prevents the control from being inadvertently moved clockwise from this position.

c. *ALIGN.* The switch must be pulled out before this position can be selected: the indicator dimmer-lamp lights and the homer marker appears (Chapter 5). With the switch in this position movement of the HDG selector knob has no effect upon aircraft heading in the automatic mode.

d. *PROP NAV.* Brings the proportional navigation computer in the external receiver into use and enables the aircraft to be homed on to the target; with the autopilot in use, the turn on to the jamming target commences.

e. *ATTACK.* Isolates the external receiver from the B-scope and permits normal operation of the AI.



1—3—1 Fig 3 E/F-Band Homer Control Unit

B-SCOPE DISPLAYS

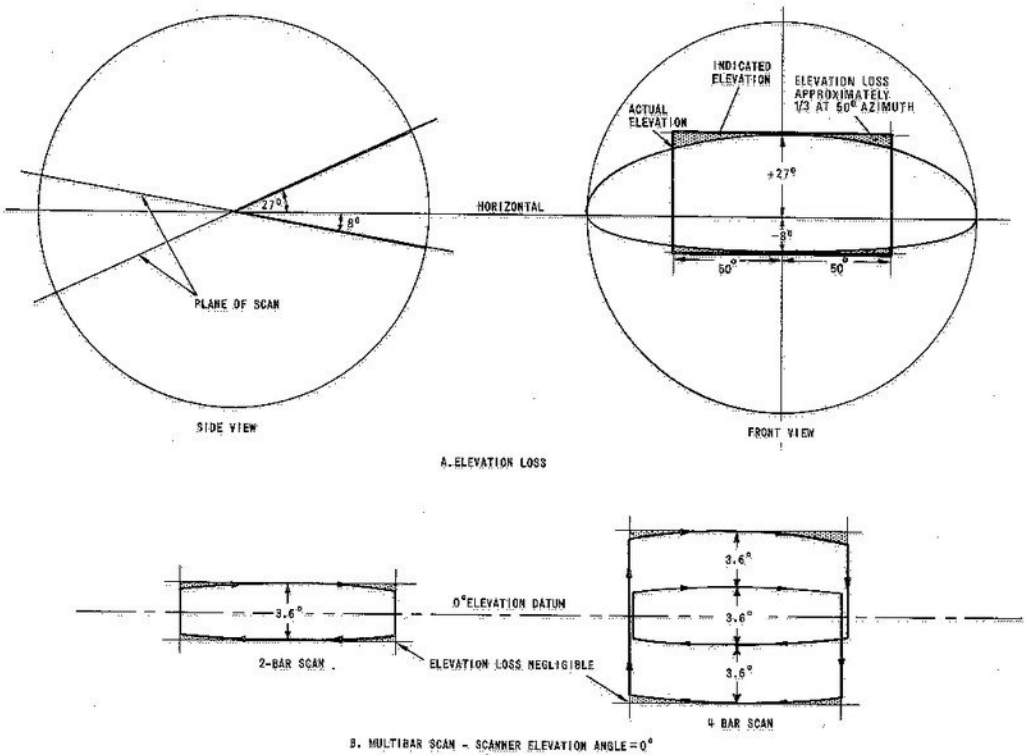
Radar Mode

39. The AI operates in the radar mode when the LFS/CRT switch is set to CRT. An automatic attack in this mode is carried out in three phases, search, acquisition and track.

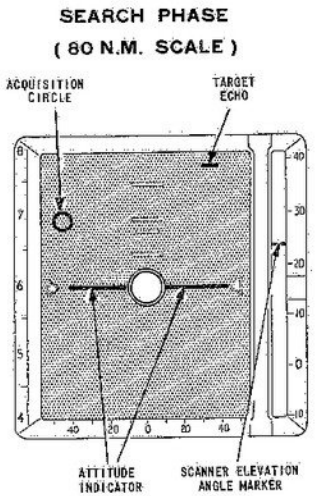
40. *Search Phase.* A normal attack sequence starts in this phase, selected if necessary by the phase selector when the radar is on and transmitting. The 10 NM, 40 NM or 80 NM scale and 1, 2 or 4 bar scan should be selected as required. Azimuth scan is through 50° on either side of centre at a rate of approximately 160°/second, so that one complete scan cycle (from centre to 50° left then through 100° to right and back to centre) takes 1·25 seconds. The scan pattern can be directed upwards through 25° and downwards through 10° relative to the MRG horizontal within the ±30° limits of scanner movement in elevation. The search phase display, shown in Fig 5 is described in sub-para a and b.

Note 1: The mechanical arrangement of the scanner assembly is such that when the aerial is deflected in elevation its azimuth path and thus the path of the beam, is a curve which would reduce elevation angle to zero at each end of the azimuth sweep if it were through ±90° (Fig 4A). The elevation loss when the scanner moves through 50° in azimuth is up to ⅓. With multibar scan and zero elevation angle selected, the effect is a scan pattern as shown in Fig 4B by exaggeration, the scans nearest zero elevation in 4-bar scan being less curved than the outer scans. When the scanner is deflected in elevation by the hand control unit, the pattern changes so that with 27° upward deflection selected the pattern is as shown in Fig 4C. The multibar scan pattern with 8° downward deflection is inverted and less curved. It can be seen that the effect of elevation loss is negligible at small elevation angles but produces blind spots in beam coverage as the beam approaches its azimuth limits when elevation angles are large. Targets bearing 40° to 50° with a height separation that requires large scanner elevation angles may not give any returns.

Note 2: The scan pattern in multibar scan is changed in steps applied at each end of the azimuth scan and varies the elevation of the bars by 3·6°. The



1 – 3 – 1 Fig 4 Elevation Loss and Multibar Scan



1—3—1 Fig 5 Search Phase Display

scan is clockwise as shown in Fig 4, resulting in targets below the centre point of the scan being displayed during right to left sweeps. To ensure that the beam is directed to give maximum paint from the target when single-bar scan is automatically switched in at the acquisition phase, the scanner elevation should be adjusted until a paint of equal intensity is received.

a. *Search Phase Display.*

The display during the search phase is as follows and as illustrated in Fig 5:

(1) The range timebase representing 10 NM, 40 NM or 80 NM sweeps through a full 50° on either side of centre.

(2) The scanner elevation angle scale is illuminated.

(3) The azimuth scale is illuminated.

(4) The 10 NM, 40 NM or 80 NM scale, as selected, is illuminated.

(5) The attitude indicator is displayed and positioned by the MRG.

(6) The acquisition circle is displayed. It is a small circle which should be positioned in azimuth and range by the hand control unit to encircle the target echo. This determines the range setting of the range gates (Chapter 4) and the centre of the narrow angle scan which commences when the acquisition phase is selected.

(7) The scanner elevation angle marker is displayed as a horizontal line to the right of the 10 NM scale. It indicates scanner elevation angle from minus 10° to +40° relative to the MRG horizontal when read against the scanner elevation angle scale.

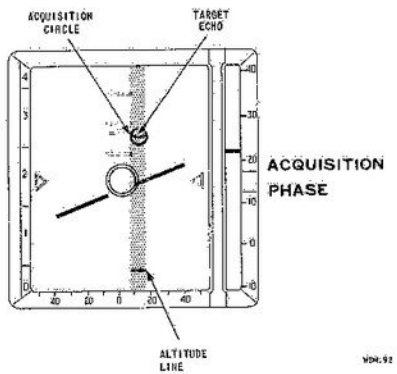
(8) The target echo, if within the field of sweep, is displayed.

b. *E/F-Band Operation.* E/F-band homing modifies the display by blanking out the bottom 4 to 5 NM of the AI returns and presents in their place the jamming signals (E/F-band return) as noise grass along the bottom of the B-Scope. The peak point of the noise grass represents the relative bearing of the strongest signals, ie the jamming source. During the ALIGN and PROP NAV stages of a homing, the acquisition marker is replaced by a homer marker (a short vertical line at about 7 NM range) which, under the control of the HDG selector knob, is used to track the jammer by aligning it with the peak point of the noise grass. The E/F-band display is illustrated in Chapter 5 of this Section.

41. *Acquisition Phase.*

a. When this phase is selected, the display (Fig 6) remains the same as for the search phase except that the scan becomes single-bar limited to ±5° in azimuth relative to the position of the acquisition marker and painted 5 times per second. The scanner is now linked with the acquisition marker and therefore the pilot has azimuth control of the scanner through ±50°: control of the acquisition marker in range and the scanner in elevation is still effected by operation of the hand control unit.

b. Prior to selecting track, the acquisition marker must be positioned as precisely as possible over the echo.



1—3—1 Fig 6 Acquisition Phase Display

42. *Track Phase.* When track is selected, the scales around the edges of the B-Scope remain illuminated and the attitude indicator and scanner elevation angle and acquisition circle continue to be displayed. The other markers on the B-Scope change as detailed in the following sub-para (Fig 7). In the track phase, overloading of the receiver is prevented by the introduction of an attenuator, for target echoes below 12,000 feet.

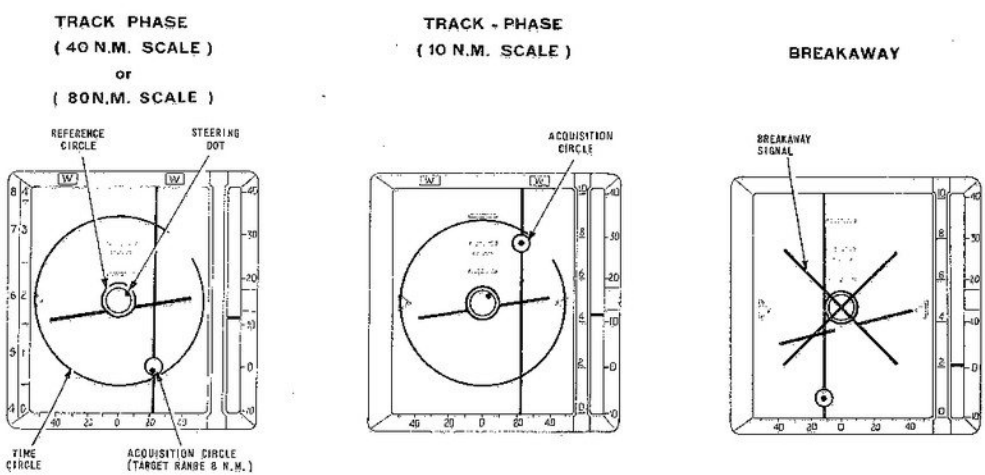
a. *Steering Dot.* The computed approach path is followed by maintaining the steering dot within the engraved reference circle. The steering dot is limited in movement to remain within the time circle, which has a radius equivalent to 6° of angular steering error; the reference circle has an angular radius of 0·7° up to the 'Time-to-Go' switching, then 1·2° thereafter. In missile attacks, the steering dot is removed at breakaway. If range lock is lost and at the same time, signal strength is insufficient to produce the angle-locked-on signal which brings in kinematic ranging (Chapter 4), the acquisition circle will sweep ±2500 feet and drift inwards at 2400 knots. However if range lock is lost due to jamming, but angle lock is maintained, the acquisition circle will immediately become a short horizontal line indicating that kinematic ranging is available (Chapter 4).

Note: The steering dot does not appear unless the LFS/CRT switch is selected to CRT and the MAS is selected away from OFF.

b. *Time Base Scan.* A vertical line indicates the bearing of the scanner and range is indicated by the position of the target echo relative to the appropriate range scale. The position of the range gates (Chapter 4) is indicated by the acquisition circle; with the system locked on in range, the target echo appears in the centre of the acquisition circle (Fig 7). The ranging circuits involved in the lock on to a target incorporate a 5-second memory (provided the radar has been locked on for 4 seconds), to cover short period fading during the track phase. When range lock is lost the acquisition circle immediately starts to sweep ±2500 feet above the last measured range for a period of 5 seconds. If the echo does not reappear during this period the circle then starts to drift in at a rate of 2400 knots towards zero range. If range lock is lost but angle lock is maintained, the operation of the AI will be as detailed in Chapter 4. When range lock is maintained the acquisition circle remains concentric over the target echo down to minimum range. At ranges of less than approximately 500 yards, the target echo disappears off the bottom of the B-Scope, but the top of the circle is still visible. This provides additional short range information and can be used as a cross-check against the vis-ident range presentation. The marker unit allocations are given in Part 1, Section 3, Chapter 2, para 20.

c. *Time Circle.*

(1) The time circle is 50 mm in diameter and is positioned about the centre of the B-scope.



1—3—1 Fig 7 Track Phase Displays

During an approach on to targets for which 1, 2 or 3 has been set on the B-Scope COMPUTER switch, the position of a gap in the circle shows the closing or opening speed, the 9 o'clock position indicating zero rate. Clockwise rotation gives closing speeds up to 2400 knots, each 90° representing 1000 knots. Anti-clockwise rotation indicates opening speed up to 70 knots. When the COMPUTER switch is set to 4, 5 or 6, the gap in the circle is larger and its position represents the angle between the courses of the target and interceptor up to 107° (from 180° down to 73°); the 6 o'clock position is head on; 30° movement of the gap there will indicate a 150° angle between courses. If, when range lock is lost, kinematic ranging becomes inaccurate the gap is not present. At the appropriate time during an attack the time circle also serves to give firing instructions which vary with the weapon in use.

(2) When the missiles are to be launched, the diameter of the time circle reduces in two steps, first to $\frac{2}{3}$ and then to $\frac{1}{3}$ its normal diameter.

(a) The first reduction indicates:

(i) The outer range bracket (Fire Signal and Launch Warning simultaneously) when using Firestreak.

(ii) Launch warning when using Red Top.

(b) The second reduction indicates:

(i) Last chance to fire when using Firestreak. The reduction occurs 2 seconds before the inner range bracket.

(ii) The moment of automatic firing (Fire Signal) when using Red Top. This second reduction occurs 2 seconds after the first.

d. *Breakaway.* The breakaway signal is a large cross that replaces the time and steering dot. The signal appears whether or not the weapons have been fired and immediate evasive action must be taken upon receipt of the signal. Breakaway is displayed as follows:

(1) When the ranging part of the computer is set below:

The computed inner range bracket of Firestreak.

The computed inner range bracket of Red Top.

(2) When the Red Top weapon pack computes one missile fired/misfired and the other missile obscured (Part 1, Section 7, Chapter 2).

e. *Locking Under Adverse Conditions.*

Lock-on can be achieved by maintaining manual receiver gain for a short period after selection of track phase, by keeping the phase change trigger pressed. When the trigger is released the radar reverts to automatic gain control (AGC).

Radar Ranging Mode

43. With the LFS/CRT switch at LFS, the AI switches to its radar ranging mode. The display presented is that of the track phase minus the reference circle and steering dot.

a. *GW Radar Ranging.* With LFS set on the LFS/CRT switch and GW set on the MAS, the AI scanner is programmed to the missile boresight. A preset range gate, 750 feet long sweeps between 5000 and 10,000 feet when the aircraft is above 15,000 feet and between 3000 and 6000 feet when the aircraft is below this altitude. The range timebase is therefore at 0° in azimuth and the elevation circle sweeps between 5000 feet and 10,000 feet. The AI does not lock-on in range or angle, but if a target enters the range gate, an 'in range' signal is fed to the LFS for as long as it remains within the sweep. The receiver is maintained in a fixed gain condition to reduce the effect of signal strength fluctuations to a minimum.

b. *Guns Radar Ranging.* With LFS set on the LFS/CRT switch and GUNS set on the MAS, the AI scanner is programmed to a guns boresight position 1·9° below the missile boresight. A preset range gate is generated between 1350 feet and 625 feet in range. The LFS 'in range' marker lamp illuminates whenever a target is seen within this gate. The AI does not lock on in range or angle. The lamp remains illuminated between 1350 feet and approximately 500 feet independent of opening or closing rates. In GW the receiver is maintained on fixed gain.

Note: To return the AI to normal search operation after radar ranging, select CRT on the LFS/CRT switch.

Visual Identification Mode

44. The vis-ident mode is brought into use by selection of the vis-ident switch and 10 NM at the 10 NM scale switch. The mode is an extension of the track phase and is switched in when tracking has reduced range to about 2·5 NM.

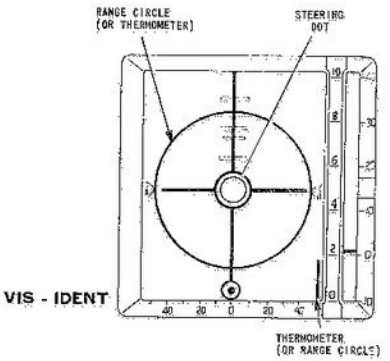
Note: The vis-ident display can only be presented when the 10 NM range timebase is selected, and when the LFS/CRT switch is selected to CRT.

45. On selecting vis-ident, the time circle is converted into a vertical line (thermometer) at ranges above 900 yards and is positioned to the left of the 0 to 10 NM range scale (Fig 8). In this mode the

0 to 10 NM scale represents 5000 yards (1000 yards/division) and the thermometer shortens from its maximum length representing 5000 yards as range reduces.

46. When range closes to 900 yards (just below 2 NM on the range scale) the thermometer is replaced by a range circle and range assessment is by the range circle which contracts as range is further reduced. This gives target range by its position relative to the 900, 600, 500 and 300 yard marks engraved on the B-Scope.

47. At all times when vis-ident and the 10 NM scale are selected, the red indicator (SNIG lamp-signal not in gate) on the scanner elevation angle scale is functional and flashes, together with thermometer or range circle fluctuations, if range lock is lost.



1—3—1 Fig 8 Vis-Ident Display

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